

CONTRACT DOCUMENTS FOR
CONSTRUCTION OF THE
FY21 MULTIPLE PUMP STATIONS
PROJECTS
PROGRAM NO. S5036



Prepared for the
COBB COUNTY WATER SYSTEM
COBB COUNTY, GEORGIA

VOLUME 1 OF 2 - SPECIFICATIONS

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this project, contact:

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Jacobs

JACOBS Project No. JJX13603
SEPTEMBER 2020

BID DOCUMENTS

**COBB COUNTY WATER SYSTEM
STANDARD CONTRACT DOCUMENTS
for
FY21 MULTIPLE PUMP STATIONS PROJECTS
PROGRAM NO. S5036**

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DIVISION 0

BIDDING AND CONTRACT DOCUMENTS

**SECTION 00020
ADVERTISEMENT FOR BIDS**

FY21 MULTIPLE PUMP STATIONS PROJECTS

PROGRAM NO. S5036

for

COBB COUNTY, GEORGIA

Separate, sealed bids for furnishing all materials, labor, tools, equipment, and incidentals necessary for the construction of the aforementioned project will be received by **COBB COUNTY**, a political subdivision of the State of Georgia, herein referred to as "Owner", at the offices of the **Purchasing Department, 122 Waddell Street NE, Marietta, GA 30060**, until **12:00 Noon** (local time) on **October 22, 2020**. **No bids will be accepted after the 12:00 Noon deadline.**

Sealed bid labels are included in the bid document and **MUST** be affixed to both the outside of the sealed bid envelope and the shipping container, if applicable. The project name, program number, date, and name and address of the bidder must be shown on the sealed bid labels.

Bids will be opened at 2:00 PM (local time) on **October 22, 2020**, at the **Purchasing Department, 122 Waddell Street NE, Marietta, GA 30060**.

The Project consists of **rehabilitation of various aspects of seven different pump stations – Plant Atkinson Road, Marina Trace, Six Flags, Allatoona Beach, West Hampton #1, West Hampton #2 and Wood Valley**. Work at each location is variable. Generator, automatic transfer switches, pumps, control buildings are included at specific sites, along with various appurtenant rehabilitation work. The work to be performed under this Contract shall consist of furnishing all labor, materials, tools, equipment and incidentals and performing all work required to construct complete in place and ready to operate the rehabilitation of each pump station site as detailed within the bid documents.

All qualified contractors are invited to bid on this project; however, the Owner will adjudge qualification based on the "Bidder's Statement of Qualifications" submitted with the bid. Only those bidders deemed qualified by the Owner will be considered for award.

The Cobb County Purchasing Department uses an e-procurement system for electronic solicitation through BidNet's Georgia Purchasing Group. The Instructions to Bidders, form of Bid, form of Contract, Drawings, Specifications, forms of Bid Bond, Performance Bond, and Payment Bond, and other Contract Documents are available on BidNet's Georgia Purchasing Group website via the Cobb County Purchasing Department's Web Portal for Sealed Bids at www.bidnetdirect.com/georgia/cobbcounty.

Bids will be accepted only from Bidders who are listed on the Plan Holders List, signifying that they have acquired the bid documents through the Bidder's registered account with BidNet's Georgia Purchasing Group.

Each bid must be accompanied by cashier's or certified check or a bid bond prepared on accepted form, duly executed by the bidder, in the amount of five per cent (5%) of the bid.

Owner reserves the right to waive any informality or to reject any or all bids, to evaluate bids, and to accept any bid which in its opinion may be for the best interest of Owner. Any bids submitted that do not include a duplicate of Section 00300, Section 00310, and a copy of the bid bond as specified in the Instructions to Bidders may be rejected. Owner has the right to add to and delete from the contract once it has been awarded. Award, if award is made, will be to the lowest responsive, responsible bidder.

The successful bidder for this contract will be required to furnish a satisfactory performance bond and labor and material payment bond, each in the amount of one-hundred percent (100%) of the bid.

No bidder may withdraw his bid within 60 days after the actual date of the opening thereof.

END OF SECTION

SEALED BID LABELS

SEALED BID ENCLOSED

DELIVER TO:

Cobb County Purchasing Department
122 Waddell Street, NE
Marietta, GA 30060

PROJECT NAME: FY21 Multiple Pump Stations Projects

PROGRAM NO.: S5036

DATE: _____

BIDS MUST BE RECEIVED BEFORE 12:00 NOON ON THE DATE OF THE BID OPENING

BIDDER: _____

ADDRESS: _____

SEALED BID ENCLOSED

DELIVER TO:

Cobb County Purchasing Department
122 Waddell Street, NE
Marietta, GA 30060

PROJECT NAME: FY21 Multiple Pump Stations Projects

PROGRAM NO.: S5036

DATE: _____

BIDS MUST BE RECEIVED BEFORE 12:00 NOON ON THE DATE OF THE BID OPENING

BIDDER: _____

ADDRESS: _____

SECTION 00100
INSTRUCTIONS TO BIDDERS

1. RECEIPT AND OPENING OF BIDS

COBB COUNTY, a political subdivision of the State of Georgia, herein called the "Owner", invites bids on the form attached hereto, all blanks of which must be appropriately filled in. Bids from Bidders included on the Cobb County Water System's Plan Holders List will be received by the Owner at the offices of the **Purchasing Department, 122 Waddell Street NE, Marietta, GA 30060**, on the date and at the time indicated on the Advertisement for Bids. After such time on the same day, bids will be publicly opened and read aloud. Bids received after the designated time will not be considered.

The Owner may consider informal any bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or reject any and all bids. Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified shall not be considered. No bidder may withdraw a bid within 60 days after the actual date of the opening thereof.

2. PREPARATION OF BID

Each bid must be submitted on the prescribed form, prepared and provided by the Owner. All blank spaces for bid prices must be filled, in with ink. All required enclosed certifications must be fully completed and executed when submitted.

Each bid must be submitted in a sealed envelope, addressed to the Owner. The following information must be clearly displayed on the exterior of the envelope utilizing one of the **sealed bid labels** found in Section 00020, *Advertisement for Bids*:

Project name and program number
Date
The name of the Bidder and his address.

If forwarded by mail or delivery service, the sealed envelope containing the bid must be enclosed in another shipping container (envelope or box) addressed as specified in the bid forms. The second **sealed bid label** provided must be affixed to the outside of the shipping container, as well.

Any and all bids not meeting the aforementioned criteria for bid submittal, will be declared non-responsive, will be returned to the Bidder unopened.

Each bidder is required to submit a duplicate of Section 00300 and a copy of their bid bond (with each page clearly marked as duplicate) with the original bid documents. Failure to provide a duplicate may result in the bid being considered non-responsive.

3. METHOD OF BIDDING

The unit or lump sum price of each of the items in the bid shall include the actual cost to perform the work item and the item's pro rata share of overhead and profit so that the sum of the products obtained by multiplying the quantity shown for each item by the unit price represents the total bid. Any bid not conforming to this requirement, such as unit prices which in the opinion of the Owner

do not represent a reasonable cost for the work, will be considered unbalanced. Unbalanced bids may be rejected at the discretion of the Owner.

A bid in which a unit or lump sum price for an item is not entered, or for which a unit price of \$0.00 is entered, will be regarded as non-responsive and the bid will be rejected.

Bid prices shall include everything necessary for the completion of the work including, but not limited to, providing the materials, equipment, tools, plant and other facilities, and the management, superintendence, labor and services. Bid prices shall include allowance for Federal, state and local taxes.

In the event that the product of a unit price and an estimated quantity does not equal the extended amount quoted, the unit price shall govern, and the correct product of the unit price and the estimated quantity shall be deemed to be the amount bid. If the sum of two or more items in the bid schedule does not equal the total amounts quoted, the individual item amounts shall govern and the correct total shall be deemed to be the amount bid.

Bidders must satisfy themselves as to the accuracy of the estimated quantities in the bid schedule by examination of the site and a review of the drawings and specifications including any addenda. After bids have been submitted, the Bidder shall not assert that there has been any misunderstanding concerning the quantities of work or of the nature of the work to be done.

The quantities listed in the unit price bid form shall be considered as approximate and will be used only for comparison of bids. Payment to the Contractor will be made only for the actual quantities of work performed or materials furnished in accordance with the Contract, and it is understood that the quantities may be increased or decreased as provided in the General Conditions without in any way invalidating the unit bid prices.

4. MODIFICATION OR WITHDRAWAL OF BIDS

A submitted bid may be retrieved in person by a bidder or its authorized representative if, before the scheduled closing time for receipt of bids, the identity of the persons requesting retrieval is established and that person signs a receipt for the bid. If the bid is retrieved for modification, the sealed bid must be resubmitted prior to the scheduled closing time for receipt of bids. If the bid is not resubmitted, it will be considered as withdrawn.

5. ADDENDA

Each bid schedule shall include specific acknowledgment in the space provided of receipt of all addenda issued by the Owner during the bidding period. Failure to so acknowledge may result in the bid being rejected as non-responsive.

6. LAND ACQUISITION

The Work on this Project is to be performed on property owned and easements acquired by the Owner and within public road right-of-way.

Pursuant to the requirements of OCGA § 36-91-20(b)(4)(B), detailed information on project specific easements can be found in the Special Conditions of the Bid (Section 00300).

7. BID GUARANTY

Each bid must be accompanied by cashier's or certified check payable to the Owner, or a bid bond attached hereto, duly executed by the bidder as principal and issued by a surety listed in the latest issue of U.S. Treasury Circular 570, registered in the State of Georgia, and approved by the Owner in the amount of not less than five percent (5%) of the total amount of the base bid, as a guarantee that the Bidder will enter into a Contract and furnish bonds and evidence of insurance coverage, within twenty-one days after the issuance of the Notice of Award of the Contract to him. Such checks or bid bonds will be returned to all bidders except the lowest bidder after tabulation of bids.

The successful Bidder, upon his failure or refusal to execute and deliver the Contract, bonds and evidence of insurance coverage required within twenty-one days after the issuance of the Notice of Award of the Contract to him, shall forfeit to the Owner, as liquidated damages for such failure or refusal, the security deposited with his bid.

8. MISTAKES; CORRECTIONS AND WITHDRAWAL OF BIDS

After bids are opened, if the low Bidder claims a serious and honest error in bid preparation, and can support such claim with evidence satisfactory to the Owner, withdrawal of the bid will be permitted. As a condition of this release, the low bidder will be prohibited from:

- A. Subcontracting or furnishing labor or equipment on this project.
- B. Bidding on any Cobb County Water System projects within ninety (90) days of release by Owner.

9. INTERPRETATIONS

No interpretation of the meaning of the drawings, specifications or other pre-bid documents will be made to any Bidder orally. Every request for such interpretation should be in writing, addressed to the Owner, and in order to be given consideration must be received by the close of business on the Tuesday, October 13, 2020 (one week prior to the date fixed for the opening of bids). Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the bid. All addenda so issued shall become a part of the Contract Documents.

Any questions concerning this bid should be directed in writing via letter, facsimile, or email to:

Ms. Stephanie Brice
Interim Purchasing Director
Cobb County Purchasing Department
122 Waddell Street NE
Marietta, GA 30060
FAX: (770) 528-8428
purchasing@cobbcounty.org

and Mr. Eric W. Olson, P.E.
Manager, Engineering & Records Div.
Cobb County Water System
660 South Cobb Drive
Marietta, GA 30060-3105
FAX: (770) 419-6335
eric.olson@cobbcounty.org

10. SITE EXAMINATION

The site of the proposed work is shown on the drawings. The Bidder, before making his bid, shall examine the drawings, specifications and the site and shall make such examinations on the ground as may be necessary to thoroughly familiarize himself with the nature and extent of the proposed construction and with all local conditions affecting the work. The Bidder shall also accept the premises in its present condition and carry out all work in accordance with the

requirements of the specifications and as shown on the drawings. The Owner will not be responsible for Bidder's errors and misjudgment nor for failure to obtain any information on local conditions or general laws or regulations pertaining thereto.

At the time of the opening of bids, each Bidder will also be presumed to have read and to be thoroughly familiar with the drawings, Contract Documents (including all addenda) and the construction specifications. The failure or omission of any Bidder to examine any form, instrument or document shall in no way relieve any Bidder from any obligation in respect to his bid.

11. NOTICE OF SPECIAL CONDITIONS

Attention is particularly called to those parts of the Contract Documents and specifications which deal with the following:

- A. Insurance requirements
- B. Surveys, permits and regulations

The Federal and state regulations herein referred to supersede all conflicting requirements of the Contract Documents.

12. LAWS AND REGULATIONS; LICENSING

The Bidder's attention is directed to the fact that all applicable Federal and state laws, county and municipal ordinances and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the Contract throughout, and they will be deemed to be included in the Contract the same as though herein written out in full.

The State of Georgia has requirements for the licensing of contractors engaged in specific types of construction, including electrical, plumbing, and underground utility work [re: OCGA § 43-14]. Any contractor (or subcontractor of any tier) performing regulated work on this project shall furnish proof of valid and current registration to the Owner. Similarly, the State requirements concerning local business licenses shall be met (see also Section 00751 of these documents).

13. STATUS OF PERMITS

The following status of permits related to this project is presented pursuant to the requirements of OCGA § 36-91-20(b)(4)(A).

- A. Refer to the Special Requirements (Section 01012) for the status of permits for which the Owner is responsible.
- B. The Contractor is responsible for obtaining any necessary building permits or individual trade permits from the Cobb County Community Development Department. Contact the Development and Inspections Division at (770) 528-2039 for further information.
- C. Other permits necessary for construction shall be the full responsibility of the Contractor. These may regularly include, but not limited to:
 - Cobb County Trenching and Excavation Permit
 - Cobb County Department of Transportation Lane Closure / Road Closure Permit

- Cobb County and State of Georgia permits associated with the use of explosives (blasting)

14. NON-COLLUSION AFFIDAVIT

The Georgia statute concerning public works construction contracting requires that any person who procures such work by bidding or proposal shall make an oath in writing that he/she has not prevented or attempted to prevent competition in such bidding. [OCGA § 36-91-21(d),(e)]. Pursuant to this requirement, the Bidder shall submit before commencing work, an executed copy of the Non-Collusion Affidavit form included in 00550, completed by all persons materially involved in the procurement on this project. If the Bidder is a partnership, all of the partners and any officer, agent, or other person who may have represented or acted for them in bidding for or procuring the contract shall make the oath and complete the Affidavit. If the Bidder is a corporation, all officers, agents, or other persons who may have acted for or represented the corporation in bidding for or procuring the contract shall make the oath and complete the Affidavit. If such oath is false, the Contract shall be void, and all sums paid by the County on the Contract may be recovered by appropriate action.

15. GEORGIA SECURITY AND IMMIGRATION COMPLIANCE ACT

The Georgia Security and Immigration Compliance Act (O.C.G.A. § 13-10-91) requires that contractors who enter into a contract for physical performance of services for a political subdivision of the state must register and participate in the federal work authorization program to verify employment eligibility of all newly hired employees. Further Contract provisions regarding this Act are included herein as Section 00560.

The Contractor Affidavit and Agreement (See Section 00560), signed and notarized by the Bidder, must be submitted with the Bid. Bids received without an executed affidavit will be deemed non-responsive and will be disqualified from further consideration.

16. EXECUTION OF BID DOCUMENTS

The Contractor, in signing his bid on the whole or any portion of the work, shall conform to the following requirements:

- A. Bids which are not signed by individuals providing said bid shall have attached thereto a power of attorney evidencing authority to sign the bid in the name of the person for whom it is signed.
- B. Bids which are signed for a partnership shall be signed by all of the partners or by an attorney-in-fact. There should be attached to the bid a power of attorney executed by the partners evidencing authority to sign the bid.
- C. Bids which are signed for a corporation shall have the correct corporate name thereof and the signature of the president or other authorized officer of the corporation manually written below the corporate name following the wording "By _____." The corporate seal shall also be affixed to the bid.

17. METHOD OF AWARD

The Contract will be awarded to the responsive, responsible Bidder submitting the lowest base bid complying with the conditions of the invitation to bid. Award will be made on the basis of the

prices given in the base bid (not including alternates). Alternates may be awarded at the discretion of the Owner. The Bidder to whom the award is made will be notified at the earliest possible date following Board of Commissioners approval. The Owner reserves the right to reject any and all bids and to waive any informality in bids received whenever such rejection or waiver is in its best interest.

A responsive Bidder shall be one who submits his bid in the proper form without qualification as called for in the specifications and on the Contract Drawings; and who binds himself on behalf of his bid to the Owner with the proper bid bond or certified check completed and attached; and who properly completes all forms required to be completed and submitted at the time of the advertised bid opening.

A responsible Bidder shall be one that has the capability in all respects to perform fully and reliably the contract requirements. The responsibility of the Bidder will be adjudged by the Owner based on the information presented in the Contractor's Statement of Qualifications. If the solicitation for this project is limited to Pre-qualified Cobb County Water System Contractors, the Statement of Qualification information on file is used in the evaluation of responsibility. If a Statement of Qualification is included as part of the bidding documents for this project, the form and all attachments must be properly completed and submitted with the Bid.

18. DISADVANTAGED BUSINESS ENTERPRISES (DBE) PARTICIPATION

Cobb County Government encourages the participation of all businesses in offering their services and/or products. The Cobb County Government has the goal to fairly and competitively procure the best product at the most reasonable cost.

A Disadvantaged Business Enterprise (DBE) is generally defined as a Female, Black American, Hispanic American and any other minority owned business. The Federal Government has long had a program in place to ensure participation of DBE vendors and suppliers on federally-funded contracts. The State of Georgia has established a similar program whereby DBE firms are defined, certified, and made known. This effort is managed by the Georgia Department of Transportation (GDOT). Additional information regarding this State program can be found at <http://www.dot.state.ga.us/doingbusiness/dbePrograms/Pages/default.aspx>.

While the Cobb County Government does not administer a DBE certification program, the County does desire to identify DBE participation in our contracts and to quantify that participation. The Bidder is requested to advise of DBE status (if any) by completing the *Disadvantaged Business Enterprise (DBE) Identification Form* in Section 00300 of these Documents and to report the participation of any DBE subcontractors (See Section 00570 and Section 00752).

19. CONTRACT PERFORMANCE BOND AND PAYMENT BOND

The Contractor will be required to furnish a contract performance bond and a payment bond executed by a surety company listed in the latest issue of U.S. Treasury Circular 570, registered and duly authorized to do business in the State of Georgia, and signed (or countersigned) by a local agent, each in an amount that is at least equal to one-hundred percent (100%) of the Contract Price, as security for the faithful performance of this contract and as security for the payment of all persons performing labor and furnishing material in connection with the Contract.

The surety shall be acceptable to the Owner and the bond shall be executed on the form attached. In case of default on the part of the Contractor, all expenses incident to ascertaining

and collecting losses under the bond, including both engineering and legal services, shall lie against the bond.

The Contractor will be required to provide the Owner a one-year guarantee covering workmanship and materials of the project. The contract performance bond shall remain in force for one year from date of acceptance by the Owner. The cost of this bond shall be paid by the Contractor.

20. INSURANCE PROOF OF COVERAGE

Prior to execution of Contract Documents, a certificate of insurance will be required as outlined in Section 00750 of these specifications, Insurance Requirements for Contractors.

21. AWARD OF CONTRACT

The Bidder to whom the Contract is being awarded will be required to execute the agreement, accompanying affidavits and forms, and obtain the performance bond, payment bond and insurance within twenty-one (21) calendar days from the date when the notice of award is issued to the Bidder. In case of failure of the Bidder to execute the agreement, affidavits and forms, and furnish the required bonds, the Owner may consider the Bidder in default, in which case the bid bond or check accompanying the bid shall become payable to the Owner.

END OF SECTION

BID

MADE TO: COBB COUNTY, a political subdivision of the State of Georgia
COBB COUNTY WATER SYSTEM
660 SOUTH COBB DRIVE
MARIETTA, GA 30060-3105

PROJECT NAME: **FY21 MULTIPLE PUMP STATIONS PROJECTS**
PROGRAM NO.: **S5036**

The undersigned, as **Bidder**, hereby declares that the only person or persons, company or parties interested in this bid is or are named herein; and that this bid is made without connection with any other person, company or parties making bid; and that it is in all respects fair and in good faith, without collusion or fraud.

The **Bidder** further declares that he has carefully examined the site of the work, has read and understands the plans, specifications and Contract Documents relative thereto, and has read all special provisions and addenda furnished prior to the opening of bids; and the Bidder further declares that he has informed himself fully in regard to all conditions and requirements pertaining to the work.

The **Bidder** proposes and agrees, if this bid is accepted, to enter into agreement with the Owner in the form of the Contract specified and to furnish all materials, labor, tools, equipment and incidentals necessary to complete the work in full and in accordance with the shown, noted, described and reasonably intended requirements of the Contract Documents.

Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of bid security. The Bidder agrees that, at the time of signing the Contract, he will furnish the performance bond and payment bond in the forms attached hereto, each in the amount of one-hundred percent (100%) of the Contract Price. Bidder will also furnish all of the required insurance certificates.

The undersigned agrees, unless hereinafter stated otherwise, to furnish all materials shown and specified in the plans, specifications and bid schedule.

THE REMAINDER OF THIS PAGE IS LEFT BLANK INTENTIONALLY

Name of Bidder: _____

BID SCHEDULE

FY21 MULTIPLE PUMP STATIONS PROJECTS

PROGRAM NO. S5036

All Bid items shall include costs for furnishing to Owner all materials, equipment and supplies and for all costs incurred in completing the Work including the installation of all materials, equipment and supplies furnished, complete in place and ready for continuous service, all other labor, permit fees, taxes, insurance, miscellaneous costs, overhead and profit.

Base Bid

<u>Item No</u>	<u>Description</u>	<u>Total Price</u>
1	Lump Sum Base Bid Price for Plant Atkinson Rd Pump Station	
1.1	Remove and replace submersible pumps, complete and in accordance with the work described in the Contract Documents.	\$ _____
1.2	Remove and replace standby diesel generator and ATS complete and in accordance with the work described in the Contract Documents	\$ _____
1.3	Remove and replace prefabricated FRP electrical equipment building complete and in accordance with the work described in the Contract Documents.	\$ _____
1.4	Remove and replace existing boundary fence complete and in accordance with the work described in the Contract Documents	\$ _____
1.5	Install a new pole mounted manual water proof light switch at the pole and connect it to the existing LED fixture complete in accordance with the work described in the Contract Documents.	\$ _____
	Subtotal for Plant Atkinson Rd Pump Station	\$ _____
2	Lump Sum Base Bid Price for Marina Trace Pump Station	
2.1	Provide, install, operate and remove bypass pumping equipment complete and in accordance with the work described in the Contract Documents.	\$ _____
2.2	Remove and replace submersible pumps, guiderails and 90 deg, bend complete and in accordance with the work described in the Contract Documents.	\$ _____
2.3	Remove and replace standby diesel generator and ATS complete and in accordance with the work described in the Contract Documents.	\$ _____
2.4	Remove and replace prefabricated FRP electrical equipment building complete and in accordance with the work described in the Contract Documents.	\$ _____
2.5	Remove and replace wooden fence	\$ _____

<u>Item No</u>	<u>Description</u>	<u>Total Price</u>
2.6	Replace the existing site light fixture with a new LED fixture on the existing pole and install a new pole mounted manual water proof light switch at the pole and connect it to the new LED fixture complete and in accordance with the work described in the Contract Documents.	\$ _____
	Subtotal for Marina Trace Pump Station	\$ _____
3	Lump Sum Base Bid Price for Six Flags Pump Station	
3.1	Remove and replace submersible pumps, complete and in accordance with the work described in the Contract Documents.	\$ _____
3.2	Reroute cables, provision and installation of cable, conduits, cable trays complete and in accordance with the work described in the Contract Documents.	\$ _____
	Subtotal for Six Flags Pump Station	\$ _____
4	Lump Sum Base Bid Price for Allatoona Pump Station	
4.1	Remove and replace standby diesel generator and ATS complete and in accordance with the work described in the Contract Documents.	\$ _____
4.2	Install a new pole mounted manual water proof light switch at the pole and connect it to the existing LED fixture complete in accordance with the work described in the Contract Documents.	\$ _____
	Subtotal for Allatoona Pump Station	\$ _____
5	Lump Sum Base Bid Price for West Hampton #1 Pump Station	
5.1	Remove and replace standby diesel generator and ATS complete and in accordance with the work described in the Contract Documents.	\$ _____
5.2	Replace the existing site light fixture with a new LED fixture on the existing pole and install a new pole mounted manual water proof light switch at the pole and connect it to the new LED fixture complete and in accordance with the work described in the Contract Documents.	\$ _____
	Subtotal for West Hampton #1 Pump Station	\$ _____
6	Lump Sum Base Bid Price for West Hampton #2 Pump Station	
6.1	Remove and replace standby diesel generator and ATS complete and in accordance with the work described in the Contract Documents.	\$ _____
6.2	Replace the existing site light fixture with a new LED fixture on the existing pole and install a new pole mounted manual water proof light switch at the pole and connect it to the new LED fixture complete and in accordance with the work described in the Contract Documents.	\$ _____
	Subtotal for West Hampton #2 Pump Station	\$ _____

<u>Item No</u>	<u>Description</u>	<u>Total Price</u>
7	Lump Sum Base Bid Price for Wood Valley Pump Station	
7.1	Remove and replace standby diesel generator and ATS complete and in accordance with the work described in the Contract Documents.	\$ _____
7.2	Replace the existing site light fixture with a new LED fixture on the existing pole and install a new pole mounted manual water proof light switch at the pole and connect it to the new LED fixture complete and in accordance with the work described in the Contract Documents.	\$ _____
	Subtotal for Wood Valley Pump Station	\$ _____
8	Lump Sum Base Bid Price for Brushy Mountain Pump House	
8.1	Remove and replace standby diesel generator and ATS complete and in accordance with the work described in the Contract Documents.	\$ _____
	Subtotal for Brushy Mountain Pump House	\$ _____
9	Extra Work Allowance, for additional work as directed by the Owner. No payments shall be made to the Contractor for extra work unless specific work items are negotiated and authorized by the Owner, as described in the General Conditions. Allowance in the amount of:	\$ <u>60,000.00</u>

TOTAL BASE BID, ITEMS 1 THROUGH 9, INCLUSIVE \$ _____

TOTAL BID PRICE (IN WORDS) _____

_____ DOLLARS

BID BOND IS REQUIRED FOR THIS PROJECT.

Name of Bidder: _____

FY21 MULTIPLE PUMP STATIONS PROJECTS

PROGRAM NO. S5036

PART 3 – BASE BID MAJOR EQUIPMENT ITEMS

The Total Bid in Part 1 shall include the costs for the Manufacturers/Suppliers listed in the Major Equipment Schedule below.

The Bidder must indicate which manufacturer/supplier of major equipment it intends to provide by writing in the name in the table below. Named equipment suppliers must meet the terms and conditions and technical requirements of the Contract.

If Bidder does not write in the name of the equipment manufacturers/suppliers for each piece of major equipment, the Owner will select the manufacturer/supplier that is to be provided. No adjustments will be made to Total Base Bid if Owner is required to make selection.

Major Equipment Schedule		
<i>Specification Section Number</i>	<i>Equipment Description</i>	<i>Manufacturer/ Supplier/Model Reference</i>
Plant Atkinson Rd Pump Station		
11305	Submersible pumps	
16230	Standby Diesel Generator	
16412	Automatic Transfer Switches	
13121	Electrical Equipment Building	
Marina Trace Pump Station		
11305	Submersible pumps	
16230	Standby Diesel Generator	
16412	Automatic Transfer Switches	
13121	Electrical Equipment Building	
Six Flags Pump Station		
11305	Submersible pumps	
Allatoona Beach Pump Station		
16230	Standby Diesel Generator	
16412	Automatic Transfer Switches	
West Hampton #1 Pump Station		
16230	Standby Diesel Generator	
16412	Automatic Transfer Switches	
West Hampton #2 Pump Station		
16230	Standby Diesel Generator	
16412	Automatic Transfer Switches	
Wood Valley Pump Station		
16230	Standby Diesel Generator	
16412	Automatic Transfer Switches	
Brushy Mountain Pump House		
16230	Standby Diesel Generator	
16412	Automatic Transfer Switches	

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SPECIAL CONDITIONS

The following project specific Special Conditions take precedent over plans and specifications. Section numbers shown refer to the appropriate section of the Cobb County Water System Contract Documents. All other requirements remain in full effect.

1. None.

END OF SPECIAL CONDITIONS

**DISADVANTAGED BUSINESS ENTERPRISE (DBE)
IDENTIFICATION FORM**

A Disadvantaged Business Enterprise (DBE) is generally defined as a Female, Black American, Hispanic American and any other minority owned business. See *Instructions to Bidders* (Section 00100) and *Disadvantaged Business Enterprise (DBE) Participation* (Section 00570) for additional information related to periodic reporting guidelines.

If your firm is classified as a Disadvantaged Business Enterprise (DBE), please complete this form and submit with bid response:

Cobb County Purchasing Department
Attn: Purchasing Director
122 Waddell Street NE
Marietta, GA 30060
FAX: (770) 528-8428
Email: purchasing@cobbcounty.org

Name of Firm: _____

Address: _____

Telephone: _____ Fax: _____

Email: _____

DBE Certification Number: _____

Name of Certifying Organization: _____

**This information is acquired for documentation of participation only and
will have no bearing on the award unless otherwise stated in the
Advertisement for Bids.**

Bidder hereby agrees to commence work under this Contract promptly after receipt of Notice to Proceed and to complete the work within **Three Hundred Sixty Five (365)** calendar days. Should said work not be completed by that date, the sum of **Five Hundred Dollars (\$500)** per day will be paid by the Contractor to the Owner as liquidated damages for each consecutive calendar day of delay.

Receipt is acknowledged of the following addenda:

No. _____, Dated _____.

No. _____, Dated _____.

Bidder agrees that the Owner has the right to accept or reject any or all bids and to waive all formalities.

Respectfully submitted,

Company

Date: _____

By: _____
Signature

Name

Title

Address

CORPORATE SEAL

City/State/Zip Code

(_____) _____
Telephone

(_____) _____
Fax Number

Georgia Utility Contractor License No.

**SECTION 00310
STATEMENT OF QUALIFICATION**

**COBB COUNTY WATER SYSTEM
FY21 MULTIPLE PUMP STATIONS PROJECTS
S5036**

1. Name of Contractor: _____
(AS REGISTERED WITH THE SECRETARY OF STATE)
2. Contact Information:
 - a. Mailing Address: _____

 - b. Business Address: _____

 - c. Telephone number: (____) _____
 - d. Fax number: (____) _____
 - e. Primary Contact Person:
Name: _____
Email Address: _____
3. Licensing Information:
 - a. Business License Number: _____ County of Issue: _____
4. Type of Organization (check appropriate block):
☐ Corporation ☐ Partnership ☐ Sole Proprietorship
 - a. If corporation, indicate:
State of incorporation: _____ Date: _____
 - b. If partnership, indicate date of organization: _____
 - c. If sole proprietorship, indicate number of years in continuous business: _____
 - d. List names of officers or partners and their length of time with the firm.

_____ years
_____ years
_____ years
_____ years

5. How many persons does your company permanently employ? _____
6. How many years of experience in the proposed type and size of work has your organization had as a general contractor? _____

➔ *A minimum of five years of active experience in fire hydrant maintenance and replacement is required.*

7. List all names previously used by your firm:

8. List all companies, firms, or organizations that own any part of your organization:

9. Is your firm currently prequalified with other municipalities or public utilities?

Yes: _____ No: _____

If yes, list names of municipalities or public utilities:

10. Provide a summary of the background and experience of the members of your organization who will perform management and supervisory functions on this project. The summary must include the individual's name, position and number of years with the firm, details regarding work experience with project names and dates, information about education, specialized training and/or certifications, and other pertinent information.

11. Submit an audited or reviewed financial statement for each of the past three years, including the most recent fiscal year activity. The statements must be prepared by an independent, licensed certified public accountant. Financial statements must include balance sheets, income statements, and a statement of retained earnings, supporting schedules, and notes. All copies of financial statements will be returned to the Applicant following completion of the prequalification review process.

Indicate method of submittal for copies of financial statements:

☐ Included with Application

☐ Separate, scheduled submittal

As an alternate, submit a completed Financial Information Form prepared by an independent, licensed certified public accountant. The form must include information for each of the past three years, including the most recent fiscal year activity.

- ➔ *Provide Financial Statements for the last three years, including the most recent fiscal year.*
- ➔ *As an alternate, provide Financial Information Form.*

- ➔ *Include SASE or delivery service account number for return shipment of financial statement, if return is desired.*

12. Liability Insurance: Provide the following information regarding your insurance coverage.

a. General Liability Insurance

1. Name of Primary Agent or Broker: _____

2. Telephone No.: _____ Fax No.: _____

- ➔ *Provide copies of a current Certificate of Liability Insurance that confirms that your firm carries minimum coverage required in Section 00750 - "Insurance Requirements for Contractors".*

13. Have you ever been refused surety or liability insurance?

Yes: _____ No: _____

- ➔ *If yes, attach an explanation.*

16. Safety Information:

a. Does your firm have a written Safety, Health, and Environmental Program?

Yes: _____ No: _____

b. Obtain from your insurance agent/broker/carrier your Experience Modification Rate (EMR) for the past three years and list these Rates in the spaces provided below.

Year	Experience Modification Rate
20__	
20__	
20__	

- ➔ *Provide a copy of your workers compensation insurance carrier's documentation showing calculation of your EMR for the most current year.*

c. Has your firm received any OSHA violations (citations) in the past three years?

Yes: _____ No: _____

- ➔ *If yes, attach a separate page describing the citations, including information about the dates of the citations, the nature of the violation, the project on which the citation was issued, the amount of penalty paid, if any. This question must be answered "Yes" and information provided if citations have been appealed or contested, but have not yet been resolved. If the citation was appealed and a decision has been issued, state the case number and the date of the decision.*

17. Do Applicant's business policies conform with government regulations regarding nondiscrimination of employment and employment practices on the basis of sex, race, color, national origin, ancestry, age, religious conviction, veteran status, handicap status, political beliefs or non-job related criteria?

Yes: _____ No: _____

18. Is your firm classified as a Disadvantaged Business Enterprise (DBE)?

Yes: _____ No: _____

If yes, indicate:

DBE Certification Number: _____

Name of Certifying Organization: _____

19. Has your firm ever failed to complete any work awarded to you?

Yes: _____ No: _____

➔ *If yes, attach a detailed explanation.*

20. Has your firm been assessed penalties or liquidated damages on any project in the past five years?

Yes: _____ No: _____

➔ *If yes, attach a detailed explanation.*

21. Has your firm been involved in claims, arbitration, mediation, and lawsuits on public works projects, either a plaintiff or defendant, in the last five years?

Yes: _____ No: _____

➔ *If yes, attach a separate sheet listing the name of the claim, the nature of the claim, when and where filed, status, final disposition if resolved, and the name and location of the project involved.*

22. Does your firm (including any member, officer, partner, subsidiary or affiliate thereof) have a pending citation for violating any provision of The Official Code of Cobb County, Georgia at the current time?

Yes: _____ No: _____

➔ *If yes, attach a separate sheet with a detailed explanation of the Code violation and the status of the resolution of the citation.*

23. Submit information regarding your experience (use the attached Form for Similar Projects and References) for a minimum of three projects completed by your firm over the past six years. The names, addresses, location of the jobs performed, contract amounts, dates, project superintendent, and reference contact names with telephone numbers must be indicated on the form. The brief description of each project shall include total number of fire hydrants, contract value and duration, and other pertinent information. Please be complete and ensure that all reference contact information is accurate and current. The submittal of Letters of Reference is encouraged; but only in addition to the current reference contact information.

One Form for Similar Projects and References shall be completed for each project, using the blank form attached. Supplemental information in other formats may also be attached to the Form if desired; however, a completed Form must be submitted for each project.

24. Forms: The forms to be completed and submitted with the Application follow this page.

- ➔ Affidavit for Contractor – Certification of Qualification Application Content
- ➔ Financial Information Form (alternate to submittal of financial statements)
- ➔ Forms for Similar Projects and References
- ➔ Bidder's Checklist

Note: This symbol (➔) indicates required attachments.

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**COBB COUNTY WATER SYSTEM
FY21 MULTIPLE PUMP STATIONS PROJECTS
S5036**

**Affidavit for Contractor
Certification of Qualification Application Content**

I, the undersigned, _____ (typed name) as the authorized representative for _____ (typed company name), a contractor interested in becoming qualified for submitting a bid on this contract, do hereby attest that all statements and representations made herein are true and correct to the best of my knowledge. These statements are made openly and freely without intent to influence or embellish actual conditions or circumstances that occurred.

I understand that the Cobb County Water System will investigate any and all statements and representations in this application made by my firm and me and we freely give our permission for them to do so. Should releases be required by any of our professional, financial, or bonding institutions to release verification of the enclosed data, I have provided them in the application package. I agree to waive any claims against the Cobb County Water System for the release of the information necessary to evaluate this application.

I am hereto sworn _____ (signature)

_____ (title)

_____ (firm name)

This date _____, _____

County of _____ State of _____

The foregoing instrument was acknowledged before me this _____ day of _____

_____ (Notary signature) _____ (serial no.)

_____ (typed Notary name)

My commission expires _____

(Notary Seal)

**COBB COUNTY WATER SYSTEM
FY21 MULTIPLE PUMP STATIONS PROJECTS
S5036**

Financial Information Form

All Applicants must provide an audited or reviewed Financial Statement or must submit this Financial Information Form, completed by an independent certified public accountant. The ratios and other information listed hereon must be calculated from data included in audited or reviewed Financial Statements prepared for the Applicant by an independent certified public accountant. The use of compiled or self-prepared financial statements is not acceptable.

Name of Applicant _____

Item	Value by Year		
	20__	20__	20__
Current Ratio ¹			
Quick Ratio ²			
Solvency Ratio ³			
Total Debt Ratio ⁴			
Debt to Equity Ratio ⁵			
Profitability ⁶			
Stockholder's Equity ⁷			

¹Current Ratio = Current Assets / Current Liabilities

²Quick Ratio = Cash + Accounts Receivable / Current Assets - Current Liabilities

³Solvency Ratio = Shareholder's Equity / Total Assets

⁴Total Debt Ratio = Current Liabilities + Long-term Liabilities / Total Assets

⁵Debt to Equity Ratio = Current Liabilities + Long-term Liabilities / Shareholder's Equity

⁶Profitability = Profit before Taxes x 100 / Total Assets

⁷Stockholder's Equity – indicate range of value based on the following categories:

Less than \$500K = 1; \$500K to \$1M = 2; \$1M to \$2M = 3; \$2M to \$4M = 4; Greater than \$4M = 5

Accountant's Certification

I (we) have examined this Financial Information Form and the Applicant's original audited or reviewed financial statements, and find that the all information presented hereon is based on data extracted from those financial statements. I understand that this form is intended solely for use by the Cobb County Water System during review of the Application for Prequalification for Water and Sewer Line Construction submitted by the Applicant. In addition, I have no personal financial interest or affiliation with this organization or individual.

Firm Signature: _____ Date: _____

Independent Certified Public Accountant:

Firm Name: _____

Address: _____

Telephone Number: _____

Email Address: _____

FORM FOR SIMILAR PROJECTS AND REFERENCES

FY21 MULTIPLE PUMP STATIONS PROJECTS
S5036

Name of Contractor:		
Project Name:		
Location:		
Project Owner:		
Contact Person:		
Title:		
Telephone Number		
Email Address:		
Contract Dates:	Date of Notice to Proceed:	Date of Final Completion:
Contract Amount:	Original: \$	Final: \$
Brief Description of Project		
Type of Project (check appropriate box): <input type="checkbox"/> Public Works <input type="checkbox"/> Private Owner Contractual Status on Project (check appropriate box): <input type="checkbox"/> Prime Contractor <input type="checkbox"/> Subcontractor If subcontractor, provide name of Prime Contractor: _____		
Did you provide performance and/or payment bonds on this project? Yes ____ No ____		
Was this project completed within the original contract period? Yes ____ No ____		
Is a letter of reference from the project owner included with this application? Yes ____ No ____		

Copy this form for additional Similar Projects

**COBB COUNTY WATER SYSTEM
CONTRACTOR'S STATEMENT OF QUALIFICATION
FY21 MULTIPLE PUMP STATIONS PROJECTS
S5036**

Bidder's Checklist

NOTE: This checklist is designed for completion of the Contractor's Qualification Section of this Document only. Please refer to Section 00100 - Instructions to Bidders for additional documents required in the bid package. Contractors are strongly encouraged to read the entire Bid Document before submitting a bid.

Contractor Name: _____ Date Submitted: _____

- | | |
|---|--------------------------|
| Statement of Qualifications filled out in its entirety? | <input type="checkbox"/> |
| Background and Experience Summaries for key personnel attached? | <input type="checkbox"/> |
| Financial statements or <u>Financial Information Form</u> attached? | <input type="checkbox"/> |
| Copy of current Certificate of Liability Insurance | <input type="checkbox"/> |
| Information regarding inability to obtain surety or liability insurance attached (if applicable)? | <input type="checkbox"/> |
| Documentation showing calculation of EMR | <input type="checkbox"/> |
| OSHA citation information attached (if applicable)? | <input type="checkbox"/> |
| Information regarding failure to complete work attached (if applicable)? | <input type="checkbox"/> |
| Liquidated damages assessment information attached (if applicable)? | <input type="checkbox"/> |
| Information regarding claims, arbitration, mediation, and lawsuits attached (if applicable)? | <input type="checkbox"/> |
| Information regarding pending County Code violation citations attached (if applicable)? | <input type="checkbox"/> |
| Forms for similar Project and Experience completed fully for a minimum of 3 projects attached? | <input type="checkbox"/> |
| Letters of Reference attached? | <input type="checkbox"/> |
| Signed and notarized <u>Affidavit for Contractor</u> attached? | <input type="checkbox"/> |
| An original and one copy of forms and attachments submitted? | <input type="checkbox"/> |
| <u>Bidder's Checklist</u> included with submittal? | <input type="checkbox"/> |

SECTION 00410
BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we _____, as Principal, hereinafter called the Bidder, and _____, a corporation duly organized under the laws of the State of _____, listed in the latest issue of U.S. Treasury Circular 570, and registered in the State of Georgia, as Surety, are held and firmly bound unto **COBB COUNTY**, a political subdivision of the State of Georgia, as Obligee, hereinafter called Owner, in the sum of _____ Dollars (in words), (\$ _____) (in figures), for the payment of which sum well and truly to be made, the said Bidder and the said Surety bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Bidder has submitted a bid for construction of this project located in Cobb County, Georgia, identified by the Cobb County Water System as **Program No. S5036** and known as **FY21 Multiple Pump Stations Projects**, consisting of rehabilitation of various aspects of seven different pump stations – Plant Atkinson Road, Marina Trace, Six Flags, Allatoona Beach, West Hampton #1, West Hampton #2 and Wood Valley. Work at each location is variable. Generator, automatic transfer switches, pumps, control buildings are included at specific sites, along with various appurtenant rehabilitation work. The work to be performed under this Contract shall consist of furnishing all labor, materials, tools, equipment and incidentals and performing all work required to construct complete in place and ready to operate the rehabilitation of each pump station site as detailed within the bid documents.

NOW THEREFORE, if the Owner shall accept the bid of the Bidder and the Bidder shall enter into a contract with the Owner in accordance with the terms of such bid, and give such bond or bonds as may be specified in the Bidding or Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the execution thereof, or in the event of the failure of the Bidder to enter such Contract and give such bond or bonds, if the Bidder shall pay the Owner the penalty hereof, then this obligation shall be null and void, otherwise to remain in full force and effect, unless returned by Owner to Bidder; until Owner shall demand payment by Surety, all as allowed in Contract Documents.

THE REMAINDER OF THIS PAGE HAS BEEN LEFT BLANK INTENTIONALLY

Signed and sealed this _____ day of _____ A.D. _____.

Attest:

_____ (SEAL)

Principal (Bidder)

By:

Signature

Typed Name

Title

Attest:

_____ (SEAL)

Surety

By:

Signature, Attorney-in-Fact

Typed Name

(Attach Certified Copy of Power of Attorney)

**SECTION 00500
AGREEMENT/CONTRACT**

THIS AGREEMENT, made and entered into this ____ day of _____ in the year 2020, by and between **COBB COUNTY**, a political subdivision of the State of Georgia, hereafter called the Owner, and _____, hereinafter called the Contractor.

W I T N E S S E T H

That the Owner and the Contractor, in consideration of the mutual covenants hereinafter set forth, agree as follows:

1. WORK

The Contractor shall perform all work as specified or indicated in the Contract Documents for the completion of the project generally described as **FY21 Multiple Pump Stations Projects, Program No. S5036**.

The Owner shall not be liable to the Contractor for any neglect, default, delay or interference of or by any other contractor, nor shall any such neglect, default, delay or interference of any other contract or alteration which may be required in the work, release the Contractor from the obligation to finish the work within the time allowed.

2. CONTRACT TIME AND LIQUIDATED DAMAGES

The Contractor will commence the work required by the Contract Documents on the date specified in the Notice to Proceed and will complete the same within **Three Hundred Sixty Five (365)** calendar days, unless the period for completion is extended otherwise by the Contract Documents. Should said work not be completed by that date, the sum of **Five Hundred Dollars (\$500)** per day will be paid by the Contractor to the Owner as liquidated damages for each consecutive calendar day of delay.

3. CONTRACT PRICE

The Contractor agrees to perform all the work described in the Contract Documents and comply with the terms therein for the sum of _____ Dollars (in words), (\$_____) (in figures), and/or as shown in the Bid Schedule.

4. PAYMENTS

It is hereby mutually agreed that the Owner is to pay and the Contractor is to receive the prices bid in the proposal herein contained, or hereto annexed, as full compensation for furnishing all materials, supplies, machinery, equipment, tools, apparatus and other means of construction, maintenance and repairs, and all management, supervision, and labor, and perform all construction maintenance and repair necessary to complete the work under the conditions herein specified and for fully complying with the terms and conditions of this Contract; provided that any increased cost to the Contractor due to any subsequent levy of Federal or State tax against any item entering into the work of this Contract exclusive of profits, may be reimbursed to the Contractor by the Owner as provided hereunder.

5. PROGRESS AND FINAL PAYMENTS

The Contractor shall submit an Application for payment in accordance with a schedule agreed upon in the preconstruction conference. The Contractor will provide, with the Payment Application, a line item breakdown of all previous costs to date plus the amount being applied for. The Owner will make payments to the Contractor within a reasonable period of time after receipt of the Payment Application; but may withhold payment if the Owner determines there is unsatisfactory job progress, defective work, disputed work, actual or potential third party claims, failure to make timely payments for labor or materials, damage to other entities connected with the project or reasonable evidence that the Contract cannot be completed for the balance of the Contract Price. Payments that are not unreasonably delayed will bear no interest penalties. The terms of this paragraph and the entire Contract Documents are intended to supersede all provisions of the Prompt Pay Act, O.C.G.A. 13-11-1 through 13-11-11.

The Contractor shall present to the Owner the final request for payment within forty-five (45) days of the final inspection of the work performed under this Contract. The Owner reserves the right to reject any and all payment claims made by the Contractor after the forty-five (45) day period. In connection herewith and by execution of this document, the Contractor hereby agrees to waive any and all rights to such payments, the claims for which have not been submitted to the Owner within the required forty-five (45) day period.

6. CONTRACT DOCUMENTS

The Contract Documents which comprise the Contract between Owner and Contractor are attached hereto and made a part hereof and consist of the following:

- A. ADVERTISEMENT FOR BIDS (00020)
- B. INSTRUCTIONS TO BIDDERS (00100)
- C. BID (00300)
- D. CONTRACTOR'S QUALIFICATION STATEMENT (00310)
- E. BID BOND (00410)
- F. AGREEMENT/CONTRACT (00500)
- G. NON-COLLUSION AFFIDAVIT (00550)
- H. GEORGIA SECURITY AND IMMIGRATION ACT COMPLIANCE (00560)
- I. DISADVANTAGED BUSINESS ENTERPRISE (DBE) PARTICIPATION (00570)
- J. PERFORMANCE BOND (00610)
- K. PAYMENT BOND (00620)
- L. GENERAL CONDITIONS (00700)
- M. INSURANCE REQUIREMENTS FOR CONTRACTORS (00750)
- N. BUSINESS LICENSE (00751)
- O. SUBCONTRACTOR NOTIFICATION LIST (00752)
- P. SPECIFICATIONS: Divisions 1 through 16
- Q. DRAWINGS : Numbered _____, Dated _____
- R. ADDENDA: No _____ Dated _____

7. MISCELLANEOUS

- A. Terms used in this Agreement/Contract are defined in the General Conditions and shall have the meanings described therein.
- B. Neither Owner nor Contractor shall, without the prior written consent of the other, assign or sublet in whole or in part his interest under any of the Contract

Documents; and specifically, Contractor shall not assign any monies due or to become due without the prior written consent of the Owner.

- C. Owner and Contractor each binds himself, his partners, successors, assigns and legal representatives, to the other party hereto in respect to all covenants, agreements and obligations contained in the Contract Documents.
- D. Contract Documents constitute the entire Agreement/Contract between Owner and Contractor and may be altered, amended or repealed only by a duly executed written instrument, in the form of a change order.
- E. This Agreement shall be administered and interpreted under the laws of the State of Georgia. Jurisdiction of litigation arising from this Agreement shall be in that state and venue shall lie in Cobb County, Georgia. If any part of this Agreement is found to conflict with applicable laws, such part shall be inoperative, null, and void insofar as it conflicts with said laws, but the remainder of this Agreement shall be in full force and effect.

THE REMAINDER OF THIS PAGE HAS BEEN LEFT BLANK INTENTIONALLY.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement/Contract the day and year first above written. The Cobb County Board of Commissioners authorized the Chairman to execute this Agreement/Contract, the same being recorded in Minutes of Meeting of Board of Commissioners.

IN WITNESS WHEREOF, this instrument is executed in four (4) counterparts, each one of which shall be deemed an original.

Date of BOC approval:

Recommended:

Judy B. Jones, P.E.
Director,
Cobb County Water System

Approved as to form:

County Attorney

CONTRACTOR

By:

Signature

Typed Name

Title

Date

Attest:

By: _____
Secretary

AFFIX SEAL

COBB COUNTY

OWNER

By:

Signature

Michael H. Boyce
Typed Name

Chairman, Cobb County
Board of Commissioners

Date

Attest:

By: _____
Clerk

**SECTION 00550
NON-COLLUSION AFFIDAVIT**

STATE OF GEORGIA
COUNTY OF COBB

PROJECT NAME: **FY21 MULTIPLE PUMP STATIONS PROJECTS**

PROGRAM NO.: **S5036**

(Name) Affiant

the _____
(Title or relationship to Bidding Entity)

Of _____
(Bidder's Company Name)

Affiant states upon oath that he/she has not, by himself or herself or otherwise, prevented or attempted to prevent competition in the bidding on this project by any means whatever, either directly or indirectly.

Affiant further states that he/she has not, by himself or herself or for another, prevented or endeavored to prevent anyone from making a bid therefore by any means whatsoever, nor has caused or induced another to withdraw a bid for the work.

(Signature of Affiant)

Sworn to and subscribed
before me, this _____
day of _____, 20____

Notary Public

County

My commission expires: _____

SECTION 00560
GEORGIA SECURITY AND IMMIGRATION COMPLIANCE ACT
(Revised 07/01/13; supersedes all previous versions)

1. GENERAL

- A. The Georgia Security and Immigration Compliance Act (O.C.G.A. § 13-10-91) requires every contractor of a public employer and every subcontractor of a public employer's contractor that enters into a contract for the physical performance of services must register and participate in a federal work authorization program to verify employment eligibility of all newly hired employees. The applicable federal work authorization program is currently "E-Verify", an internet-based system operated by the Department of Homeland Security in partnership with the Social Security Administration, pursuant to the Immigration Reform and Control Act of 1986 (IRCA).
- B. Compliance with the requirements of the Georgia Security and Immigration Compliance Act (O.C.G.A. § 13-10-91), Rule 300-10-1 of the Georgia Department of Labor, and the following Procedures and Requirements of Cobb County are conditions of this Contract for the physical performance of services.
- C. Definitions.

Affidavit – a written statement made or taken under oath before an officer of the court or a notary public or other person who duly has been authorized so to act.

Affiant – the person who makes and subscribes to a statement made under oath (affidavit).

Physical Performance of Services – any performance of labor or services for a public employer using a bidding process or by contract wherein the labor or services exceed \$2,499.99.

2. PROCEDURES AND REQUIREMENTS

- A. **The attached CONTRACTOR AFFIDAVIT & AGREEMENT (Exhibit A), signed and notarized by the Bidder, must be submitted with the Bid to attest the Bidder's compliance with the Act.**

BIDS RECEIVED WITHOUT AN EXECUTED AFFIDAVIT WILL BE DEEMED NON-RESPONSIVE AND WILL BE DISQUALIFIED FROM FURTHER CONSIDERATION.

- B. The Contractor (or any subcontractor, regardless of tier) shall notify the Owner within five (5) business days of entering into a contract or other agreement for hire with any subcontractor(s), regardless of tier.
- C. The Contractor shall obtain and provide to the Owner the attached Subcontractor Affidavit & Agreement (Exhibit A-1) and Immigration Compliance Certification (Exhibit A-2) from each subcontractor, regardless of tier, employed or retained for work under the Contract prior to the commencement of any work under the Contract or any subcontract.

- D. The Owner reserves the right to dismiss, or require the dismissal of, any contractor or subcontractor for failing to provide the required affidavit or certification and/or for failure to comply with the statutory requirements of O.C.G.A. § 13-10-91 and/or for providing false or misleading information upon the required affidavit(s) or certification(s).
- E. The Contractor and/or subcontractor retaining any other subcontractor to perform services under the Contract shall provide legal notice to any subcontractor of the requirements of the Owner for immigration compliance and further provide notice that the Owner reserves the right to dismiss, or require the dismissal of, any contractor or subcontractor for failing to provide the required affidavit or certification and/or for failure to comply with the statutory requirements of O.C.G.A. § 13-10-91 and/or for providing false or misleading information upon the required affidavit(s) or certification(s).
- F. Failure to comply with any of the Procedures and Requirements of the Owner (i.e., failure to timely supply required affidavits or compliance certification documents; failure to utilize federal work authorization procedures; failure to permit or facilitate audits or reviews of records by the Owner or State officials upon request; and/or failure to continue to meet any of the statutory or County obligations during the life of the contract) shall constitute a material breach of the Contract and shall entitle the Owner to dismiss the Contractor or to require the dismissal of any subcontractor or sub/subcontractor (irrespective of tier) for failing to fully comply with these requirements.
- G. Upon notice of a material breach of these provisions, the Contractor (or subcontractor, regardless of tier) is entitled to cure the breach within ten (10) days and provide evidence of such cure. Should the breach not be cured, the Owner shall be entitled to all available remedies, including termination of the contract, the requirement that a subcontractor be dismissed from performing work under the contract, and any and all damages permissible by law.
- H. Prior to commencing work under this Contract for the physical performance of services, the Contractor shall complete the attached Immigration Compliance Certification (Exhibit A-2) form and submit the same to the Owner.
- I. Prior to allowing any other subcontractor to perform work under the Contract, the Contractor shall obtain a completed Immigration Compliance Certification (Exhibit A-2) from each subcontractor (regardless of tier) and submit the same to the Owner.

AFFIDAVITS AND FORMS ON FOLLOWING PAGES

THE REMAINDER OF THIS PAGE HAS BEEN LEFT BLANK INTENTIONALLY

**CONTRACTOR AFFIDAVIT & AGREEMENT
(EXHIBIT A)**

This affidavit must be signed, notarized and submitted with any bid requiring the performance of physical services. If the affidavit is not submitted at the time of the bid, bid will be determined non-responsive and will be disqualified.

By executing this affidavit, the undersigned contractor verifies its compliance with O.C.G.A. § 13-10-91, stating affirmatively that the individual, firm or corporation which is contracting with Cobb County, Georgia, has registered with, is authorized to use, and is participating in a federal work authorization program (an electronic verification of work authorization program operated by the U.S. Department of Homeland Security or any equivalent federal work authorization program operated by the U.S. Department of Homeland Security to verify information of newly hired employees, pursuant to the Immigration Reform and Control Act of 1986 (IRCA)). The undersigned contractor further attests that it will continue to use the federal Employment Eligibility Verification (EEV) work authorization program throughout the contract period.

The undersigned further agrees that should it employ or contract with any subcontractor(s) or should its subcontractor(s) employ other subcontractor(s) for the physical performance of services pursuant to the contract with Cobb County, Georgia, the contractor or subcontractor will:

- (1) Notify the County within five business days of entering into a contract or agreement for hire with any subcontractor(s);
- (2) Secure from any subcontractor(s) and/or their subcontractor(s) verification of compliance with O.C.G.A. § 13-10-91 on the attached Subcontractor Affidavit & Agreement (EXHIBIT A-1) prior to the commencement of any work under the contract/agreement;
- (3) Secure from any subcontractor(s) and/or their subcontractor(s) a completed Immigration Compliance Certification (EXHIBIT A-2) prior to the commencement of any work under the contract/agreement;
- (4) Provide the subcontractor(s) with legal notice that Cobb County, Georgia, reserves the right to dismiss, or require the dismissal of, any contractor or subcontractor for failing to provide the affidavit and/or for failure to comply with the requirements referenced in the affidavit;
- (5) Maintain records of such compliance and provide a copy of each such verification to Cobb County, Georgia, at the time the subcontractor(s) is retained to perform such services or upon any request from Cobb County, Georgia; and
- (6) Maintain such records for a period of five (5) years.

EEV (E-Verify) Program User ID Number

EEV Program Date of Authorization

BY: _____
Authorized Officer or Agent
[Contractor Name]

Contractor Business Name

Printed Name

Date

SWORN AND SUBSCRIBED BEFORE ME
ON THIS THE ____ DAY OF _____, 201__

Notary Public Commission Expires: _____

Effective 07/01/2013

**SUBCONTRACTOR AFFIDAVIT & AGREEMENT
(EXHIBIT A-1)**

By executing this affidavit, the undersigned subcontractor verifies its compliance with O.C.G.A. § 13-10-91, stating affirmatively that the individual, firm or corporation which is engaged in the physical performance of services on behalf of Cobb County, Georgia, has registered with, is authorized to use, and is participating in a federal work authorization program (an electronic verification of work authorization program operated by the U.S. Department of Homeland Security or any equivalent federal work authorization program operated by the U.S. Department of Homeland Security to verify information of newly hired employees, pursuant to the Immigration Reform and Control Act of 1986 (IRCA)). The undersigned subcontractor further attests that it will continue to use the federal Employment Eligibility Verification (EEV) work authorization program throughout the contract period.

The undersigned further agrees that should it employ or contract with any subcontractor(s) or should its subcontractor(s) employ other subcontractor(s) for the physical performance of services pursuant to the contract with Cobb County, Georgia, the undersigned subcontractor will:

- (1) Notify the County within five business days of entering into a contract or agreement for hire with any subcontractor(s);
- (2) Secure from any subcontractor(s) and/or their subcontractor(s) verification of compliance with O.C.G.A. § 13-10-91 on this Subcontractor Affidavit & Agreement (EXHIBIT A-1) form prior to the commencement of any work under the contract/agreement;
- (3) Secure from any subcontractor(s) and/or their subcontractor(s) a completed Immigration Compliance Certification (EXHIBIT A-2) prior to the commencement of any work under the contract/agreement;
- (4) Provide the subcontractor(s) with legal notice that Cobb County, Georgia, reserves the right to dismiss, or require the dismissal of, any contractor or subcontractor for failing to provide the affidavit and/or for failure to comply with the requirements referenced in the affidavit; and
- (5) Maintain records of such compliance and provide a copy of each such verification to Cobb County, Georgia, at the time the subcontractor(s) is retained to perform such services or upon any request from Cobb County, Georgia; and
- (6) Maintain such records for a period of five (5) years.

EEV (E-Verify) Program User ID Number

EEV Program Date of Authorization

BY: Authorized Officer or Agent
[Subcontractor Name]

Subcontractor Business Name

Printed Name

Date

SWORN AND SUBSCRIBED BEFORE ME

ON THIS THE ____ DAY OF _____, 201__

Notary Public Commission Expires: _____

Effective 07/01/2013

IMMIGRATION COMPLIANCE CERTIFICATION
(To be completed by Contractors and all Subcontractors)
(EXHIBIT A-2)

I certify to the Cobb County Board of Commissioners that the following employees will be assigned to:

FY21 Multiple Pump Stations Projects <i>(Project Name/Description)</i>		

I further certify to Cobb County, Georgia the following:

- The E-Verify program was used to verify the employment eligibility of each of the above-listed employees hired after the effective date of our contract to use the program;
- We have not received a Final Nonconfirmation response from E-Verify for any of the employees listed.
- If we receive a Final Nonconfirmation response from E-Verify for any of the employees listed above, we will immediately terminate that employee's involvement with the project.
- I have confirmed that we have an I-9 on file for every employee listed above and that to the best of my knowledge all the I-9s are accurate.
- To the best of my knowledge and belief, all of the employees on the above list are legally authorized to work in the United States.
- If any other employee is assigned to this Cobb County project, a certification will be provided for said employee prior to the employee commencing work on the project.

To the best of my knowledge and belief, the above certification is true, accurate and complete.

Sworn to by:

Employer Name & Address:

Signature of Officer

Printed Name/Title

Date

SWORN AND SUBSCRIBED BEFORE ME
ON THIS THE ____ DAY OF _____, 201__

Notary Public Commission Expires: _____

Effective 07/01/2013

SECTION 00570

DISADVANTAGED BUSINESS ENTERPRISE (DBE) PARTICIPATION

As indicated in the *Instructions to Bidders* (Section 00100), the Cobb County Government does not administer a Disadvantaged Business Enterprise (DBE) certification program; however, the County does desire to identify individuals/businesses certified and/or meeting the definition of a DBE who are providing products and/or services to Cobb County.

The Cobb County Government addresses DBE participation in the following ways:

1. All Contracts:

- a. DBE firms are requested to identify such status at the time they register as a Vendor with the County. (Contact the Purchasing Department at 770-528-8400 or go to <https://www.cobbcounty.org/purchasing/vendor-registration> for Vendor application instructions and forms.)
- b. DBE firms are requested to identify themselves at the time they propose to do business with the County. Contractors are to indicate their status on the DBE Identification Form included in Section 00300 of these Contract Documents and submit this form with their bid.
- c. Contractors are requested to identify the DBE status and participation of any subcontractors that will be working on the project. This information is to be indicated on the Subcontractor Notification List (Section 00752) submitted following award at the time of execution of the Contract Documents.
- d. Contractors are requested to submit a *Cobb County Government Disadvantaged Business Participation Monthly Report* with each request for payment. A copy of this form and instructions for its use follow this page.

2. Specifically Identified Contracts:

- a. Cobb County has established a Disadvantaged Business Enterprise Plan in accordance with the regulations of the U.S. Department of Transportation (U. S. Department of Transportation (USDOT), 49 CFR Part 26.) The Cobb County Department of Transportation is the lead agency for implementing the USDOT DBE Program for the County.
- b. This Disadvantaged Business Enterprise Plan applies only to projects which are clearly identified at the time of advertisement for bids.

THE REMAINDER OF THIS PAGE HAS BEEN LEFT BLANK INTENTIONALLY

DISADVANTAGED BUSINESS ENTERPRISE (DBE) PARTICIPATION REPORTING

All Cobb County Government contractors or vendors are requested to complete a report descriptive of any DBE subcontractor involvement in work for which the government is making payment. If otherwise specified in an RFP or contract, additional reporting forms may be required as well.

The objective of this request is to assist in the identification of Disadvantaged Business Enterprise (DBE) business participation with the Cobb County Government and to quantify that participation.

The Cobb County Government does not administer a DBE Certification Program. The principal certification agency for the State of Georgia is the Georgia Department of Transportation. As a Contractor/Vendor you are not responsible for verification of any DBE Certification information of your subcontractor(s).

*** Instructions ***

1. Complete the following *DBE Participation Monthly Report* form and submit with each request for payment.
2. Upon receipt of a Contractor/Vendor payment request, County staff will record the information. In order to add or verify the prime contractor is registered as a DBE vendor in AMS, the County department/agency should send a copy of the DBE report to the Purchasing Department (Attn.: DBE Report).

*** DBE Definition ***

A Disadvantaged Business Enterprise (DBE):

1. Is a firm that is under the control of someone in an ownership position (at least 51%) that:
 - a. Has membership in one or more of the following groups: Female, Black American, Hispanic American, Native American, Subcontinent Asian American and Asian-Pacific America. There may be other groups that may be eligible to be certified as DBE;
 - b. Is a U.S. citizen or lawfully admitted permanent resident of the U.S.; and,
 - c. Has a personal net worth which does not exceed \$1.32 million.
2. Meets the Small Business Administration's size standard for a small business and the average gross annual receipts for the three previous fiscal years does not exceed \$23.98 million; and,
3. Is organized as a for-profit business.

Note that the business may also be DBE eligible as a certified U.S. Small Business Administration 8(a) program participant.

COBB COUNTY GOVERNMENT DISADVANTAGED BUSINESS ENTERPRISE PARTICIPATION
MONTHLY REPORT

Contractor/Vendor: Please keep this blank report to make copies as needed. Print or type in the report, then send the completed report to the County department/agency receiving the service or product.

County Departments: Keep a copy of this completed report and use the dollar figures to input into your quarterly DBE report to the DBE Liaison (Records Management Division). If you already have a similar reporting method of gathering the dollar figures continue to use it. Send a copy of this completed report to the Purchasing Division (Attn: DBE Report) to add or verify the prime contractor is registered as a DBE vendor in AMS.

Submitted by: _____ Month Invoiced: _____
Name of Prime Contractor/Vendor From/To:

Cobb County Project Name: FY21 Multiple Pump Station Projects

Cobb County Department or Agency receiving service or product: _____

Description of Purchased Service/Product: _____

Full Contracted Amount: \$_____ Payment amount requested at this time: \$_____

1. Are YOU, the Prime Contractor, a DBE business? YES _____ NO _____
2. Are YOUR subcontractors DBE vendors? YES _____ NO _____

Please provide information below for each participating subcontractor(s).

DBE Subcontractor Business Name	Type Service or Product Supplied	DBE Subcontractor Business/Contact Tel. Number	Actual Dollar Value of DBE Subcontractor Participation this Reporting Month
			\$
			\$
			\$
			\$
			\$
			\$
			\$

Submitted by: _____
Printed Name

Title or position: _____

Date Completed: _____

Signature of Authorized Representative

SECTION 00610
PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS, that we _____, as Principals, hereinafter called Contractor, and _____, a corporation duly organized under the laws of the State of _____, listed in the latest issue of U.S. Treasury Circular 570, and registered in the State of Georgia, as Surety, are held and firmly bound unto **COBB COUNTY**, hereinafter called Owner, in the sum of _____, **(in words) (\$_____)**, for payment of which sum, well and truly to be made, the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Contractor has entered into a written contract dated the ____ day of _____, 2020, with the Owner for **FY21 Multiple Pump Stations Projects, Program No. S5036**, in accordance with drawings and specifications prepared by the Cobb County Water System.

NOW THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Contractor shall promptly and faithfully perform said Contract, then this obligation shall be null and void otherwise shall remain in full force and effect. The Surety hereby waives notice of any alteration or extension of time made by the Owner. Whenever Contractor shall be, and declared by Owner to be in default under the Contract, the owner having performed Owner's obligations thereunder, the Surety may promptly remedy the default, or shall promptly:

- A. Complete the Contract in accordance with its terms and conditions; or,
- B. Obtain a bid or bids for completing the Contract in accordance with its terms, and conditions, and upon determination by Surety of the lowest responsible bidder, or, if the Owner elects, upon determination by the Owner and the Surety jointly of the lowest responsible bidder, arrange for a contract between such bidder and Owner, and make available as Work progresses (even though there should be default or a succession of defaults) under the contract or contracts of completion arranged under this paragraph sufficient funds to pay the cost of completion less the balance of the contract prices; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "balance of the Contract Price", as used in this paragraph, shall mean the total amount payable by Owner to Contractor under the Contract and any amendments thereto, less the amount properly paid by Owner to Contractor.

Any suit under this Bond must be instituted before the expiration of two (2) years from the date on which final payment under the Contract falls due. No right of action shall accrue on this Bond to or for the use of any person or corporation other than the Owner named herein or the heirs, executors, administrators or successors of the Owner.

The Contractor is required to provide the Owner a one-year guarantee covering workmanship and materials of the Project. This Performance Bond shall remain in force for one year from the date of Acceptance of the Project by the Owner.

IN WITNESS WHEREOF, this instrument is executed in four (4) counterparts, each one of which shall be deemed an original, this _____ day of _____, 2020.

Attest:

Principal (Bidder) (SEAL)

Signature

Typed Name

Title

Attest:

Surety (SEAL)

Signature Attorney-in-Fact

Typed Name

(Attach Certified and Dated Copy of Power of Attorney)
DO NOT DATE PERFORMANCE BOND. BOND DOCUMENT WILL BE DATED BY BOC.
(Bond must not be dated prior to date of Agreement)

SECTION 00620
PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS, that we _____, as Principals, hereinafter called Contractor, and _____, a corporation duly organized under the laws of the State of _____, listed in the latest issue of U.S. Treasury Circular 570, and registered in the State of Georgia, as Surety, are held and firmly bound unto **COBB COUNTY**, hereinafter called Owner, in the sum of _____, (In words) (\$_____), for payment of which sum, well and truly to be made, the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Contractor has entered into a written contract dated the ____ day of _____, 2020, with the Owner for **FY21 Multiple Pump Stations Projects, Program No. S5036**, in accordance with drawings and specifications prepared by the Cobb County Water System.

NOW THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Contractor shall promptly make payment to all claimants as hereinafter defined, for all labor and material used or reasonably required for use in the performance of the Contract, then this obligation shall be void; otherwise it shall remain in full force and effect, subject, however, to the following conditions:

- A. A claimant is defined as one having a direct contract with the Contractor or with a Subcontractor of the Contractor for labor, material, or both, used or reasonably required for use in the performance of the Contract, labor and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment directly applicable to the Contract.
- B. The above named Contractor and Surety hereby jointly and severally agree with the Owner that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work or labor was done or performed, or materials were furnished by such claimant, may sue on this bond for the use of such claimant, prosecute the suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon. The Owner shall not be liable for the payment of any costs or expense of any such suit.
- C. No suit or action shall be commenced hereunder by any claimant,
 - 1. Unless claimant, other than one having a direct contract with the Contractor, shall have given written notice to any two of the following: the Contractor, the Owner, or the Surety above-named, within ninety (90) days after such claimant did or performed the last of the work of labor, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was done or performed. Such notice shall be served by mailing the same by registered mail or certified mail, postage prepaid, in an envelope addressed to the Contractor, Owner or Surety, at any place where any office is

regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the state in which the aforesaid project is located, save that such service need not be made by a public officer.

2. After one (1) year from the completion of Contract and the acceptance by Owner of the work thereunder, it being understood, however, that if any limitation embodied in this bond is prohibited by any law controlling the construction hereof such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.
3. Other than in a state court of competent jurisdiction in and for the county or other political subdivision of the state in which the project, or any part thereof, is situated, and not elsewhere.
4. The amount of this bond shall be reduced by and to the extent of any payment of payments made in good faith hereunder, inclusive of the payment by surety of mechanics' liens which may be filed on record against said improvement, whether or not claim for the amount of such presented under and against this bond.

PROVIDED FURTHER, that the Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specifications.

PROVIDED FURTHER, that no final settlement between Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claims may be unsatisfied.

THE REMAINDER OF THIS PAGE HAS BEEN LEFT BLANK INTENTIONALLY.

IN WITNESS WHEREOF, this instrument is executed in four (4) counterparts, each one of which shall be deemed an original, this _____ day of _____, 2020.

Attest:	_____(SEAL)
	Principal (Bidder)
_____	Signature

	Typed Name

	Title
Attest:	_____(SEAL)
	Surety
_____	Signature Attorney-in-Fact

	Typed Name

(Attach Certified and Dated Power of Attorney)
DO NOT DATE PAYMENT BOND. BOND DOCUMENT WILL BE DATED BY BOC.
(Bond must not be dated prior to date of Agreement)

**SECTION 00700
GENERAL CONDITIONS**

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PART 1 GENERAL

1.01 DEFINITIONS OF WORDS AND TERMS

Where used in the Contract Documents, the following words and terms shall have the meanings indicated. The meanings shall be applicable to the singular, plural, masculine and feminine of the words and terms.

- A. Acceptance. Formal action of the Owner in determining that the Contractor's work has been completed in accordance with the Contract and in notifying the Contractor in writing of the acceptability of the work.
- B. Act of God. A cataclysmic phenomenon of nature, such as an earthquake, flood or cyclone. Rain, wind, high water, or other natural phenomenon that might reasonably have been anticipated from historical records of the general locality of the Work shall not be construed as acts of God.
- C. Addenda. Supplemental written specifications or drawings issued prior to execution of the Contract that modify or interpret the Contract Documents by addition, deletion, clarification, or corrections.
- D. Bid. Offer of a bidder submitted on the prescribed form setting forth the price or prices of the Work to be performed.
- E. Bidder. Individual, partnership, corporation, or a combination thereof, including joint venturers, offering a bid to perform the Work.
- F. Construction Manager. The person designated, in writing, by the Owner to act as its representative at the construction site and to perform construction inspection services and administrative functions relating to this Contract. Contact by the Contractor with the Owner and Engineer shall be through the Construction Manager.
- G. Contract. The writings and drawings embodying the legally binding obligations between the Owner and the Contractor for completion of the Work.
- H. Contract Documents. The Contract comprises the documents listed below. Approved shop drawings, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.
 - 1. Advertisement for Bids
 - 2. Instructions to Bidders
 - 3. Bid
 - 4. Bid Bond
 - 5. Agreement
 - 6. Noncollusion Affidavit
 - 7. Georgia Security and Immigration Compliance Affidavit
 - 8. Performance Bond
 - 9. Payment Bond
 - 10. Subcontractor Notification List

11. General Conditions
12. Specifications
13. Contract Drawings
14. Addenda
15. Notice of Award
16. Notice to Proceed
17. Change Orders
18. Directives

- I. Contract Drawings. The drawings included in the Contract Documents plus those prepared by the Owner pursuant to the terms of the Contract. They include:
 1. Drawings.
 2. Modifying drawings issued by addenda.
 3. Drawings submitted by the Owner to the Contractor during the progress of the Work either as attachments to the change orders or as explanatory supplements to drawings and modifying drawings issued by addenda.
- J. Contract Price. Amount payable to the Contractor under the terms and conditions of the Contract. Based on the price given on the bidding schedule, with adjustments made in accordance with the Contract.
- K. Contract Time. Number of calendar days stated in the Contract for the completion of the Work; such completion as evidenced by the Owner's Acceptance.
- L. Contractor. The individual, partnership, corporation, or combination thereof, including joint venturers who enter into the Contract with the Owner for the performance of the Work.
- M. Contractor's Plant and Equipment. Equipment, material, supplies, and all other items, except labor, brought onto the site by the Contractor to carry out the Work, but not to be incorporated in the Work.
- N. County. Cobb County, Cobb County Board of Commissioners, Cobb County Water System or any combination thereof. Also referred to as the Owner.
- O. Day. Calendar day.
- P. Direct. Action of the Owner or Construction Manager by which the Contractor is ordered to perform or refrain from performing work under the Contract.
- Q. Directive. Written documentation of the actions of the Owner or Construction Manager in directing the Contractor.
- R. Engineer. The entity designated by the Owner to address issues deferred to it that affects the design and intent of the design of the Project.
- S. Equipment. Mechanical, electrical, instrumentation or other device with one or more moving parts, or devices requiring an electrical, pneumatic, electronic, or hydraulic connection.

- T. Furnish. To deliver to the job site or other specified location any item, equipment or material.
- U. Herein. Refers to information presented in the Contract Documents.
- V. Holidays. Legal holidays are New Year's Day, Martin Luther King Day, Good Friday, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday following Thanksgiving, and Christmas.
- W. Install. Placing, erecting, or constructing complete in place any item, equipment, or material.
- X. May. Refers to permissive actions.
- Y. Owner. Cobb County, a political subdivision of the State of Georgia and/or Cobb County Water System (may be used interchangeably).
- Z. Owner's Representative. The person designated in writing by the Owner to act as its agent on specified matters relating to this Contract.
- AA. Paragraph. For reference or citation purposes, paragraph shall refer to the paragraph, or paragraphs, called out by section number and alphanumeric designator. For example, this definition is found in paragraph 00700-1.02; permits and licenses are discussed in paragraph 00700-1.06 B.
- BB. Person. The term, person, includes firms, companies, corporations, partnerships, and joint ventures.
- CC. Project. The undertaking to be performed under the provisions of the Contract.
- DD. Provide. Furnish and install, complete in place.
- EE. Punch List. List of incomplete items of Work and of items of Work that are not in conformance with the Contract.
- FF. Resident Project Representative. See Construction Manager. The Construction Manager shall function as the Resident Project Representative (RPR).
- GG. Shall. Refers to actions by either the Contractor or the Owner and means the Contractor or Owner has entered into a covenant with the other party to do or perform the action.
- HH. Shown. Refers to information presented on the Drawings, with or without reference to the Drawings.
- II. Specifications. That part of the Contract Documents consisting of written descriptions of the technical features of materials, equipment, construction systems, standards, and workmanship.

- JJ. Specify. Refers to information described, shown, noted or presented in any manner in any part of the Contract.
- KK. Submittals. The information that is specified for submission to the Engineer through the Construction Manager in accordance with Division 1 of the Contract Documents.
- LL. Substantial Completion. Sufficient completion of the Project or the portion thereof to permit utilization of the Project, or portion thereof for its intended purpose. Substantial completion requires not only that the Work be sufficiently completed to permit utilization, but that the Owner can effectively utilize the substantially completed Work. Determination of substantial completion is solely at the discretion of the Owner. Substantial completion does not mean complete in accordance with the Contract nor shall substantial completion of all or any part of the Project entitle the Contractor to acceptance under the Contract.
- MM. Substantial Completion Date. Date when the Owner puts into service the Project, or that portion of the Project that has been determined to be substantially complete.
- NN. Utility. All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, casings, tunnels or other such facilities or attachments, and any encasements containing such facilities which have been installed underground or aboveground to furnish products or services related to, but not limited to, electricity, gases, steam, liquid petroleum products, telephone or other communications including fiber optics, cable television, sanitary sewer, storm sewer, water, and traffic control systems.
- OO. Will. Refers to actions entered into by the Contractor or the Owner as a covenant with the other party to do or to perform the action.
- PP. Work. The labor, materials, equipment, supplies, services, and other items necessary for the execution, completion and fulfillment of the Contract.

1.02 JOINT VENTURE CONTRACTOR

In the event the Contractor is a joint venture of two or more contractors, the grants, covenants, provisos and claims, rights, power, privileges and liabilities of the Contract shall be construed and held to be several as well as joint. Any notice, order, direct request or any communication required to be or that may be given by the Owner or the Construction Manager to the Contractor under this Contract, shall be well and sufficiently given to all persons being the Contractor if given to any one or more of such persons. Any notice, request or other communication given by any one of such persons to the Owner or the Construction Manager under this Contract shall be deemed to have been given by and shall bind all persons being the Contractor.

1.03 CONTRACT REQUIREMENTS

A. SUCCESSORS' OBLIGATIONS:

The grants, covenants, provisos and claims, rights, powers, privileges and liabilities obtained in the Contract Documents shall be read and held as made by and with, and granted to and imposed upon, the Contractor and the Owner and their respective heirs, executors, administrators, successors and assigns.

B. ASSIGNMENT OF CONTRACT:

The Contract shall not be assigned in whole or in part without the written consent of the Owner. Involuntary assignment of the Contract as caused by the Contractor being adjudged bankrupt, assignment of the Contract for the benefit of Contractor's creditors or appointment of a receiver on account of Contractor's insolvency shall be considered as failure to comply with the provisions of the Contract and subject to the termination provisions contained herein.

C. WAIVER OF RIGHTS:

Except as herein provided, no action or want of action on the part of the Contractor, Owner, Owner's Representative, Engineer or Construction Manager at any time with respect to the exercise of any right or remedies conferred upon them under this Contract shall be deemed to be a waiver on the part of the Contractor and Owner of any of their rights or remedies. No waiver shall be effective except in writing by the party to be charged. No waiver of one right or remedy shall act as a waiver of any other right or remedy or as a subsequent waiver of the same right or remedy.

D. AMENDMENT OF GENERAL CONDITIONS:

These general conditions may be amended only by mutual consent of the Owner and the Contractor in writing.

1.04 LABOR STANDARDS

No work shall be performed between the hours of 6:00 p.m. and 7:00 a.m. or on Saturdays, Sundays or holidays except as such work as is necessary for the proper care and protection of the Work already performed, in the case of an emergency, or during approved, scheduled, and planned connections to existing facilities.

It is understood that the proposed construction schedule is based upon a normal 40-hour, five-day workweek, less recognized holidays. The Contractor may schedule his operations as desired within the designated core work hours and may work up to 50 hours per week. If the Contractor desires to work in excess of this limit, the Contractor shall submit a written request through the Construction Manager to the Owner, a minimum of five days prior to the desired work date.

1.05 LAWS, REGULATIONS AND PERMITS

A. GENERAL:

The Contractor shall give the notices required by law and comply with all laws, ordinances, rules and regulations pertaining to the conduct of the Work. The Contractor shall be liable for violations of the law in connection with work provided by the Contractor. If the Contractor observes that the Drawings, Specifications or other portions of the Contract Documents are at variance with any laws, ordinances, rules or regulations, he shall promptly notify the Construction Manager in writing of such variance. The Owner shall promptly review the matter and, if necessary, shall issue a change order or take any other action necessary to bring about compliance with the law, ordinance, rule or regulation in question. Contractor agrees not to perform work known to be contrary to any laws, ordinances, rules or regulations.

B. PERMITS AND LICENSES:

Unless otherwise specified herein, permits and licenses from governmental agencies that are necessary only for and during the prosecution of the Work and the subsequent guarantee period, including the Cobb County Building Permits, shall be secured and paid for by the Contractor. Permits and licenses of regulatory agencies that are necessary to be maintained after completion of the guarantee period shall be secured and paid for by the Owner. Water and sewer impact fees are not applicable to this Project.

The Cobb County Land Disturbance Permit for this Project will be obtained by the Owner and will be made available to the Contractor. The Contractor shall be responsible for complying with all of the terms and special conditions of permit approvals.

C. PATENTS AND ROYALTIES:

The costs involved in fees, royalties or claims for any patented invention, article, process or method that may be used upon or in a manner connected with the Work under this Contract or with the use of completed Work by the Owner, shall be paid by the Contractor. The Contractor and his sureties shall protect and hold the Owner, the Engineer, and the Construction Manager, together with their officers, agents and employees, harmless from any and all loss, defense cost, and expenses and against any and all demands made for such fees or claims brought or made by the holder of any invention or patent. Before final payment is made on the account of this Contract, the Contractor shall, if requested by the Owner, furnish acceptable proof of a proper release from all such fees or claims.

Should the Contractor, his agent, employee or any of them be enjoined from furnishing or using any invention, article, material or plans supplied or required to be supplied or used under this Contract, the Contractor shall promptly pay such royalties and secure the requisite licenses; or, subject to acceptance by the Owner, substitute other articles, materials or appliances in lieu thereof which are of equal efficiency, quality, finish, suitability and market value to those planned or required under the Contract. Descriptive information of these substitutions shall be submitted to the Engineer

through the Construction Manager for determination of general conformance to the design concept and the construction Contract. Should the Owner elect to refuse the substitution, the Contractor agrees to pay such royalties and secure such valid licenses as may be requisite for the Owner, his officers, agents and employees or any of them, to use such invention, article, material or appliance without being disturbed or in any way interfered with by any proceeding in law or equity on account thereof.

1.06 HEADINGS

Headings to parts, divisions, sections, paragraphs, subparagraphs and forms are inserted for convenience of reference only and shall not affect the interpretation of the Contract Documents.

1.07 SUBCONTRACTS

The Contractor shall perform with his own organization not less than one-half of the Work and shall not sublet to one subcontractor more than one-third of the Work without the previous written consent of the Owner. The Contractor shall obtain the Owner's written consent of all subcontractors who will perform subcontract work.

PART 2 OWNER-CONTRACTOR AUTHORITY/RESPONSIBILITY

2.01 AUTHORITY OF OWNER

A. GENERAL:

The Owner, acting through the Owner's Representative, the Engineer and the Construction Manager, shall have the authority to act as the sole judge of the work and materials with respect to both quantity and quality as set forth in the Contract. It is expressly stipulated that the Drawings, Specifications and other Contract Documents set forth the requirements as to the nature of the completed work and do not purport to control the method of performing work except in those instances where the nature of the completed work is dependent on the method of performance.

B. AUTHORITY OF OWNER'S REPRESENTATIVE:

1. General: The Owner's Representative has the authority to act on behalf of the Owner on change orders, directives, progress payments, contract decisions, acceptability of the Contractor's work, and early possession.
2. Change Orders: The Owner's Representative has the authority to make recommendations to the Board of Commissioners to accept or reject change orders proposed by the Construction Manager, the Engineer, or the Contractor.
3. Directives: The Owner's Representative has the authority to issue Directives to the Contractor and to accept or reject Directives that have been proposed by the Construction Manager.

4. Progress Payments: The Owner's Representative has the authority to accept or reject requests for progress payments that have been submitted by the Contractor and recommended by the Construction Manager.
5. Contract Decisions: Should the Contractor disagree with the Construction Manager's decision with respect to the Contract, the Contractor may request that the Owner's Representative review the Construction Manager's decision and make a determination on behalf of the Owner in the manner provided under paragraph 00700-2.05 F.
6. Acceptability of Work: The Owner's Representative has the authority to make the final determination of the acceptability of the Work as provided under paragraph 00700-6.05 and 00700-6.07. The Owner's Representative also has the authority to accept or reject the Construction Manager's recommendations regarding retention of defective work as provided in paragraph 00700-4.09 B.
7. Early Possession: The Owner's Representative has the authority to take early possession in accordance with paragraph 00700-6.06.

C. **AUTHORITY OF CONSTRUCTION MANAGER:**

1. General: The Construction Manager is the construction site representative of the Owner employed to act as advisor and consultant to the Owner in construction matters related to the Contract. The Owner has delegated his authority to the Construction Manager to make initial decisions regarding questions which may arise as to the quality or acceptability of materials furnished and work performed and as to the manner of performance and rate of progress of the Work under the Contract. The Construction Manager interprets the intent and meaning of the Contract and makes initial decisions with respect to the Contractor's fulfillment of the Contract and the Contractor's entitlement to compensation. The Contractor shall look initially to the Construction Manager in matters relating to the Contract. The Construction Manager's decisions are subject to review by the Owner's Representative in accordance with paragraph 00700-2.05 F.
2. Inspection of Construction: The Construction Manager shall have access to the Work and to the site of the Work and to the places where work is being prepared or where materials, equipment, and machinery are being obtained for the Work. If requested by the Construction Manager, the Contractor shall provide the assistance necessary for obtaining such access, and shall provide information related to the inspection of construction.
3. Change Orders and Use of Allowances: The Construction Manager has the authority to initiate or recommend change orders or use of allowances. Such change orders and use of allowances are subject to review and approval by the Owner.
4. Limits of Construction Manager's Responsibility: The Construction Manager shall not be responsible for the acts or omissions of any contractor, or of any subcontractor, any supplier, or of any other person or organization performing

or furnishing any of the Work. The Construction Manager shall not be responsible for Contractor's failure to perform or furnish the Work in accordance with the Contract Documents. Services provided by Construction Manager during construction shall not impose on Construction Manager responsibility to supervise, direct or control such work or for the means, methods, techniques, sequences or procedures of construction or safety precautions or programs incident thereto, or Contractor's compliance with laws, rules, regulations, ordinances, codes or orders applicable to Contractor's furnishing and performing the Work. Accordingly, Construction Manager neither guarantees the performance of any Contractor nor assumes responsibility for any Contractor's failure to furnish and perform its work in accordance with the Contract Documents.

D. AUTHORITY OF THE ENGINEER

1. General: The Engineer will assist the Owner by providing technical and engineering support services and coordinating with the Construction Manager during project coordination. The engineering support services will consist of technical reviews of requests for information submitted by the Contractor, development of Designer Clarifications, providing technical evaluations of Contractor-initiated and Owner-initiated change orders, review of Contractor-initiated substitution requests for equipment and/or materials, review of submittals, attendance at weekly progress meetings, periodic site visits, review of manufacturers' operations and maintenance manuals, development of an Operations Manual and assisting in plant start-up and operator training.
2. Limits of Engineer's Responsibility: The Engineer shall not be responsible for the acts or omissions of any contractor, or of any subcontractor, any supplier, or of any other person or organization performing or furnishing any of the Work. The Engineer shall not be responsible for Contractor's failure to perform or furnish the Work in accordance with the Contract Documents. Services provided by Engineer during construction shall not impose on Engineer responsibility to supervise, direct or control such work or for the means, methods, techniques, sequences or procedures of construction or safety precautions or programs incident thereto, or Contractor's compliance with laws, rules, regulations, ordinances, codes or orders applicable to Contractor's furnishing and performing the Work. Accordingly, Engineer neither guarantees the performance of any Contractor nor assumes responsibility for any Contractor's failure to furnish and perform its work in accordance with the Contract Documents.

Engineer is not responsible for providing Resident Engineering services. Site visits/inspections are periodic. As such, the Engineer's professional opinions rendered pursuant to site visits/inspections shall be based solely upon the information provided, observations reported on, knowledge and belief, formulated in accordance with commonly accepted procedures consistent with applicable standards of practice, and as such does not constitute a guaranty or warranty, either expressed or implied.

2.02 RESPONSIBILITIES OF OWNER

A. ATTENTION TO WORK:

The Owner shall notify the Contractor in writing of the name of the Owner's Representative and of the Construction Manager. The Construction Manager normally will be at the site of the Work. During his absences, the Contractor may contact a previously designated representative of the Construction Manager.

B. OWNER'S EMPLOYEES:

The Owner shall be responsible for the adequacy, efficiency, and sufficiency of his employees and of any consultant, supplier or subcontractor employed by the Owner.

C. REFERENCE POINTS:

The Owner or Engineer will provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable the Contractor to proceed with the Work.

2.03 AUTHORITY OF CONTRACTOR

A. CONTRACTOR'S REPRESENTATIVE:

The Contractor shall notify the Owner in writing of the name of the person who will act as the Contractor's representative and shall have the authority to act in matters relating to this Contract. This person shall have authority to carry out the provisions of the Contract and to supply materials, equipment, tools and labor without delay for the performance of the Work.

B. CONSTRUCTION PROCEDURES:

The Contractor will supervise and direct the Work. He has the authority to determine the means, methods, techniques, sequences and procedures of construction, except in those instances where the Owner, to define the quality of an item of work, specifies in the Contract, a means, method, technique, sequence or procedure for construction of that item of work.

C. SUBCONTRACTORS:

Subcontractors will not be recognized as having a direct relationship with the Owner. The persons engaged in the Work, including employees of subcontractors and suppliers, will be considered employees of the Contractor and their work shall be subject to the provisions of the Contract. References in the Contract Documents to actions required of subcontractors, manufacturers, suppliers, or any person other than the Contractor, the Owner, the Engineer or the Construction Manager shall be interpreted as requiring that the Contractor shall require such subcontractor, manufacturer, supplier or person to perform the specified action.

2.04 RESPONSIBILITIES OF CONTRACTOR

A. SUBCONTRACTORS, MANUFACTURERS AND SUPPLIERS:

The Contractor shall be responsible for the adequacy, efficiency and sufficiency of subcontractors, manufacturers, suppliers and their employees.

The Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.

The Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with the Construction Manager through the Contractor.

The divisions and sections of the Specifications and the identifications of any Drawings shall not control the Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

B. CONTRACTOR'S EMPLOYEES:

The Contractor shall be responsible for the adequacy, efficiency and sufficiency of his employees. Workers shall have sufficient knowledge, skill and experience to perform properly the work assigned to them. Upon written notification from the Owner, Contractor shall immediately remove from the job, for its duration, any laborer, worker, mechanic, foreman, superintendent or other person employed who is found to be intemperate, troublesome, disorderly or otherwise objectionable. The Contractor shall enforce strict discipline and good order among its employees and subcontractors at all times during the performance of the Work.

C. PAYMENT FOR LABOR AND MATERIALS:

The Contractor shall pay and require his subcontractors to pay any and all accounts for labor including Workers Compensation premiums, State Unemployment and Federal Social Security payments and other wage and salary deductions required by law. The Contractor also shall pay and cause his subcontractors to pay any and all accounts for services, equipment, and materials used by him and his subcontractors during the performance of Work under this Contract. Such accounts shall be paid as they become due and payable. If requested by the Owner, the Contractor shall furnish proof of payment of such accounts to the Owner.

The Contractor shall pay all sales, retail, occupational, service, excise, old age benefit and unemployment compensation taxes, consumer, use and other similar taxes, as well as any other taxes or duties on the materials, equipment, and labor for the work provided by the Contractor which are legally enacted by any municipal, county, state or federal authority, department or agency at the time bids are received, whether or not yet effective. The Contractor shall maintain records pertaining to such taxes and levies as well as payment thereof and shall

make the same available to the Owner at all reasonable times for inspection and copying.

The Contractor is obligated to comply with all local and State Sales and Use Tax laws. The Contractor shall provide the Owner with documentation to assist the Owner in obtaining sales and/or use tax refunds for eligible machinery and equipment used for the primary purpose of reducing or eliminating air or water pollution as provided for in Chapter 48-8-3 (36) and (37) of the Official Code of Georgia. All taxes shall be paid by the Contractor. All refunds will accrue to the Owner.

D. PROSECUTION OF THE WORK:

1. Attention to the Work: The Contractor, acting through his representative, shall give personal attention to and shall manage the Work so that it shall be prosecuted faithfully. When his representative is not personally present at the Project site, his designated alternate shall be available and shall have the authority to act on the Contract.
2. Protection of the Work: The Contractor shall take all necessary precautions and provide the necessary protection to prevent damage or loss to the Work, including work partially complete and stored materials and equipment to be incorporated into the Work, whether in storage on or off the site.
3. Extent of the Work: Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.
4. Lines and Grades. All Work shall be done to the lines, grades, and elevations indicated on the Drawings. Basic horizontal and vertical control points will be identified by Construction Manager to be used as datums for the Work. All additional survey, layout, and measurement work shall be performed by Contractor as a part of the Work.

The Contractor shall provide an experienced instrument person, competent assistants, and such instruments, tools, stakes, and other materials required to complete the survey, layout, and measurement work. In addition, Contractor shall furnish, without charge, competent persons and such tools, stakes, and other materials as the Construction Manager may require in checking survey, layout, and measurement work performed by the Contractor.

The Contractor shall keep the Construction Manager informed, a reasonable time in advance, of the times and places at which it wishes to do Work, so that horizontal and vertical control points may be established, and any checking deemed necessary by the Construction Manager may be done with minimum inconvenience to the Construction Manager and minimum delay to the Contractor.

The Contractor shall remove and reconstruct work which is improperly located.

The Contractor shall protect all horizontal and vertical control points identified by the Construction Manager from damage. Contractor shall relocate all horizontal and vertical control points which will be impacted by the construction operations to a location on the Site which is acceptable to the Owner and the Construction Manager. Contractor shall replace all horizontal and vertical control points which are damaged.

5. Connections to Existing Facilities.

- a. Unless otherwise specified or indicated, Contractor shall make all necessary connections to existing facilities, including structures, drain lines, and utilities such as water, sewer, gas, telephone, and electric. In each case, Contractor shall receive permission from Owner or the owning utility prior to undertaking connections. Contractor shall protect facilities against deleterious substances and damage.
- b. Connections to existing facilities which are in service shall be thoroughly planned in advance, and all required equipment, materials, and labor shall be on hand at the time of undertaking the connections. Work shall proceed continuously (around the clock) if necessary to complete connections in the minimum time. Operation of valves or other appurtenances on existing utilities, when required, shall be by or under the direct supervision of the owning utility.
- c. At least 21 days prior to each connection to an existing facility, the Contractor shall submit to the Construction Manager for review and approval a detailed shutdown and connection plan in accordance with Section 01300 – Submittals. A separate submittal is required for each connection to an existing facility. The shutdown and connection plan shall provide the Contractor's schedule for the shutdown and connection, sequencing details and sketches indicating the sequence of the Work to be performed, as well as a listing of the materials required for the Work. The Contractor's schedule for shutdowns and connections shall be acceptable to the Owner and the Construction Manager.
- d. Approximately 14 days prior to the scheduled shutdown, a coordination meeting shall be conducted to review the Contractor's shutdown and connection plan. The Contractor, Construction Manager, Engineer, and Owner shall attend the meeting. The Construction Manager shall preside at the meeting. The purpose of the meeting will be to review the

schedule/sequence of activities for the shutdown and connection, establish coordination efforts, and develop contingency plans.

- e. A minimum of 7 days prior to the scheduled shutdown, based on discussions from the coordination meeting, the Contractor shall submit a revised shutdown and connection plan and a detailed responsibility matrix to the Construction Manager for review and approval. The Contractor shall also provide certification that all required materials for the connection to the existing facility are onsite and ready for use.
- f. Within three days of receipt of an acceptable shutdown and connection plan and certification from the Contractor that all required materials to make the connection are onsite and ready for use, Owner shall grant permission to Contractor to make the connection; notwithstanding granting of permission, the Owner reserves the right to unilaterally cancel any planned shutdown if prevailing circumstances warrant such action.
- g. Prior to the commencement of each connection, the existing facility or pipeline to which the connection is being made and any other facilities connected thereto, shall be isolated from service and prepared for connection (e.g., evacuated, dewatered, etc.) by the Contractor at no additional cost to the Owner.
- h. Unless otherwise acceptable to the Owner and Construction Manager, each connection to an existing facility shall be scheduled independently of one another and shall not occur concurrently. The Contractor shall provide adequate equipment and workforce to ensure that the connection is completed within the required timeframe.
- i. The Contractor shall provide any additional temporary plugs, sleeves, couplings, closure pieces, restraining devices, bulkheads, dewatering pumps and systems, and any other miscellaneous appurtenances required to perform the Work in the specified sequence at no additional cost to the Owner.

E. USE OF THE SITE

- 1. Operating/Staging Area: Contractor shall confine all operations, including storage of materials on the site, to Owner-approved areas as shown on the Drawings.
- 2. Temporary Buildings: Temporary buildings (including storage sheds, shops, and offices) may be erected by the Contractor on the site only with the consent of the Owner and without expense to the Owner. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the Work. When the Contractor uses any portion of the site as a shop, the Contractor shall be responsible for any repairs, patching, or cleaning arising from such

use and for obtaining any necessary permits to establish such shop or temporary storage facilities.

3. Use of Roadways: The Contractor shall use only established roadways or temporary roadways authorized by the Owner. When materials are transported during prosecution of the Work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by federal, state, or local law or regulation. Any damage to existing roadways caused by the Contractor's activities during prosecution of the Work shall be repaired by the Contractor.
4. Clean-up and Disposal/Removal of Materials: The Contractor shall clean up all refuse, rubbish, scrap materials, and debris caused by its operations to the end that the site of the Work shall present a neat, orderly and workmanlike appearance at all times. The Contractor shall be responsible for compliance with all laws governing the storage and ultimate disposal of all such materials and components. The Contractor shall provide the Owner with a copy of all manifests and receipts evidencing proper disposal when required by the Owner or applicable law.
5. Employee Parking: On-site parking for the vehicles of the Contractor's or subcontractors' employees shall be restricted to those areas specifically designated for that purpose on the Drawings. If no such areas are shown, or if additional parking areas are required, it shall be the sole responsibility of the Contractor to arrange and pay for off-site employee parking and to provide transportation from the parking area to the Work site. Violations of on-site parking requirements will result in the impoundment and towing of vehicles, with all costs thereof to be paid by the owner of the vehicle(s). Repeated violations will result in the revocation of any on-site employee parking privileges.
6. Sanitary Facilities: The Contractor shall furnish temporary sanitary facilities at the site for the needs of all construction workers and others performing work or furnishing services on the Project. Sanitary facilities shall be of reasonable capacity, properly maintained throughout the construction period, and obscured from public view to the greatest practical extent. If toilets of the chemically treated type are used, at least one toilet will be furnished for each 20 persons. Contractor shall enforce the use of such sanitary facilities by all personnel at the Site. The use of restroom facilities in any existing building on the site by employees of the Contractor or his subcontractors is prohibited.
7. Hazardous Materials, Fuel/Oil Storage: All hazardous materials shall be locked up in approved storage areas and containers, and in compliance with the latest EPA regulations. Fuel and oil storage areas on site shall be configured and maintained in strict conformance with federal, state, and local fire safety regulations and requirements.
8. Concrete Wastes. Waste concrete shall be deposited, and mix trucks washed out, in a properly designed and operated Concrete Waste

Management area installed by the Contractor in a location approved by the Construction Manager and the Owner. Collected waste materials shall be disposed of by the Contractor in conformance with applicable laws and regulations, and in a manner acceptable to the Owner.

9. Temporary Residence. Travel trailers, recreational vehicles, mobile homes or similar means to provide overnight accommodations will not be allowed at the site of the Work. Workmen will not be allowed to remain on the site before or after work hours. Overnight use of the site will only be allowed when construction scheduling may require 24-hour shifts or when otherwise approved by the Owner.
10. Owner's Security Program. The Contractor and his employees, subcontractors, vendors, and other persons employed by the Contractor for the execution of the Work, shall comply with the Owner's security program related to the site of the Work and the operation of the facility. Security measures will involve proper identification of persons and vehicles, controlled access to the facility during certain hours of the day and/or days of the week, maintenance of site fencing, and other related requirements. The Owner assumes no responsibility for the security of the Contractor's plant and equipment, nor for any materials or equipment stored by the Contractor on the site of the Work.
11. Dust Control. The Contractor shall be responsible for the control of fugitive dust emissions from the construction site, implementing measures such as appropriate planning, sequencing, and training, development of consistent materials handling procedures, application of dust suppressants, use of wind barriers, and other project-specific measures. The Contractor shall make adequate provision to fully protect the surrounding area from damage by dust, fumes, or spray caused by construction activities. Protect all of the Owner's existing facilities (indoors or out), including motors, bearings, electrical gear, instrumentation, HVAC equipment, and building surfaces by enclosure, masking, covering, exhausting, containment, dust palliatives, or other effective means. The disposable intake filters of existing HVAC units with the impact zone of construction activities shall be replaced by the Contractor on a monthly basis for the duration of the Project, or until adequate stabilization of surfaces is attained in the opinion of the Construction Manager.

F. PROTECTION OF WORK, PROPERTY, AND PERSONS:

1. The Contractor shall be responsible for conditions of the site, including safety of all persons and property, during performance of the Work. The Contractor shall maintain the site and perform the Work in a manner which meets all statutory and common law requirements or other specific contractual requirements for the provision of a safe place to work and which adequately protects the safety of all persons and property on or near the site. This obligation shall apply continuously and shall not be limited to normal working hours. The Owner's inspection of the Work or presence at the site does not and shall not be construed to include review of the

adequacy of the Contractor's safety measures in, on or near the site of the Work.

2. The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs, including adequate safety training, in connection with the Work. The Contractor shall comply with all applicable laws, ordinances, rules, regulations, and lawful orders of any public authority having jurisdiction bearing on the safety of persons or property or their protection from damage, injury, or loss.
3. Unless otherwise required in the Contract Documents, the Contractor shall protect and be responsible for any damage or loss to the Work or to the materials and equipment associated with the Work until the date of Substantial Completion. The Contractor remains responsible for any damage or loss caused directly or indirectly by the acts or omissions of the Contractor, subcontractors, suppliers, or third parties authorized or allowed on the site by the Contractor until Acceptance of the Project.
4. The Contractor shall also be solely and completely responsible for damages arising from the Work that affect property adjacent to the site.
5. The Contractor shall repair or replace without cost to the Owner any damage or loss that may occur, except damages or loss caused by the acts or omissions of the Owner.
6. The Contractor shall erect and maintain adequate signs, fencing, barricades, lights, or security measures and persons to protect the Work until the Owner's Representative authorizes in writing the removal of signs, fencing, barricades, lights, or security measures.

G. PROTECTION OF PERSONS:

1. The Contractor shall take all reasonable precautions for the safety of all employees working on this Contract and all other persons who may be affected by such work. The Contractor shall designate a responsible member of its organization at the site whose duty shall be to manage and coordinate the safety programs and to prevent accidents of the Contractor and subcontractors.
2. Except as otherwise stated in the Contract, if the Contractor encounters, on the site, material reasonably believed to be Hazardous Material including but not limited to asbestos, lead, or polychlorinated biphenyl (PCB), the Contractor shall immediately stop work in the area affected and give Notice of the condition to the Owner. Work in the affected area shall not be resumed without written direction by the Owner.
3. The Contractor shall maintain in a reasonable number of conspicuous and accessible places at the site all materials necessary for giving first aid to the injured. The Contractor shall establish, publish and make known to all employees procedures for ensuring immediate removal to a hospital or a

doctor's care, of persons who may have been injured on the site. The Contractor shall ensure that at least one of its employees on site has adequate training in first aid. Employees shall not be permitted to work on the site before the Contractor has:

- a. Provided all materials necessary for giving first aid at the site; and,
 - b. Established and made known procedures for removal of injured persons to a hospital or doctor's care.
4. In order to protect the lives and health of persons performing work under this Contract, the Contractor shall comply with the Federal Occupational Safety and Health Act of 1970 (OSHA), including all revisions, amendments, and regulations issued thereunder, and the provisions of state and local safety and health regulations. There is no acceptable deviation from these safety requirements, regardless of practice in the construction industry. Any violation of OSHA or other safety requirements applicable to the Work may be considered a breach of this Contract.
 5. The Contractor's attention is drawn to the fact that additional hazards are present at facilities that convey, pump, and treat wastewater. These hazards arise from the presence of pathogens in the wastewater and from the slime and scum layer that coat walking, working, and other surfaces. In dealing with these hazards, the Contractor shall take special precautions appropriate for the prevailing conditions to ensure worker safety.
 6. Work in Confined Spaces:
 - a. The provisions of OSHA Regulation Standards – 29 CFR Section 1910.146, "Permit-Required Confined Spaces", have been adopted by Owner and shall apply to Work under this Contract. The Owner has established a confined-space entry program for its own use, and will be responsible for enforcement of the program for Owner's personnel only.
 - b. The Contractor is hereby notified that the existing manholes and other structures on the site, included under the confined-space definition of 29 CFR 1910.146, shall be considered as hazardous locations with hazardous atmospheric conditions. The structures may contain methane, hydrogen sulfide, carbon dioxide, and other gases which are dangerous to life or health. Contractor shall allow its personnel or subcontractors to enter these confined spaces only through compliance with an entry permit program as specified herein.
 - c. The Contractor shall establish and maintain a confined-space entry program appropriate to the structures and conditions encountered. The program shall meet the requirements of 29 CFR 1910.146 and shall specifically address the provisions of Paragraph (d) therein. The Contractor shall enforce the requirements of Paragraphs (e) and (f), shall establish and conduct a training program in accordance with

Paragraph (g), and shall comply with all other applicable requirements of the referenced regulation.

- d. Upon request, the Owner's confined-space entry program will be made available to the Contractor for review, but Owner's program shall not be considered as necessarily addressing all steps and measures to be taken into account. Contractor shall cooperate with Owner for coordination of activities whenever Contractor's personnel and Owner's personnel will both be working in or near the confined spaces at the same time.

- 7. Lockout/Tagout. The Contractor is advised that the Owner has established a "Lock-out / Tag-out" program for the facility. The Contractor shall establish and adhere to a "Lock-out / Tag-out" program for new facilities and shall be responsible for adhering to the provisions of the Owner's program for existing facilities.

- 8. Hazardous Areas. The Contractor is advised that certain hazardous chemicals may be stored, handled, and used at wastewater treatment facilities. The Owner will make copies of MSDS sheets and other information about the chemicals, their uses and hazards available to Contractor's personnel, upon request of the Contractor. The Contractor shall be fully responsible for the safety of his employees and any subcontractors and shall develop and adhere to a site-specific safety program which accounts for the hazards of the facility.

H. COOPERATION WITH CONSTRUCTION MANAGER:

The Contractor, when requested, shall assist the Construction Manager in obtaining access to work that is to be inspected. The Contractor shall provide the Construction Manager with information requested in connection with the inspection of the Work.

2.05 OWNER-CONTRACTOR COORDINATION

A. SERVICE OF NOTICE:

Notice, order, direction, request or other communication given by the Construction Manager or Owner to the Contractor shall be deemed to be well and sufficiently given to the Contractor if left at any office used by the Contractor or delivered to any of his officers, clerks or employees or posted at the site of the Work or mailed to any post office addressed to the Contractor at the address given in the Contract or mailed to the Contractor's last known place of business. If mailed by first-class mail, any form of communication shall be deemed to have been given to and received by the Contractor a day after the day of mailing.

B. SUGGESTIONS TO CONTRACTOR:

Plan or method of work suggested by the Owner or the Construction Manager to the Contractor but not specified or required, if adopted or followed by the

Contractor in whole or in part, shall be used at the risk and responsibility of the Contractor. The Owner and the Construction Manager assume no responsibility therefor and in no way will be held liable for any defects in the Work which may result from or be caused by use of such plan or method of work.

C. COOPERATION:

The Contractor agrees to permit entry to the site of the Work by the Owner or other contractors performing work on behalf of the Owner. The Contractor shall afford to the Owner, other subcontractors and their employees, reasonable facilities and cooperation and shall arrange his work and dispose of his materials in such a manner as to not interfere with the activities of the Owner or of others upon the site of the Work. The Contractor shall promptly make good any injury or damage that may be sustained by other contractors or employees of the Owner at his hands. The Contractor shall join his work to that of others and perform his work in proper sequence in relation to that of others.

If requested by the Contractor, the Owner shall arrange meetings with other contractors performing work on behalf of the Owner to plan coordination of construction activities. The Owner shall keep the Contractor informed of the planned activities of other contractors.

Differences or conflicts arising between the Contractor and other contractors employed by the Owner or between the Contractor and the workers of the Owner with regard to their work shall be submitted to the Construction Manager for his decision in the matter. If the work of the Contractor is affected or delayed because of any act or omission of other contractors or of the Owner, the Contractor may submit for the Owner's consideration, a documented request for a change order.

D. DEVIATION FROM CONTRACT:

The Contractor shall not make an alteration or variation in, addition to, or deviation or omission from the terms of this Contract without the written consent of the Owner.

E. APPEAL TO THE CONSTRUCTION MANAGER FOR RECONSIDERATION OR FOR COMPENSATION:

1. In the event the Contractor disagrees with a decision of the Construction Manager or considers that the decision requires extra Work which causes additional costs or cause additional time on the critical path, he shall, within 5 calendar days, notify the Construction Manager in writing of the disagreement or of the claimed extra Work involved and the associated estimated additional cost and additional time of said Work.
2. The Contractor shall prepare and submit complete documentation of the nature and cost of extra Work within 10 calendar days of submittal of written notification of disagreement.

3. The Construction Manager shall make a determination in writing to the Contractor within 10 calendar days from the receipt of the Contractor's complete submittal of the nature and cost of the alleged extra Work.

F. APPEALS TO THE OWNER'S REPRESENTATIVE:

1. In the event the Contractor disagrees with any determination or decision of the Construction Manager, the Contractor may appeal the determination or decision to the Owner's Representative.
2. A Notice of Appeal must be submitted in writing by the Contractor to the Owner's Representative within 15 calendar days of the date of such determination or decision by the Construction Manager. Failure of the Contractor to appeal the decision or determination of the Construction Manager within said 15-day period shall constitute a waiver of the Contractor's right to thereafter assert an appeal resulting from such determination or decision.
3. Within 30 calendar days following the submittal of a Notice of Appeal the Contractor must submit in writing full documentation related to the Appeal, including:
 - a. A detailed factual statement of the Appeal providing all necessary details, dates, locations, and items of Contract Work affected;
 - b. Copies of documents and a written description of the substance of any oral communications that concern or relate to the Appeal;
 - c. The specific provisions of the Contract Documents on which the Appeal is based;
 - d. If an adjustment in the Contract Price is sought, the exact amount sought, accompanied with all records meeting the requirements herein for Contractor Change Proposals; and,
 - e. If an adjustment in the Contract Time is sought, the specific days and dates for which it is sought, accompanied by a schedule analysis meeting the requirements herein for Changes in Contract Time.
4. The Owner's Representative shall review the appeal and transmit his decision in writing to the Contractor within 45 calendar days from the date of receipt of the appeal. At the discretion of the Owner's Representative, additional information may be requested from the Contractor or the review period may be extended, following written notice to the Contractor.
5. Pending final decision of an Appeal hereunder, the Contractor shall proceed diligently with the performance of the Work, including that work associated with the Appeal, and maintain its progress with the Work.

6. The Contractor shall have the burden of proof to demonstrate entitlement to the relief sought through the Appeal process.

G. USE OF CONTRACTOR'S PLANT AND EQUIPMENT:

Contractor agrees to make available to the Owner his plant and equipment for the performance of work at the Project site. The Owner agrees that the use of such plant and equipment shall be considered as extra work and paid for accordingly.

PART 3 SPECIFICATIONS AND DRAWINGS

3.01 INTERPRETATION OF SPECIFICATIONS AND DRAWINGS

A. GENERAL:

The Specifications and Drawings are intended to be complementary of each other. Work specified on the Drawings and not in the Specifications, or vice versa, shall be executed as if specified in both.

B. BEFORE STARTING CONSTRUCTION:

Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures shown thereon and all applicable field measurements. Contractor shall promptly report in writing to Engineer through Construction Manager any conflict, error, ambiguity or discrepancy which Contractor may discover and shall obtain a written interpretation or clarification from the Construction Manager before proceeding with any work affected thereby; however, Contractor shall not be liable to Owner, Construction Manager or Engineer for failure to report any conflict, error, ambiguity or discrepancy in the Contract Documents, unless Contractor knew or reasonably should have known thereof.

C. REQUEST FOR CLARIFICATION:

In the event the Work to be done or matters relative thereto are not sufficiently detailed or explained in the Contract Documents, the Contractor shall apply to the Engineer through the Construction Manager for further explanations as may be necessary and shall conform thereto so far as may be consistent with the terms of the Contract. In the event of doubt or question arising respecting the true meaning of the Specifications or Drawings, reference shall be made to the Construction Manager for his decision. Should the Contractor disagree with the Construction Manager's decision, he may appeal to the Owner's Representative in accordance with paragraph 00700-2.05 E.

3.02 DIVISION OF SPECIFICATIONS AND DRAWINGS

Specifications and Drawings are divided into groups for the convenience of the Owner, Construction Manager and Engineer. These divisions are not for the purpose of apportioning work or responsibility for work among subcontractors, suppliers and manufacturers.

3.03 DISCREPANCIES IN SPECIFICATIONS AND DRAWINGS; DIFFERING CONDITIONS

A. ERRORS AND OMISSIONS:

If the Contractor, in the course of the Work, becomes aware of any claimed errors or omissions in the Contract Documents or in the Owner's fieldwork, he shall immediately inform the Construction Manager in writing. The Construction Manager shall promptly review the matter and if he finds an error or omission has been made, he shall determine the corrective actions and advise the Contractor accordingly. If the corrective work associated with an error or omission increases or decreases the amount of work called for in the Contract, an adjustment to the Contract will be developed through the procedures outlined herein for Changes in the Work. After discovery of an error or omission by the Contractor, related work performed by the Contractor shall be done at his risk unless authorized by the Construction Manager. In the event the Contractor disagrees with the determination of the Construction Manager under this provision, he may appeal to the Owner's Representative in accordance with paragraph 00700-2.05 F.

B. CONFLICTING PROVISIONS:

In cases of conflict between the Specifications and Drawings, the Specifications shall govern. Figure dimensions on drawings shall govern over scale dimensions and detail drawings shall govern over general drawings. In the event an item of work is described differently in two or more locations on the Drawings and in the Specifications, the Contractor shall request a clarification from the Engineer through the Construction Manager.

C. UNDERGROUND FACILITIES:

The Owner has endeavored to determine the existence of underground facilities at the site of the Work from the records of the owners of known utilities in the vicinity of the Work and from records of previous construction activities at the site. The positions of these underground facilities as derived from such records are shown on the Drawings. No excavations were made to verify the locations shown for underground facilities. The service connections to utilities are not shown on the Drawings. It shall be the responsibility of the Contractor to determine the exact location of underground facilities, utilities, and service connections thereto. The Contractor shall make his own investigations, including exploratory excavations, to determine the locations and type of existing underground facilities, prior to commencing work which could result in damage to such facilities. The Contractor shall immediately notify the Construction Manager as to any underground facility discovered by him in a different position than shown on the Drawings or which is not shown on the Drawings.

Work on underground facilities shall be performed and paid for as follows:

1. Shown or Indicated: the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:

- a. reviewing and checking all such information and data,
 - b. locating all underground facilities shown or indicated in the Contract Documents,
 - c. coordination of the Work with the owners of such underground facilities, including Owner, during construction, and
 - d. the safety and protection of all such underground facilities and repairing any damage thereto resulting from the Work.
2. Not Shown or Indicated: If an underground facility is uncovered or revealed at or contiguous to the site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any work in connection therewith (except in an emergency), identify the owner of such underground facility and give written notice to that owner and to Owner and Construction Manager. Construction Manager will promptly review the underground facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the underground facility. During such time, Contractor shall be responsible for the safety and protection of such underground facility.

If the Construction Manager concludes that a change in the Contract Documents is required, a Directive will be processed to reflect and document such consequences. An equitable adjustment may be made in the Contract Price or Contract Times, or both, to the extent that such adjustment is attributable to the existence or location of any underground facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. The adjustment to Contract Time shall be in conformance with the requirements specified elsewhere herein regarding impact to controlling activities on the critical path of the schedule.

E. DIFFERING SITE CONDITIONS:

1. The Contractor shall promptly, in any event no later than five days, and before such conditions are disturbed, notify the Owner in writing of:
 - a. Subsurface or latent physical conditions at the site differing materially from those indicated in this Contract.
 - b. Unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this Contract.

2. Unless otherwise agreed upon in writing by the Construction Manager, within fourteen days of the Contractor's initial written notification of the Differing Site Condition to the Owner, the Contractor shall provide a change proposal in accordance with the requirements of paragraph 00700-7.03 of this Section and:
 - a. A detailed description of the Differing Site Condition; and,
 - b. Substantive, contractual, and technical basis supporting the existence of the Differing Site Condition and its impacts.
3. The Owner shall promptly investigate the alleged Differing Site Conditions and respond to the Contractor's Notice of Differing Site Conditions and issue a Directive if appropriate.
4. Waiver:
 - a. If the Contractor's actions disturb the site such that the Owner or Construction Manager cannot adequately and fully investigate the alleged Differing Site Condition, the Contractor waives its right to receive any additional time or money as a result of the Differing Site Condition.
 - b. Failure by the Contractor to provide either (i) immediate notice or (ii) a change proposal shall constitute a waiver of the Contractor's right to receive any additional time or money as a result of the Differing Site Condition.
 - c. The Contractor shall be responsible for any and all costs or damages incurred by the Owner resulting from the Contractor's failure to provide appropriate notice and/or the detailed description and change proposal.
5. The Contractor shall not disturb the condition until receipt of written authorization from the Construction Manager that work can resume at the location of the alleged Differing Site Condition. The Contractor shall continue with the performance of all other Work.

3.04 SUBMITTALS

Where required by the Specifications, the Contractor shall submit specified information which will enable the Engineer to determine and advise the Owner whether the Contractor's proposed materials, equipment or methods of work are in general conformance with the design concept and in compliance with the Drawings and Specifications.

3.05 CONTRACTOR'S COPIES OF CONTRACT DOCUMENTS

The Owner will furnish the Contractor four sets of Contract Documents, including full-size drawings, within 14 days after the issuance of the Notice-To-Proceed. The Contractor is advised that revisions incorporating changes by addenda may not be incorporated into the reduced or full-size drawings furnished under the provisions of this

paragraph. Additional copies of the Contract Documents, if required by the Contractor, will be furnished by the Owner at cost. The Contractor shall keep at the construction site at least one set of the Contract Documents, including full-size drawings.

PART 4 MATERIALS, EQUIPMENT AND WORKMANSHIP

4.01 GENERAL

Unless otherwise specifically stated in the Contract Documents, the Contractor shall provide and pay for materials, labor, tools, equipment, water, light, power, transportation, supervision, and temporary construction of any nature, and other services and facilities of any nature, whatsoever necessary, to execute, complete and deliver the Work within the specified time. Material and equipment shall be new and of a quality equal to that specified. Equipment offered shall be current modifications which have been in successful regular operation under comparable conditions. This requirement does not apply to minor details, nor to thoroughly demonstrated improvements in design or in materials of construction. Construction work shall be executed in conformity with the standard practice of the trade.

4.02 PRODUCT DATA

Data required by the Owner for inspecting, testing, operating or maintaining parts of the Work shall be provided by the Contractor when specified. Unless otherwise specified, such information shall consist of three copies and shall be provided at the time the referenced material or equipment is delivered to the job site. The data shall be as specified and include such items as shop drawings, erection drawings, reinforcing steel schedules, testing and adjusting instructions, operations manuals, maintenance procedures, parts lists and record drawings. When applicable, information and data to be provided shall be identified by the specified equipment number. Extraneous material on the pages or drawings provided shall be crossed out, and the equipment or material to be supplied shall be clearly marked. Such information is to be provided as part of the Work under this Contract and its acceptability determined under normal inspection procedures.

4.03 QUALITY

Where the Contract requires that materials or equipment be provided or that construction work be performed, and detailed specifications of such materials, equipment or construction work are not set forth, the Contractor shall perform the Work using materials and equipment of the best grade in quality and workmanship obtainable in the market, from firms of established good reputations, and shall follow standard practices in the performance of construction work. The work performed shall be in conformity and harmony with the intent to secure the standard of construction and equipment of work as a whole and in part.

4.04 MATERIAL AND EQUIPMENT SPECIFIED BY NAME

A. GENERAL:

When material or equipment is specified by reference to two or more patents, brand names, or catalog numbers, it shall be understood that this is referenced for the purpose of defining the performance or other salient requirements, and that other materials or equipment, of equal capacities, quality and function shall be considered by the Owner upon the Contractor's request for substitution. Requests for substitution shall be made in accordance with paragraph 00700-4.05.

B. SINGLE SOURCE PRODUCTS:

If material or equipment is specified by only one patent or proprietary name, or by the name of only one manufacturer, it is for the purpose of standardization, or because the Owner knows of no equal. If standardization is the reason for using one name to specify any material or equipment, the specifications will so state that substitutions will not be considered. In other cases, the Contractor may offer substitutions of products considered to be equal to that specified. Such substitutions shall be requested in accordance with paragraph 00700-4.05.

4.05 REQUESTS FOR SUBSTITUTION

The Contractor may offer material or equipment of equal or better quality and performance in substitution for those specified. The Owner will consider offers for substitution only from the Contractor and will not acknowledge or consider such offers from suppliers, distributors, manufacturers, or subcontractors. The Contractor's offers of substitution shall be made in writing to the Engineer through the Construction Manager and shall include sufficient data to enable the Engineer to assess the acceptability of the material or equipment for the particular application and requirements. All requests for substitution must be made within 120 days of the receipt of notice to proceed. Requests for substitutions submitted after this 120-day period will not be considered unless evidence is submitted to the Engineer through the Construction Manager that all of the following circumstances exist:

1. The specified product is unavailable for reasons beyond the control of the Contractor. Such reasons shall consist of strikes, bankruptcy, discontinuance of manufacturer, or acts of God.
2. The Contractor placed, or attempted to place, orders for the specified products within 30 days after Notice to Proceed.
3. Request for substitution is made in writing to the Engineer through the Construction Manager within 10 days of the date on which the Contractor ascertains that he cannot obtain the item specified.
4. Complete data as set forth herein to permit complete analysis of the proposed substitution is submitted with the request.

The Engineer's decision regarding evaluation of substitutions shall be considered final and binding. Requests for time extensions and additional costs based on submission of, acceptance of, or rejection of substitutions will not be allowed.

If the offered substitution necessitates changes to or coordination with other portions of the Work, the data submitted shall include drawings and details showing such changes. Contractor agrees to perform these changes as part of the substitution of material or equipment at no additional cost to the Owner. Within 30 calendar days after receipt of the offer of substitution, the Engineer will review the material submitted by the Contractor and advise the Contractor of objections, if any, to the proposed substitution or if further information is required. Upon notification by the Engineer, the Contractor shall either provide material or equipment that complies with Project Specifications or furnish requested additional information. While the Engineer might not take any objections to the proposed substitution, such action shall not relieve the Contractor from responsibility for the efficiency, sufficiency, quality and performance of the substitute material or equipment, in the same manner and degree as the material and equipment specified by name. Any cost differential associated with a substitution shall be reflected in the offer and the Contract Documents shall be modified by Changes in the Work procedures.

4.06 DEMONSTRATION OF COMPLIANCE WITH CONTRACT REQUIREMENTS

A. INSPECTION:

To demonstrate his compliance with the Contract requirements, the Contractor shall assist the Construction Manager in his performance of inspection work. The Contractor shall grant the Construction Manager access to the Work and to the site of the Work, and to the places where work is being prepared, or whence materials, equipment or machinery are being obtained for the Work. The Contractor shall provide information requested by the Construction Manager in connection with inspection work.

If the Contract Documents, laws, ordinances, or any public regulatory authority having jurisdiction requires parts of the Work to be specially inspected, tested or approved, the Contractor shall give the Construction Manager adequate prior written notice of the availability of the subject work for examination.

If parts of the Work are covered in contravention of the Construction Manager's directive, the cost of exposing the work for inspection and closing shall be borne by the Contractor regardless of whether or not the work is found to be in compliance with the Contract.

If any work is covered in the absence of the Construction Manager's directive to the contrary, the Contractor shall, if directed by the Construction Manager, uncover, expose or otherwise make available for inspection, portions of covered work. If it is found that such work is defective, the Contractor shall bear the expense of uncovering and reconstructing. If the work is found to be in compliance with the Contract, the Contractor will be allowed equitable compensation or an extension in the Contract Time, or both, except that extensions in Contract Time must meet the Contract requirements for impact on controlling activities. Recovery for such expense and/or time shall follow the procedures set forth herein for Changes in the Work.

B. SAMPLES OF MATERIALS:

In cases where compliance with Contract requirements for materials to be incorporated in the Work requires laboratory examination or special testing, the Contractor shall provide samples or specimens as requested by the Construction Manager. Such samples or specimens shall be provided in ample time to permit making proper test analysis and examinations before the time at which it is desired to incorporate the material into the Work. Tests of material will be conducted in accordance with the technical Specifications. In the absence of a specific test requirement, the Construction Manager will determine the appropriate standard test to be used. Unless stated otherwise in the Contract Documents, the costs of such examination or testing shall be borne by the Contractor.

C. CERTIFICATION:

In cases where compliance of materials or equipment to Contract requirements is not readily determinable through inspection and tests, the Construction Manager shall request that the Contractor provide properly authenticated documents, certificates or other satisfactory proof of compliance. These documents, certifications and proofs shall include performance characteristics, materials of construction and the physical or chemical characteristics of materials.

D. INSPECTION AT POINT OF MANUFACTURING:

If inspection and testing of materials or equipment in the vicinity of the Work by the Owner is not practicable, the Specifications may require that such inspection and testing or witnessing of tests take place at the point of manufacture. In this case and in the event the remote inspection and testing is not specified and is requested by the Owner, the required travel, subsistence, and labor expenses shall be paid by the Owner. If the Contractor requests the Owner to inspect and test material or equipment at the point of manufacture, then the additional cost to the Owner for travel, subsistence, and labor expenses shall be paid by the Contractor.

4.07 STORAGE OF MATERIALS AND EQUIPMENT

Materials and equipment shall be stored so as to ensure the preservation of their quality and fitness for the Work and so as to be protected from weather, damage, theft, and vandalism. Control panels, switchgear, drives, and other sensitive electrical and electronic equipment shall be stored indoors in a climate controlled environment. The Contractor shall be responsible for damages due to any cause that occur in connection with the care and protection of materials and equipment until Acceptance of the Work.

The Contractor is responsible for complying with the requirements of any manufacturer pertaining to the storage of their equipment, including but not limited to, motor rotation and lubrication, provision of temporary power for moisture control, provision of climate-controlled storage facilities, compliance with warranty restrictions on the use of the equipment for temporary construction-related purposes, and other special provisions as dictated by the manufacturer.

Stored equipment and materials shall be located so as to facilitate inspection. If space is available, materials and equipment may be stored on site in areas approved by the

Owner; however, they shall be stored so as not to interfere with the Owner's operations or with other work, block passageways, or obstruct access/exits to buildings or facilities. Materials and equipment may be stored off site with the Owner's consent, if the Owner's interest in those materials and equipment is protected through insurance and the Contractor provides documentation of such insurance.

4.08 MANUFACTURER'S DIRECTIONS

Manufactured articles, material and equipment shall be applied, installed, connected, erected, adjusted, tested, operated and maintained as recommended by the manufacturer, unless otherwise specified. Manufacturer's installation instructions and procedures shall be provided prior to installation of the manufactured articles, material and equipment.

4.09 DEFECTIVE WORK

A. CORRECTION OF DEFECTIVE WORK:

When, and as often as the Construction Manager determines through his inspection procedures, material, equipment or workmanship incorporated in the Project do not meet the requirements of the Contract, the Construction Manager shall give written notice of the noncompliance to the Contractor. Within five days from the receipt of such notice, the Contractor shall undertake the work necessary to correct the deficiencies, and to comply with the Contract. If the Contractor disagrees with the Construction Manager's determination and believes that the corrective work should be covered at the Owner's expense, he shall immediately notify the Owner's Representative, in writing, setting forth his position in accordance with the Appeals procedure in paragraph 00700-2.05 F. If the Owner's Representative determines that the corrective work is required to comply with the Contract, the Contractor shall proceed with such work.

B. RETENTION OF DEFECTIVE WORK:

Prior to acceptance of the Project, the Owner may, at his option, retain work which is not in compliance with the Contract if the Owner determines that such defective work is not of sufficient magnitude or importance to make the work dangerous or undesirable. The Owner also may retain defective work, if, in the opinion of the Construction Manager, and with concurrence of the Owner's Representative, removal of such work is impractical or will create conditions that are dangerous or undesirable. Just and reasonable value for such defective work shall be judged by the Owner and appropriate deductions shall be made in the payments due, or to become due to the Contractor. Acceptance of the Project shall not act as a waiver of the Owner's right to recover from the Contractor an amount representing the deduction for retention of defective work.

4.10 GUARANTEE

The guarantee period shall be for 365 days. Except for Work accepted as substantially complete, the guarantee period shall commence on the date of Acceptance of the Project. For Work described as substantially complete, the guarantee period shall

commence on the date of substantial completion. During the guarantee period, the Contractor shall, upon the receipt of notice in writing from the Owner, promptly make all repairs arising out of defective materials, workmanship or equipment. The Owner is hereby authorized to make such repairs, if ten days after giving of such notice to the Contractor, the Contractor has failed to make or undertake the repairs with due diligence. In case of an emergency, where, in the opinion of the Owner, delay could cause serious loss or damage, repairs may be made without notice being sent to the Contractor and the expenses in connection therewith shall be charged to the Contractor.

For the purpose of this paragraph, "acceptance of the Work" shall mean the acceptance of the Project or a portion of the Project by the Owner, in accordance with paragraph 00700-6.07. "Acceptance of the Work" shall not extinguish any covenant or agreement on the part of the Contractor to be performed or fulfilled under this Contract which has not, in fact, been performed or fulfilled at the time of such acceptance. All covenants and agreements shall continue to be binding on the Contractor until they have been fulfilled.

4.11 MATERIALS AND EQUIPMENT FURNISHED BY OWNER

Materials and equipment specified to be furnished by the Owner shall be installed by the Contractor. Furnishing of material and equipment by the Owner will be considered conclusive evidence of their acceptability for the purpose intended. If the Contractor discovers defects in material or equipment furnished by the Owner, he shall notify the Construction Manager. After such discovery, the Contractor shall not proceed with work involving Owner-furnished materials and equipment unless authorized by the Construction Manager. Unless otherwise noted or specifically stated, materials and equipment furnished by the Owner, which are not of local occurrence, are considered to be FOB railroad station or truck terminal nearest to the site of the Work. After receipt by the Contractor at the point of destination, all risk of loss and damage to such materials and equipment shall be borne by the Contractor, as if it had been supplied and stored by the Contractor himself. The Contractor shall unload, transport, store and protect such material and equipment from damage.

PART 5 LIABILITY AND INSURANCE

5.01 LIABILITY OF CONTRACTOR

The Contractor shall be liable for any and all losses or damages from whatever cause which, prior to Acceptance of the Project, may occur on or to any part of the Work. The Contractor shall not be liable for losses or damages caused solely by the act of the Owner.

The Contractor shall be liable for damages and injury which shall be caused to persons owning property, on or in the vicinity of the Work, or which shall occur to a person, or persons, or property whatsoever, arising out of the Contractor's performance of this Contract. The Contractor's liability shall not be dependent upon whether or not such damage or injury is caused by the negligence of the Contractor, and whether or not such damage or injury be caused by the inherent nature of the Work as specified.

The Contractor shall indemnify and hold the Owner, the Construction Manager, the Engineer, and their officers, principals, agents, subcontractors, and employees, harmless from any and all loss, defense cost, expense, claims, demand or liability whatsoever, arising from allegations of injuries to persons or damage to property related to the performance of this Contract, regardless of concurrent negligence on the part of such indemnities. The indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any subcontractor under workers compensation acts, disability benefit acts, or other employee benefit act, nor shall it be limited to the limits of the liability insurance required by this Contract.

In case suit or legal proceeding shall be brought against the Owner, the Construction Manager, the Engineer, or their officers, principals, agents, subcontractors, or employees, on account of loss or damage sustained by person, or persons, or property, as a result of the performance of the Work covered by this Contract, the Contractor agrees to assume the defense thereof, and to pay the expenses connected therewith, and the judgments that may be obtained against the Owner, the Construction Manager, the Engineer, or their officers, principals, agents, subcontractors, or employees, in such suits. In the event that a lien is placed against the property of the Owner, the Construction Manager, the Engineer, or their officers, principals, agents, subcontractors, or employees, as a result of such suits, the Contractor agrees to at once cause the same to be dissolved and discharged by giving bond or otherwise. The Contractor's agreement to defend and to pay the related expenses shall exist whether or not such injuries or damage be due to the negligence of the Contractor, and whether or not such injuries or damage be caused by the inherent nature of the Work, as specified.

The mention of specific duties or liabilities imposed on the Contractor shall not be construed as a limitation or restriction of general duties or liabilities imposed upon the Contractor by the Contract. Reference to specific duties or liabilities is made herein, merely for the purpose of explanation.

5.02 BONDS

The Contractor shall provide two bonds, each in the amount of 100 percent of the Contract Price. One shall serve as security for the faithful performance of the Work and the other as security for the faithful payment and satisfaction of the persons furnishing materials and performing labor on the Work. The bonds shall be issued by a corporation duly and legally licensed to transact surety business in the State of Georgia. Such bonds shall remain in force throughout the period required to complete the Work, and thereafter for a period of 365 calendar days after Acceptance of the Project. The bonds must be executed by a duly licensed surety company, which is listed in the latest Circular 570 of the United States Treasury Department, as being acceptable as surety on federal bonds. The Surety Company shall be licensed to do business in the State of Georgia. No surety's liability on the bonds shall exceed the underwriting limitations for the respective surety specified in Circular 570. The scope of the bonds or the forms thereof prescribed in these Contract Documents shall in no way affect or alter the liabilities of the Contractor to the Owner as set forth herein.

Companies providing Bonds under this Contract must have a current Best's rating not less than A and current Best's Financial Size Category less than Class IX. These requirements conform to the ratings published by A. M. Best & Company in the current Best's Key Rating Guide – Property-Casualty.

5.03 INSURANCE

The Contractor shall maintain throughout the Contract Period, all insurance coverage specified in Section 00750. Evidences of insurance shall be provided to the Owner prior to execution of the Contract.

All policies shall contain provisions to the effect that in the event of payment of any loss or any damage, the insurers will have no right of recovery against the insured or additionally named insured thereunder.

PART 6 PROGRESS AND COMPLETION

6.01 NOTICE TO PROCEED

After execution of the Contract by the Owner, written Notice to Proceed will be given by the Owner to Contractor. Notwithstanding other provisions of the Contract, the Contractor shall not be obligated to perform work, and the Owner shall not be obligated to accept or pay for work performed by the Contractor, prior to date of the Notice to proceed. The Owner's knowledge of work being performed prior to date of the Notice to Proceed shall not obligate the Owner to accept or pay for such work.

6.02 CONTRACT TIME

A. GENERAL:

Time shall be of the essence of the Contract. The Contractor shall promptly start the Work after the date of the Notice to Proceed and shall prosecute the Work so that the Project as a whole and portions of the Project shall be complete within the times specified in Section 00500. During periods when weather or other conditions are unfavorable for construction, the Contractor shall pursue only such portions of the Work as shall not be damaged thereby. No portions of the Work where acceptable quality or efficiency will be affected by unfavorable conditions shall be constructed while those conditions exist. It is expressly understood and agreed by and between the Contractor and the Owner that the Contract Time for completion of the Work described herein is a reasonable time taking into consideration the average climatic and economic conditions and other factors prevailing in the locality of the Work. The Contract Time may be changed only with a Change Order and in compliance with this Section and Section 00700, Article 7.03 of these Specifications.

B. CONSTRUCTION SCHEDULE:

The Contractor shall provide a construction schedule and reports as specified in Section 01310 for scheduling and coordinating the Work within the Contract Time. Contract time extensions shall be incorporated into updated schedules, reflecting

their effect at the time of occurrence. Failure of the Contractor to comply with these requirements for submittal of the construction schedule and reports may be cause for delay in review of progress payments by the Construction Manager.

C. CONSTRUCTION PROGRESS:

The Contractor shall furnish such manpower, materials, facilities and equipment as may be necessary to insure the prosecution and completion of the Work in accordance with the accepted schedule. If work falls 14 days or more behind the accepted construction schedule, the Contractor agrees that he will take some or all of the following actions to return the Project to the accepted schedule. These actions may include the following:

1. Increase manpower in quantities and crafts.
2. Increase the number of working hours per shift, shifts per working day, working days per week, or the amount of equipment, or any combination of the foregoing.
3. Reschedule activities.

If requested by the Construction Manager, the Contractor shall prepare a proposed schedule revision demonstrating a plan to make up the lag in progress and ensure completion of the Work within the Contract Time. The proposed revision shall be submitted to the Construction Manager in accordance with Section 01310. Upon receipt of an acceptable proposed schedule revision, the revision to the construction schedule shall be made in accordance with Section 01310. All actions to return the Project to the accepted schedule are at the Contractor's expense.

The Contractor shall pay all costs incurred by the Owner that result from the Contractor's action to return the Project to its accepted schedule. Contractor agrees that Owner shall deduct such charges from payments due the Contractor. It is further understood and agreed that none of the services performed by the Construction Manager in monitoring, reviewing and reporting Project status and progress shall relieve the Contractor of responsibility for planning and managing construction work in conformance with the construction schedule.

D. DELAYS:

1. Notice of Delays: When the Contractor foresees a delay in the prosecution of the Work and immediately upon the occurrence of a delay which the Contractor regards as unavoidable, he shall notify the Construction Manager in writing of the probability of the occurrence of such delay, the extent of the delay, and its possible cause. In any event, the Notice of Delay shall be submitted to the Construction Manager within seven days of the occurrence or of when the Contractor was aware of the likelihood of a possible delay. The Contractor shall take immediate steps to prevent, if possible, the occurrence or continuance of the delay. If this cannot be done, the Construction Manager shall determine how long the delay shall continue and to what extent the prosecution and completion of the Work are being delayed thereby. He shall

also determine whether the delay is to be considered avoidable or unavoidable and shall notify the Contractor of his determination. The Contractor agrees that no claim shall be made for delays that are not called to the attention of the Construction Manager at the time of their occurrence. Within seven days of the submittal of the written Notice of Delay, the Contractor shall submit the following information:

- a. Nature of the delay;
 - b. Date (or anticipated date) of commencement of delay;
 - c. Activities on the construction schedule affected by the delay, and/or new activities created by the delay and their relationship with existing activities;
 - d. Identification of person(s) or organization(s) or event(s) responsible for the delay;
 - e. Anticipated extent of the delay; and
 - f. Recommended action to avoid or minimize the delay.
2. Avoidable Delays: Avoidable delays in the prosecution of the Work shall include:
- a. Delays that could have been avoided by the exercise of care, prudence, foresight and diligence on the part of the Contractor or his subcontractors.
 - b. Delays which occur as a result of equipment maintenance, breakdown, or equipment that otherwise fails to operate properly.
 - c. Delays due to normal weather conditions.
 - d. Delays due to abnormal weather conditions for which the Contractor is specifically required to make provision.
 - e. Delays that may in themselves be unavoidable but which affect only a portion of the Work and do not necessarily prevent or delay the prosecution of other parts of the Work or the completion of the whole Work within the Contract Time.
 - f. Delays associated with the reasonable interference of other contractors employed by the Owner that do not necessarily prevent the completion of the whole Work within the Contract Time.
3. Unavoidable Delays: Unavoidable delays in the prosecution or completion of the Work shall include delays which result from causes beyond the control of the Contractor and which could not have been avoided by the exercise of care, prudence, foresight and diligence on the part of the Contractor or his subcontractors. Delays in completion of the work of other contractors employed by the Owner will be considered unavoidable delays insofar as they

interfere with the Contractor's completion of the whole Work within the Contract Time. Delays caused by acts of God, fire, abnormal weather, floods, tidal waves, earthquakes, strikes, labor disputes, freight embargoes and shortages of materials shall be considered as unavoidable delays insofar as they prevent the Contractor from proceeding with at least seventy-five percent (75%) of the normal labor and equipment force for at least five hours per day toward completion of the current controlling item on the accepted critical path schedule.

E. DAMAGES FOR DELAY:

For the period of time that any portion of the Work remains unfinished after the time fixed for completion in the Contract Documents, as modified by extensions of Contract Time granted by the Owner, it is understood and agreed by the Contractor and the Owner that the Contractor shall pay the Owner the amount of the liquidated damages specified in the Contract to cover the costs that the Owner suffers by failure of the Contractor to complete the Work within the stipulated time frame.

F. EARLY COMPLETION

The Contractor may complete the Project or any part of the Project earlier than is stipulated in the Contract. The Contractor may schedule its work to complete earlier than required by the Contract or stipulated in the approved schedule; however, under no circumstances shall the Contractor be entitled to added compensation for delays that occur during the originally stipulated Contract period. The Owner has purchased the entire scheduled time period by virtue of this Contract and further stipulates that only those delays that meet the tests set forth within paragraph 00700 - 7.03.G.4 will be considered for adjustment and only to the extent that they delay the Work past the originally contractually stipulated milestones or completion date.

G. WEATHER DELAY

Contract Time will be extended as a result of weather delays based only on the following criteria.

General Requirements: Delays caused by abnormal weather shall be considered as unavoidable delays insofar as they prevent the Contractor from proceeding with at least seventy-five percent (75%) of the normal labor and equipment force for at least five hours per day toward completion of the current controlling item on the accepted critical path schedule. Even though a cause of delay meets any, or all, of the weather delay rules stated herein, it shall in all cases be presumed that no extension, or further extension, of time is due unless the Contractor shall demonstrate that the delay is justified and had an impact to the critical path of the updated CPM schedule for the delay period. To this end, the Contractor shall maintain adequate records supporting any claim for an extension of time and shall submit such records, including a revised CPM schedule showing the impact of the delay, with the claim.

A Notice of Alleged Weather Delay shall be submitted in writing to the Construction Manager within seven days after the month for which the delay is claimed. Full supporting documentation, including a statement of the portions of the Work affected, an explanation as to the reasons work was prevented or hindered by the weather, the dates on which such portions of Work were affected, the total number of days believed that the job in its entirety was delayed, and the schedule update shall be submitted to the Construction Manager within seven days following submittal of the Notice. Failure by the Contractor to provide either (a) Notice of alleged weather delay or (b) full supporting documentation shall constitute a waiver of the Contractor's right to receive any additional time as a result of the alleged abnormal weather, unless the time for submitting the required information is extended in writing by the Construction Manager.

The Construction Manager will determine the Contractor's entitlement to an extension of the Contract Time, but in no event shall an extension be granted for days outside the Contract period. The daily records maintained by National Oceanic and Atmospheric Association's (NOAA) station located at the Atlanta Fulton County Airport (Charlie Brown Field), shall be the official source for weather data related to precipitation for this Project. A time extension of no more than one day will be granted for one day of lost work, regardless of the number of allowable reasons for lost time. The period of any extension of time shall be only for the portion of the Contract actually delayed due to the abnormal weather conditions. Any extension of Contract Time allowed under any of the following rules shall be considered non-compensable and have no impact on Contract Price.

1. Rule Number One: The total amount of precipitation that occurs during one calendar month.

If the actual amount of precipitation in a given month is less than the normal precipitation for that month, as stated in Figure 1, no claim will be allowed under this rule.

If the actual amount of precipitation for the month exceeds the normal amount, and the number of days having precipitation greater than one tenth (0.10") inch that is greater than the average number of precipitation days per month in Figure 2, then an application for extension is justified. One day time extension would be allowed for each day in excess of the average number of precipitation days. For each day, or period of consecutive days of "excess precipitation," a time extension of one day may be allowed for the following day as a "mud day." (See Rule Number Four.)

2. Rule Number Two: The frequency of the occurrences of precipitation during one calendar month.

Precipitation of greater than one-tenth (0.10") inch per day for three or more days of a consecutive five-day period is considered to be unusual frequency and, as such, is considered to be justification for application for a one-day extension. This rule can be used even when Rule Number One is not applicable, but may not apply concurrently with other rules. For each "frequency of precipitation" day, a one day time extension may be allowed for the following day as a "mud day." (See Rule Number Four.)

3. Rule Number Three: Unusually heavy precipitation.

Precipitation of greater than one inch during a single day is considered to be justification for application for a one-day time extension. For each "heavy precipitation" day or period of consecutive days, a one-day time extension may be allowed for the following day as a "mud day." (See Rule Number Four.) Rule Number Three is applicable only after the precipitation for the month exceeds the normal precipitation for that month as stated in Figure 1.

4. Rule Number Four: The effect of precipitation on the Project's site conditions.

Unfavorable site conditions that hamper work can result from unusual weather during that period when the work is unenclosed. This rule considers both mud and snow cover according to the season. A one day time extension for "mud" may be allowed for each day, or period of consecutive days, approved under Rule Number One, Two and Three; however, only one application of this rule, mud or snow, per day is allowed. Three inches or more of snow cover is considered to be justification for application for an extension of time. Whether or not the Contractor took reasonable precautions to provide protection for the Work will be considered in the evaluation of impacts related to abnormal weather.

5. Rule Number Five: Temperature

A daily high temperature of twenty degrees Fahrenheit or less is considered to be justification for application for a one-day time extension. This rule cannot be applied concurrently with any other rule. Temperatures above the statistical mean are not considered to be justification for an extension of Contract Time.

Figure 1											
Normal Precipitation (all measurements are in inches)											
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5.03	4.68	5.38	3.62	3.95	3.63	5.12	3.67	4.09	3.11	4.1	3.82

Figure 2											
Average Number of calendar days with Precipitation of 0.1 inches or more											
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
12	10	11	9	9	10	12	9	8	7	8	10

[Information contained in Figures 1 and 2 are as provided by the U.S. National Oceanic and Atmosphere Administration (NOAA) Meteorological Data for Atlanta.]

6.03 SUSPENSION PROCEDURES

- A. The Owner may, at his convenience and at any time and without cause, suspend, delay, or interrupt all or any part of the Work for a period of not more than 90 days by notice in writing to the Contractor. The Owner shall fix the date on which the Work shall be resumed. The Contractor shall resume the Work within 10 days

after receiving written notice from the Owner to do so. The Contractor will be allowed an increase in the Contract Price or an extension of Contract Time, or both, directly attributable to any suspension if he makes a claim therefore as provided in the paragraphs related to change of Contract Price and change of Contract Time. Compensation for costs due to Suspension of the Work shall be limited to the direct costs of the Project as specified under Time and Expense Changes, except that no allowance will be made for overhead and profit. Additionally, the Contractor shall not be paid for extended home office overhead, lost use of capital, impairment of bonding capacity, loss of potential profit or any other direct costs.

- B. If the Contractor fails or refuses to perform its obligations in accordance with the Contract, the Owner may order the Contractor, in writing, to stop the Work, or any portion thereof, until satisfactory corrective action has been taken. The Contractor shall not be entitled to any adjustment in the Contract Time and/or Contract Price for any increased cost or time of performance attributable to the Contractor's failure or refusal to perform its obligations under the Contract.

6.04 TERMINATION PROCEDURES

A. TERMINATION BY OWNER FOR DEFAULT:

The Owner may terminate the Contract upon seven days written notice to Contractor and his surety whenever the Contractor is deemed to be in default or fails to fulfill, in a timely and proper manner, the Contract obligations, or is in violation of any provisions or covenants of the Contract.

For purposes of this paragraph, the Contractor shall be deemed to be in default upon the occurrence of any one or more of the following events:

1. If Contractor is unable to demonstrate financial ability to finish the Project.
2. If Contractor makes a general assignment for the benefit of creditors.
3. If a trustee or receiver is appointed for Contractor, or for any of Contractor's property.
4. If Contractor files a petition to take advantage of any debtor's act, or to reorganize under any bankruptcy chapter or law.
5. If Contractor repeatedly fails to make prompt payments to subcontractors or others for labor, materials, or equipment.
6. If Contractor disregards laws, ordinances, rules, regulations, or orders of any public body having jurisdiction.
7. If Contractor disregards the authority of Construction Manager.

8. If Contractor fails to prosecute the Work or any portion thereof with sufficient diligence to ensure Substantial Completion of the Work within the Contract Time.
9. If Contractor fails to comply with Contract safety requirements.
10. If Contractor repeatedly fails to supply skilled workers or proper materials or equipment.
11. If Contractor violates in any substantial way the provisions of the Contract Documents by failing, neglecting, or refusing to proceed according to and in full compliance with the provisions and covenants of the Contract Documents.

If the Owner reasonably believes that one of the aforementioned events has occurred, the Owner will provide the Contractor with written Notice of its intent to terminate the Contractor for default, specifying within such notice the ground(s) for such termination. The Owner, at its option, shall require the Contractor to either promptly correct the deficiencies noted in the Owner's intent to terminate Notice or provide the Owner with a corrective action plan as to how such deficiencies will be remedied or cured in a timely fashion. If, after receipt of the proposed remedy, the Owner has a reasonable basis for concluding that the Contractor has (a) failed or is unwilling to repair, replace, or correct the deficiencies, or (b) failed or is unwilling to provide a reasonable and satisfactory corrective action plan, the Owner shall thereafter have the right to terminate this Contract for default.

After termination of Contractor for default, the Owner may exclude the Contractor from the site and take possession of the Work and all of the Contractor's tools, appliances, construction equipment, and machinery at the site and use the same to the full extent they could be used by the Contractor. The Owner may incorporate in the Work all materials and equipment stored at the site or for which the Owner has paid the Contractor, but which are stored elsewhere.

If the Owner proceeds as with the Work, the Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by the Owner arising out of or relating to completing the Work, such excess will be paid to the Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, the Contractor shall pay the difference to the Owner. Such claims, costs, losses, and damages incurred by the Owner will be reviewed by the Construction Manager as to their reasonableness and, when so approved by the Construction Manager, incorporated in a Change Order. When exercising any rights or remedies under this paragraph the Owner shall not be required to obtain the lowest price for the Work performed.

Where the Contractor's services have been so terminated by the Owner, the termination shall not affect any rights of the Owner against the Contractor then existing or which may thereafter accrue. Any retention or payment of monies due the Contractor by the Owner will not release the Contractor from liability.

If the Owner terminates this agreement for default, and it is thereafter determined that the Contractor had not so failed to perform its obligations or defaulted in any way, the termination shall then be deemed to have been effected for the convenience of the Owner. In that event, any adjustment of compensation to Contractor shall be in accordance with paragraph 00700-6.04 B.

B. TERMINATION BY OWNER FOR OTHER THAN DEFAULT:

The Owner may, without prejudice to any other remedy it may have under the provisions of the Contract, terminate this Contract, in whole or in part, at any time by giving written notice to Contractor or its representative by certified mail, return receipt requested. Termination shall be effective upon receipt of such notice by Contractor. Contractor shall immediately discontinue work and take all reasonable steps with its suppliers and subcontractors to minimize cancellation charges and other costs.

In the event of termination for reasons other than default of Contractor, Contractor shall be entitled to recover all reasonable costs incurred in connection with performance of the Work, plus any cost and expense reasonably and necessarily incurred in connection with such termination, plus a percentage of the profit based on the percentage of completion of the Work. The Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

C. TERMINATION BY CONTRACTOR:

If the Work is stopped by order of a court, a public authority or the Owner for a period of 90 calendar days or more through no act or fault of the Contractor or anyone employed by him or his subcontractors, then the Contractor may terminate the Contract 10 calendar days after written notice to the Owner. Upon receipt of the written notice, the Owner shall implement procedures as set forth in paragraph 00700-6.04 B.

6.05 SUBSTANTIAL COMPLETION

The Contractor, on considering the Work to be substantially complete and ready for its intended use, shall so notify the Construction Manager in writing. The notification shall include an itemized list of remaining incomplete work.

To be deemed substantially complete, the entire Project must be fully capable of providing its intended use, to the satisfaction of the Construction Manager, unless the Contract Documents expressly indicate that portions of the Project are required to be substantially complete prior to the completion of the entire Project. All portions of the Project shall be installed and operational, including accessories, controls, and safety devices. All functional testing, startup, checkout, and field performance testing (including specified equipment run-in times) shall be completed, and all manual and automatic controls shall be in place and operational as intended, including any remote reporting and control systems. All final coatings, paving, grading, and other finish items shall have been completed. Manufacturer's field test reports, O&M

manuals, and warranties shall have been submitted and approved, and all required training shall have been successfully completed.

If the Construction Manager determines that the Work is not substantially complete, he will so notify the Contractor in writing identifying the reasons for such a determination. If the Construction Manager finds the Work substantially complete, he will meet with the Contractor to:

- A. Prepare a punch list;
- B. Define the division of responsibility between Owner and Contractor with respect to security, operation, maintenance, heat, utilities, insurance, and warranties; and
- C. Describe any other issues related to acceptance of the substantially completed Work.

Upon reaching agreement with the Contractor, the Construction Manager will write to the Owner, certifying that the Work is substantially complete, identifying punch list items, stating the date for completion of incomplete Work, defining the division of responsibilities, and setting forth any other terms related to acceptance.

The Owner, who has sole discretion for determination of substantial completion, will review the Construction Manager's certification that the Work is substantially complete and concurring with that certification, will notify the Contractor, in writing, that the Work is accepted as substantially complete. Except for any portion(s) of work specified for early completion or required by the Owner for early possession (paragraph 00700-6.06), substantial completion will not occur for any work until the entire Project is ready for possession and use. The acceptance notice will include a punch list of incomplete work items, set the date for their completion, describe the division of responsibility between the Owner and Contractor, and describe any other terms of acceptance. The Contractor will acknowledge receipt of the acceptance notice in writing, indicating acceptance of all of its terms and provisions.

Upon receipt of the Contractor's acknowledgment letter, the Owner shall take possession of the Work or portion of the Work and put it into its intended service. The date that the Work or portion of the Work is put into service will become the date of substantial completion. Unless otherwise specified, the Contractor's guarantee period and start date for associated warranties shall be the date that the portion of Work is put into service.

Subsequent to the substantial completion date, the Owner may exclude the Contractor from the Work during such periods when construction activities might interfere with the operation of the Project. The Owner, however, shall allow the Contractor reasonable access for completion or correction of incomplete punch list items.

Release of retainage will not be applied to substantial completion of components to be utilized by Owner prior to completion of the Project; retainage release will only be applied upon substantial completion of the entire Project. Upon attainment of Substantial Completion of the Project, the Contractor shall become eligible for payment

of retainage, subject to a withholding of 200 percent of the value of the outstanding Work, including punch list items, as determined by the Construction Manager.

6.06 POSSESSION OF PORTIONS OF THE PROJECT

Should the Contractor fail to meet any date specified for substantial completion of the Work or any portion of the Work requiring early possession and use by the Owner, the Owner may, after written notice to the Contractor, take over such portion or all of the Work that is behind schedule. In such case, the Construction Manager will prepare a punch list. The Owner may allow the Contractor reasonable access to the Work at such times that the operation of the Project will not be affected or he may complete the Work himself after giving the Contractor notice of his intention to do so. The cost of Owner's work will be charged to and deducted from amounts due to the Contractor.

6.07 ACCEPTANCE OF THE PROJECT

Upon completion of the Work, including portions of the Work previously accepted as substantially complete, the Contractor shall so notify the Construction Manager in writing. Upon receipt of the notification, the Construction Manager will determine if the Work conforms to the terms of the Contract. If he finds materials, equipment, or workmanship that do not meet the terms of the Contract, he shall prepare a punch list of such items and submit it to the Contractor. Following completion of the corrective work by the Contractor, the Construction Manager shall notify the Owner that the Work has been completed in accordance with the Contract. Final determination of the acceptability shall be made by the Owner. Upon acceptance of the Project, the Owner shall immediately notify the Contractor and Construction Manager in writing. For portions of the Project not previously accepted as substantially complete, the conditions of guarantee shall commence on the date that the Owner issues a Notice of Completion.

The final application for payment shall be accompanied by all required documentation called for in the Contract including complete and legally effective releases or waivers of liens in a form acceptable to Owner. Subject to prior approval of Owner, Contractor may submit in lieu of the lien releases and waivers:

- A. Receipts of releases in full;
- B. An affidavit that the releases and receipts cover all labor, services, materials, and equipment for which a lien could be filed and that all payrolls, materials, and equipment bills and other indebtedness connected with the Work for which Owner or Owner's property might in any way be responsible have been paid or otherwise satisfied; and
- C. Consent of the surety, if any, to final payment.

If any subcontractor or supplier fails to furnish a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any lien.

If, after reviewing the Contractor's final application for payment including all documentation required, the Construction Manager determines that the Work is complete, he will recommend that the Owner make final payment, including retainage. The final payment will be due and payable by the Owner within 45 days after any legal notice periods have expired.

PART 7 MEASUREMENT AND PAYMENT

7.01 LIMITATIONS OF FUNDS

A. TERMS OF CONTRACT AND MONETARY OBLIGATION OF THE OWNER

1. Term: This Contract is for a term not to exceed one year and will terminate absolutely and without further obligation on the part of the Owner at the close (December 31) of the calendar year in which it was executed and at the close (midnight, December 31) of each succeeding calendar year in which it is renewed. This Contract will automatically renew at 12:01 AM, January 1 of the following calendar year unless the Owner notifies the Contractor in writing 10 days prior to the termination that the Contract will not be renewed.
2. Total Monetary Obligation: The total monetary obligation of the Owner under this Contract is shown above as the Contract Price. This Contract will terminate immediately and absolutely at such time as appropriated or unobligated funds are no longer available to satisfy the obligations of the Owner. This Contract does not create a debt of the Owner for payment of any sum beyond the calendar year of execution or, in the event of a renewal, beyond the calendar year of such renewal.
3. Annual Monetary Obligation: The amounts of the annual obligation indicated in the Contract/Agreement at the time of award and execution are percentages of the Contract Price, based on the Owner's perception at the time of award of the probable cash flow requirements for the Project. The Contract will be amended by a Supplemental Agreement at the beginning of each renewal year to adjust the amount of the monetary obligation, based on the Contractor's current schedule and cash flow projections. The cash flow projections will be determined by the Construction Manager from an evaluation of the Contractor's periodic schedule update, submitted in accordance with the requirements of Section 01310 of these Contract Documents.

B. ADMINISTRATION OF FUNDS

1. Appropriations: The initial amount indicated in the Agreement/Contract has been appropriated for this Project and is available for payments to the Contractor during the first calendar year of the Contract. It is expected that the Owner will make appropriations for future renewal years and that the Contract will be amended as necessary.
2. Earnings in Excess Of Appropriations: If earnings will be such that funds appropriated for the Contract will be exhausted before the end of any calendar

year, the Contractor shall give written notice to the Construction Manager of the estimated date of exhaustion and the amount of additional funds that will be needed to meet payments due to or to become due under the Contract during that calendar year. This notice shall be given no later than 60 days prior to the estimated date of exhaustion.

3. Suspension of Work: An equitable adjustment, in conformance with the Suspension Procedures clause of these Contract Documents, shall be made if suspension of the Work is made necessary by the exhaustion of funds. However, any suspension, delay or interruption of the Work arising as a result of an exhaustion of funds shall not constitute a breach of this Contract.
4. Excess Funds: If at any time it becomes apparent that the funds appropriated for any given calendar year are in excess of the funds required to meet all payments due or to become due the Contractor because of work performed or to be performed under the Contract during the calendar year, the Owner reserves the right to reduce said appropriation by the amount of such excess.

7.02 PAYMENTS TO CONTRACTOR

A. BREAKDOWN OF CONTRACT PRICES:

Except in cases where unit prices form the basis for payment under the Contract, the Contractor shall, within 14 days of receipt of the Notice to Proceed, submit a breakdown of the Contract Price for the Construction Manager's review and approval showing the value assigned to each part of the Work including an allowance for profit and overhead. In submitting the breakdown, the Contractor certifies that it is not unbalanced and that the value assigned to each part of the Work represents his estimate of the actual cost, including profit and overhead, of performing that part of the Work. The breakdown shall be sufficiently detailed to permit its use by the Construction Manager as one of the bases for evaluating requests for payment.

B. PROJECT STATUS REVIEW:

Contractor and Construction Manager shall meet each month prior to the Contractor submitting the progress payment request for the previous month. The purpose of the meeting is to review Project status in relation to the construction schedule; review values of Work completed during the previous month; and, if applicable, review Contractor's plans to return Project status to that required by the schedule. Within five days following this meeting, the Contractor shall submit a written progress report comprising:

1. A copy of the current construction schedule marked up to indicate percent complete, actual completion or start dates since the previous review, and the estimated remaining duration for each activity in progress.
2. Reasons any activities are behind schedule and of the corrective steps being taken.

C. PROGRESS PAYMENTS:

1. Payment Request Procedures: Each month, the Contractor shall submit to the Construction Manager a partial payment estimate filled out and signed by the Contractor covering acceptable Work performed during the previous month, or since the last partial payment estimate was submitted. If requested by the Construction Manager, the Contractor shall provide such additional data as may be reasonably required to support the payment estimate. Such data may include satisfactory evidence of payment for equipment, materials and labor including payments to subcontractors and suppliers. Request for payment for delivered and stored equipment and material shall be accompanied by certified invoices by the suppliers and, in the case of equipment stored off site, documentation of insurance coverage. Such equipment and material shall be suitably and safely stored at the site of the Work or at an off-site location previously approved by the Owner. The Owner reserves the right to accept or reject pay requests for stored equipment or to limit payments to stored equipment which, in his opinion, is necessary for continuing satisfactory Project progress.

The monthly payment request shall be accompanied by a separate submittal consisting of the invoices received during the pay period for materials and equipment incorporated or to be incorporated into the Work. The invoices should include the amount of Georgia sales tax paid. If sales tax is not included in the invoiced amount, the Contractor shall submit documentation evidencing the amount of sales tax paid to the State for the purchased materials and equipment. During the progress of the Work, each request for payment shall be accompanied by Contractor's updated Project schedule, progress photographs, required invoices, and other data specified herein or reasonably required by Engineer and/or Construction Manager.

2. Review Procedures: Within 10 days after receipt of the partial payment estimate, the Construction Manager will review the estimate and either indicate in writing to the Owner's Representative his concurrence with the estimate and his recommendation that payment be made, or indicate in writing to the Contractor his reasons for not concurring with the estimate. If the Construction Manager recommends payment and the Owner's Representative concurs, the Owner will, after receipt of the Construction Manager's recommendation, pay the Contractor a progress payment on the basis of the approved partial payment estimate. The payments will take into account the retention provisions provided for herein.

In the event the Construction Manager does not concur with the estimate, the Contractor may make the changes necessary to obtain the Construction Manager's concurrence and resubmit the partial payment estimate, or submit the original progress payment estimate directly to the Owner's Representative, indicating in writing his reasons for refusing to make the changes necessary to obtain concurrence.

3. Retention: The Owner shall retain a percentage of each payment except as specified below. The retained amount is available for the protection and

payment of the person, or persons, mechanics, subcontractors, or materialmen who shall perform labor upon the Contract or work thereunder, and persons who shall supply such person, or persons, or subcontractors with components and supplies for carrying on such work.

The Owner shall retain 10 percent of each progress payment except and at the sole discretion of the Owner:

- a. Until the value of the Work completed is at least fifty percent (50%) of the Contract amount, the Owner shall retain ten percent (10%) of the value of all Work satisfactorily completed.
- b. After construction is fifty percent (50%) complete, the total amount retained to date will be held by the Owner, and all further Applications for Payment will be paid in full subject to the requirement that the total retention shall not be less than five percent (5%) of the Contract Amount, provided that, in the opinion of the Construction Manager, the Contractor is making satisfactory progress and there is no specific cause for greater withholding. Monies in retainage shall not become due the Contractor until after Substantial Completion is attained. The Construction Manager shall make his recommendation to the Owner's Representative for final approval of reduction of retainage. If there are any remaining incomplete minor items at the time Substantial Completion is attained, an amount equal to 200 percent of the value of each item, as determined by the Construction Manager, shall be withheld until such item or items are completed.

In no case will retainage be less than required by applicable laws and regulations. At any time during the Project the Contractor fails to maintain the progress of the Work on or ahead of schedule, the Owner may resume retainage of 10 percent of the amount of total progress payments to date until the Contractor is on or ahead of schedule or until final completion.

Retainage will be invested by the Owner and any interest earned will be paid to the Contractor when the Project has been completed within the time limits and for the price specified in the Contract or any approved amendments or change orders.

4. Withholding: The Construction Manager may refuse to recommend the whole or any part of any payment if in the Construction Manager's opinion it would be incorrect to make such recommendation to the Owner. The Construction Manager may also refuse to recommend any such payment, or because of subsequently discovered evidence or the result of tests, may nullify any such payment previously recommended to such extent as may be necessary in the Construction Manager's opinion to protect the Owner from loss as a result of:
 - a. Defective or damaged work.
 - b. A deductive change order.

- c. Persistent failure of the Contractor to perform the Work in accordance with the Contract Documents, including failure to maintain the progress of the Work in accordance with the construction schedule. Persistent failure to maintain the progress of the Work shall mean that for a period of two consecutive months following a written notice from the Construction Manager, the Contractor fails to correct a behind-schedule condition at a rate that would reasonably indicate that he will finish the Project on schedule.
- d. Disregard of authority of the Construction Manager or the laws of any public body having jurisdiction.

The Owner may refuse to make payment of the full amount recommended by the Construction Manager because of claims made against the Owner on account of Contractor's performance or furnishing the Work or because liens have been filed in connection with the Work or there are other items entitling Owner to reduce the amount recommended. In such case, the Owner shall give Contractor prompt written notice with copy to the Construction Manager stating the reasons for each action.

D. FINAL PAYMENT:

The Owner will make final payment to the Contractor in the manner provided by law following the expiration of 45 calendar days after acceptance of the Work and issuance of the Notice of Completion by the Owner providing no liens or claims are outstanding. Final payment shall include the entire sum found to be due hereunder after deducting from previous payments and such other lawful amounts as the terms of this Contract describe. Prior estimates and payments, including those relating to extra work or work omitted, shall be subject to correction by the final payment.

Acceptance by the Contractor of final payments shall be and shall operate as a release to the Owner of all claims and all liability to the Contractor other than claims in stated amounts that may be specifically excepted by the Contractor for things done or furnished in connection with this Work and for every act and neglect of the Owner and others relating to or arising out of this Work. Payment by the Owner shall not release the Contractor or his surety from any obligation under the Contract or under the Performance Bond and Payment Bond.

7.03 CHANGES IN THE WORK

A. GENERAL:

The Owner may, at any time, without notice to any surety, order additions, deletions or revisions in the Work. At the Owner's discretion, these changes may be compensated for from allowance monies included in the Contract Price, from credits for omitted Work, or from an increase in the Contract Price by a Change Order approved by the Board of Commissioners. Upon receipt of a Directive issued by the Owner's representative or the Construction Manager, the Contractor shall promptly proceed with the Work.

1. Owner-Initiated Changes: When the Owner desires a change in the Work, the Construction Manager will issue a Request for Proposal to the Contractor. The Contractor shall respond within the time indicated by the Construction Manager, or 15 days, whichever is less. If the Contractor fails to meet the submittal time required by this provision, the CONTACTOR will be solely liable for any delays or impacts caused by the delayed submittal of the proposal.

If the Owner and the Contractor agree on the value of any work and the modification to the Contract Time that should be allowed as a result of the Contractor's response to a Request for Proposal, the Contractor shall proceed with the change upon receipt of a written notice from the Construction Manager. The final approval of any extension of Contract Time must be made by action of the Board of Commissioners.

2. Contractor-Initiated Changes: Any request by the Contractor for a change in the Contract Price or Contract Time shall be based upon a written notice of intent delivered by the Contractor to the Construction Manager promptly, but in no event later than 7 days after the start of the occurrence giving rise to the request for adjustment.

A notice of the amount of the request for adjustment in cost and/or time with supporting data shall be delivered within 14 days after the start of the occurrence, unless the Construction Manager allows an additional period of time to ascertain more accurate data in support of the request.

No claim by the Contractor for an equitable adjustment hereunder shall be allowed if asserted after final payment under this Contract.

3. Contractor Change Proposal Requirements: The Contractor's change proposal submitted for any potential change to the Contract shall be in a form acceptable to the Construction Manager. The Contractor's itemized estimate shall detail all applicable elements of cost, including, but not limited to, labor man-hours and payroll costs, quantities, crew mixes, production rates, material costs, subcontractor and supplier costs, equipment costs and supplemental costs. The proposal shall include sales tax. Where a change in Contract Time is sought, the proposal shall include a detailed schedule analysis demonstrating the impact to the controlling item(s) in the schedule. With respect to work during other than normal hours, the labor charges associated with such work shall consist of straight time wages and burden plus the appropriate overtime or shift premium with no additional burden (i.e. fringe benefits) on the premium portion.

The submittal shall cover all aspects of the Work involved, whether deleted, added or revised. Amounts for subcontractors or suppliers of any tier shall be similarly supported.

No submittal for an adjustment in Contract Price or Contract Time shall be valid unless submitted in accordance with this Section.

The Contractor is required to comply with the Construction Manager's documentation requirement regarding format and level of detail for the change order process.

The Owner reserves the right to direct the Contractor to solicit competitive bids for additional work. If required by Owner, the Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner who will determine, with the advice of the Engineer and Construction Manager, which bids will be accepted.

B. EXTRA WORK:

Extra work means the providing of materials and equipment and the performing of work not directly or by implication called for by the Contract. Changes in measured quantity under a unit price contract or item shall not be considered extra work. If the Owner requires extra work he may:

1. Do it himself,
2. Employ others to do it,
3. Direct the Contractor to perform the extra work at unit bid price or a combination of such items,
4. Direct the Contractor to perform the extra work at a mutually agreed upon lump sum, or
5. Direct the Contractor to perform the extra work on a time and expense basis, or
6. Direct the Contractor to perform the extra work at a lump sum amount determined by the Owner. Such lump sum amount determined by the Owner may be subject to appeals provisions of Article 2.05 of these General Conditions.

C. OMITTED WORK:

The Owner may, by written order to the Contractor, omit work, equipment and material to be provided under the Contract, and the value of the omitted work, equipment and material, including allowances for overhead and profit as described in paragraph 00700-7.03.E, will be deducted from the Contract Price. The deducted value will be a lump sum or unit bid price agreed upon in writing by the Contractor and Owner based on breakdown and cost information submitted by the Contractor and will be deducted from the Base Bid amount of the Contract Price and added to the contract allowances amount.

D. UNIT BID PRICE CHANGE:

Increases or decreases in the quantity of a Contract item of Work will be made by comparing the total pay quantity of such item of Work with the Construction

Manager's estimate therefore. When changes in quantities exceed 25 percent above or below the original bid quantity and the total dollar change of that bid item is significant, the Owner will review the unit price to determine if a new unit price should be negotiated. Adjustment in the unit price shall be applied only to the quantities above 125 percent or below 75 percent of the estimated quantity. The total payment for any item adjusted for decreased quantity shall not exceed 75 percent of the total amount originally bid for the item.

E. LUMP SUM CHANGES:

Changes in the Base Bid amount or the Contract Price resulting from extra work will be determined by a mutually agreed upon lump sum price. The Contractor's proposal for such changes shall be as outlined in paragraph 00700 - 7.03.A.3. Construction equipment costs shall be computed as outlined in paragraph 00700 - 7.03 F.5.

If the change involves extra work to be performed entirely by the Contractor, compensations for such extra work shall be based on the direct costs as listed in the detailed proposal, plus 15 percent of direct costs for overhead and profit, plus 1 percent of such direct costs for bond. When the extra work involves subcontractors, compensation for such work shall be based on direct costs as listed by the subcontractor plus 15 percent of such direct costs for the subcontractor's overhead and profit. The Contractor may add 5 percent to the subcontractor proposal for overhead and profit, and 1 percent for bond. The 5 percent subcontractor markup shall be applied only once regardless of the number of tiers of subcontractors. The above allowances for overhead and profit shall include full compensation for overhead, including superintendence, and additional overhead attributable to a time extension granted because of the change order. For extra work that is funded from contract allowances, the 1 percent additional cost for bonds shall not be applied.

F. TIME AND EXPENSE CHANGES:

1. General: Whenever the Contractor is directed to perform extra work on a time and expense basis, he has a duty to control costs and to maintain accurate records. Each day a record of labor, materials and equipment costs will be submitted to the Construction Manager for verification. These records will reflect the actual and necessary expenses pertaining to the extra work and shall be available for audit. Audits conducted under this provision shall be in accordance with generally accepted auditing standards and established procedures and guidelines of the reviewing or audit agencies.

Payment to the Contractor for extra work performed on a time and expense basis shall consist of the actual necessary expense for doing the extra work, plus an allowance of 15 percent of labor, material and equipment rental for overhead, general superintendence and profits, plus 1 percent for bond. This basis of payment applies to work done directly by the Contractor and to work done by a subcontractor, except the 1-percent allowance for bond shall not apply to work performed by a subcontractor. When a subcontractor does the work, the Contractor may add 5 percent to the subcontractor's charges to cover

overhead and profit and 1 percent for bond. For extra work that is funded from contract allowances, the 1 percent additional cost for bonds shall not be applied.

In determining time and expense compensation, the term "actual necessary expense" shall mean the sum of:

- a. Materials,
- b. Labor,
- c. Supervision,
- d. Construction equipment,
- e. Professional services, and
- f. Other costs.

Charges for such items shall mean the actual cost whether incurred by the Contractor, a subcontractor or others. The items making up "actual necessary expense" are defined as follows.

2. Materials:

- a. For materials accepted by the Construction Manager and used as an integral part of the finished Work, Contractor shall receive the actual cost of such materials delivered to the Work site, including transportation charges paid by the Contractor, exclusive of machinery rentals as hereinafter set forth.
- b. If materials are procured by Contractor by a method that is not a direct purchase from and a direct billing by the actual supplier, the cost of such material shall be deemed to be the lowest current wholesale price at which such materials are available in the quantities concerned and delivered to the site of the Work.
- c. For other materials used in the construction that are not an integral part of the finished Work, such as but not limited to sheeting, false work and form lumber, Contractor shall be reimbursed in the amount agreed upon by the Construction Manager before such work is begun. The salvage value of such material shall be taken into consideration in determining the amount of reimbursement.

3. Labor:

- a. The cost of labor shall be the sum of actual wages, labor surcharge, and subsistence and travel allowances. Actual wages paid shall include employer payments to or on behalf of the worker for health and welfare, pension, vacation and similar purposes. The labor surcharge includes

applicable labor related taxes, Workers Compensation Insurance premiums, public liability and property damage insurance premiums, and other legally required costs directly related to labor. Where subsistence and travel allowance are required for performance of extra work, the charges shall consist of the actual amount paid to each worker for these items.

- b. For all labor and for authorized foreman supervision in direct charge of the specific operations, Contractor shall receive the actual rate of wage in effect at the time the work is performed for each and every hour that said labor force is actually engaged in such work.
 - c. The charges for labor shall NOT include charges for such overhead personnel as assistant superintendents, superintendents, office personnel, timekeepers, QA/QC manager, safety manager and maintenance mechanics.
4. Supervision: If, in the Owner's judgment, full-time supervision of the extra work above the level of foreman is required, it will be authorized in writing by the Construction Manager and charges for such supervision will be included as an actual necessary expense.
5. Construction Equipment:
- a. Individual pieces of equipment or small tools having a replacement value of \$500 or less shall be considered expendable and no payment therefor shall be made.
 - b. Contractor shall be paid for the use of Contractor-owned or rented equipment at seventy percent of the suggested monthly rental rates listed for such equipment in the Rental Rates for Construction Equipment Blue Book (published by Equipment Watch, PRIMEDIA), except as modified below, which edition shall be the latest edition in effect at the time of commencement of the time and expense work. Hourly rental rates shall be calculated by dividing the listed monthly rates by 176 hours. The rental rate of equipment used in excess of eight hours per day shall be fifty percent of the hourly rates as calculated above. The rental rates for standby equipment, when authorized by the Construction Manager, shall be at the rate of fifty percent of the hourly rate for equipment in use eight hours per day. No payment for standby equipment shall be made for more than eight hours per day and no payment shall be made for weekend days or legal holidays. No payment for standby equipment shall be made when the equipment has been used at least eight hours in a 24-hour period. If it is deemed necessary by the Contractor to use equipment not listed in the applicable edition of the Blue Book Rental Rates, Contractor shall furnish the necessary cost data and paid invoices to the Construction Manager for his use in establishment of such rental rate(s).
 - c. Equipment must be in good operating condition. The rates paid for operating the equipment shall be in addition to the rental rates identified above and shall be calculated at one-hundred percent of the operating rates

as provided for in the Rental Rates for Construction Equipment Blue Book (published by Equipment Watch, PRIMEDIA). The operating costs shall cover the costs of fuel, oil, lubricants, supplies, small tools, necessary attachments, repairs and maintenance of all kinds, and all incidentals. The Contractor will be paid the equipment operating rate only for those hours the equipment is actually used. No payment of operating costs shall be made for standby equipment.

- d. The rental time to be paid for equipment on the Work site shall be the time the equipment is required for the time and expense work being performed. The time shall include the time required to move the equipment to the location of the time and expense work and return it to the original location or to another location. Moving time will not be paid if the equipment is used at the site of the time and expense work on other than such time and expense work. Loading and transporting costs will be allowed, in lieu of the moving time, when the equipment is moved by means other than its own power. No payment for loading and transporting will be made if the equipment is used at the site of the time and expense work on other than such time and expense work. Compensation will not be allowed while equipment is inoperative due to breakdown.
 - e. For the use of equipment moved in on the Work and used exclusively for work paid for on a time and expense basis, providing the Construction Manager has agreed to such move, Contractor will be paid the equipment use rate provided for herein, for the costs of transporting the equipment to the location of the Work and its return to its original location, and for the cost of loading and unloading the equipment, all in accordance with the following provisions:
 - 1) The cost for transporting equipment shall not exceed the applicable minimum established rates by the Georgia Public Service Commission.
 - 2) The equipment use period shall begin at the time the equipment is unloaded at the site of the Work and shall include each day the equipment is at the site of the Work excluding weekends and legal holidays unless the time and expense work is performed on those days and shall terminate at the end of the day on which the Construction Manager instructs the Contractor to discontinue the use of such equipment. The maximum time to be paid per day shall not exceed eight hours unless the equipment is in operation for a longer time.
6. Subcontract Work: Where the Change applies to work being performed under a subcontract, reimbursement, including overhead and profit for the subcontractor's work performed on a time and expense basis shall be computed in precisely the same manner as if performed by Contractor. One additional allowance of five percent of the subcontractor's total costs will be granted to Contractor for overhead and profit regardless of the tier of the subcontractor.

If the subcontractor elects to contract out changed work to a third (or lower) level contractor or supplier of purchased equipment, he shall not be entitled to fees, overhead or profit for such third (or lower) level work or materials.

The Owner reserves the right to direct the Contractor to contract directly with a third (or lower) level subcontractor or supplier of purchased equipment in order to avoid paying multiple fees, overhead and profit for such third (or lower) level subcontractor or supplier of purchased equipment.

If similar work is not being performed at the Work site and if required by the Construction Manager, Contractor shall obtain three competitive bids for the requirements of the Change and the Contract Documents from subcontractors acceptable to the Construction Manager. Selection of the subcontractor shall be subject to the approval of the Construction Manager and the Owner.

7. Professional Services: Professional services shall be included in "actual necessary expense" provided both the Owner has determined that such services are necessary and the Construction Manager has authorized in writing the provision of such services.
8. Other Costs: Charges for items not included in paragraphs 7.03 F.1 through 7 may be included as "actual necessary expense" if such additional items are authorized in advance and in writing by the Construction Manager.
9. Compensation: The compensation as set forth above shall be received by the Contractor as payment in full for work done on a time and expense basis. At the end of each day, the Contractor and Construction Manager shall compare records of the work performed including classification of laborers, ordered on a time and expense basis.
10. Statements: No payment shall be made for work performed on a time and expense basis until Contractor furnishes the Construction Manager itemized statements of the cost of such time and expense work. Time and expense work lasting more than one day shall require the Contractor to submit and receive the approval of the itemized statements, detailed to the satisfaction of the Construction Manager as to its contents. The itemized statements will typically include:
 - a. Labor – Name, classification, date, daily hours, total hours, rate and extension of each laborer and foreman.
 - b. Equipment – Size, type, identification number, date, daily hours, total hours, rental rate and extension of each unit of machinery and equipment.
 - c. Materials – Quantities of supplies and materials, prices including transportation costs and extensions.
 - d. Bonds and insurance premiums, as applicable.

- e. Subcontract work – time and expense details as above, or progress quantities and prices of unit price or lump sum subcontracts.
 - f. Payment for items listed above shall be conditioned upon Contractor's presentation of original receipted invoices for materials used and transportation charges. If, however, the materials used in the time and expense work are not specially purchased for such work but are taken from Contractor's stock, then in lieu of the original invoices, the statements shall contain or be accompanied by an affidavit of Contractor that shall certify that such materials were taken from his stock and that the price and transportation of the material as claimed represents actual cost.
11. If, in the Construction Manager's opinion, Contractor or any of his subcontractors, in performing time and expense work, is not making efficient use of labor, material or equipment and/or is proceeding in a manner that is expensive to the Owner, the Construction Manager may request the Contractor to make more efficient use of labor, material and equipment. Contractor shall in good faith comply with such requests as are reasonable. If the Contractor fails to comply with such requests, the Construction Manager may independently determine the reasonable cost for the work and the Contractor will be entitled only to such costs.

G. CHANGES IN CONTRACT TIME

1. Critical Path Schedule Analysis: An extension in Contract Time will not be granted unless the Contractor can demonstrate through an analysis of the critical path method progress schedule that the increases in the time to perform the Work beyond the Contract Time arise from causes beyond the control of the Contractor and his/her subcontractors or suppliers. The Contractor must demonstrate that such causes lead to completion of the Work beyond the corresponding Contract Time, despite the Contractor's reasonable and diligent actions to guard against those effects.
2. Avoidable Delays: The Owner may grant an extension of time for avoidable delay if he deems it in his best interest. If the Owner grants an extension of time for avoidable delay, the Contractor agrees to pay actual costs, including charges for engineering, construction management, inspection, and administration, as specified in paragraph 00700-7.05 incurred during the extension.
3. Unavoidable Delays: For delays that the Contractor considers to be unavoidable, he/she shall submit to the Construction Manager complete information demonstrating the effect of the delay on the controlling item in his/her construction schedule. The Construction Manager shall review the Contractor's submission and determine the number of days of unavoidable delay and effect of such on controlling operations of the Work. The Owner will grant an extension of time to the extent that unavoidable delays affect controlling operations in the construction schedule. During such extensions of time, engineering, construction management, inspection and administration costs, nor damages for delay will be charged to the Contractor. It is

understood and agreed by the Contractor and Owner that time extensions due to unavoidable delays will be granted only if such unavoidable delays involve controlling operations that would prevent completion of the whole Work within the specified Contract Time.

4. Use of Float: Total float and Contract float are not for the exclusive benefit of the Contractor, but is an expiring resource available to the Owner, Construction Manager, Engineer, their consultants, or the Contractor, to accommodate changes in the Work, however originated, or to mitigate the effects of events that may delay performance or completion of all or part of the Work within the scheduled late dates, the Contractor's anticipated completion, or Contract Time. Contract Time extensions for Contract performance will be granted only to the extent that delays or disruptions to affected work paths exceed total float along those paths when the baseline or revised baseline schedule is compared against the working schedule in effect at the time of delay or disruption and will be limited to those provisions related to the extension of time identified within this Section. Delays and disruptions must cause the end date of the Work to exceed the Contract completion date and must be beyond the control and without fault or negligence of the Contractor or any subcontractor or supplier of any tier to be considered for time extension. In the event that the delays or disruptions impact an already negative float path, the Contractor shall not receive a time extension unless and until the activity with the highest negative float is driven even further negative. Delays or disruptions are not considered a basis for time extension to this Contract unless such delays or disruptions qualify for time extensions as set forth within this Section.

H. ALLOWANCES

The amounts listed in the Bid Form for designated Allowance Items are part of the Contract Price; however the use of these funds will follow the procedures set forth herein for Changes in the Work. If the item involves Owner-initiated work, a request for proposal will be issued to the Contractor and, following receipt and review of the proposal and negotiation of the scope of work and cost, a Directive will be issued. If the work involves the response to eligible unforeseen conditions, the scope of the work and method of payment will be determined by the Construction Manager following notification by the Contractor and an assessment of the situation.

7.04 CHARGES TO CONTRACTOR

The Contractor shall pay everything charged to the Contractor under the terms of this Contract to the Owner on demand. Such charges may be deducted by the Owner from money due or to become due to the Contractor under the Contract. The Owner may recover such charges from the Contractor or from his surety.

7.05 COMPENSATION TO OWNER FOR TIME EXTENSION

The Owner, in exchange for granting an extension of time for avoidable delay, shall be compensated by the Contractor for the actual costs to the Owner of engineering,

construction management, inspection, and administration expenses which are directly chargeable to the work and which accrue during the period of such extension. The actual costs do not include charges for final inspection and preparation of the final estimate by the Owner.

END OF SECTION

SECTION 00750
INSURANCE REQUIREMENTS FOR CONTRACTORS

The Contractor shall procure and maintain for the duration of the Contract insurance against claims for injuries to persons or damages to property which may arise from or in connection with performance of the work hereunder by the Contractor, his agents, representatives, employees, or subcontractors.

Attention: The Contractor is advised that certain provisions contained herein require specific endorsements of your insurance policy. Do not assume that your standard policy will be suitable to meet the requirements of Cobb County. The submittal of incomplete or non-conforming documents will delay the execution of the Contract/Agreement and the issuance of the Notice-to-Proceed for the Project.

1. MINIMUM LIMITS OF INSURANCE

- A. Statutory Workers' Compensation Insurance. The statutory limits as established by the General Assembly of the State of Georgia shall be met by Contractor and/or subcontractor. The workers' compensation policy must include Coverage B - Employer's Liability with minimum limits of:

Bodily Injury by Accident -\$1,000,000 each accident

Excess liability coverage may be used in combination with the base policy to obtain these limits. The Contractor shall require all subcontractors, of any tier, performing work under the contract to obtain an insurance certificate showing proof of Workers' Compensation and Employers Liability Coverage or shall certify that the subcontractors are covered by the Contractor's insurance.

- B. Commercial General Liability Insurance. The Contractor shall procure and maintain a Commercial General Liability Insurance Policy covering bodily injury, property damage liability and personal injury. The policy or policies must be on an "occurrence" basis ("Claims Made" coverage is not acceptable) insuring personal injury and property damage against the hazards of premises and operations, products and completed operations, blasting and explosion, collapse, underground damage, independent contractor's and contractual liability (specifically covering the indemnity) and have the minimum limits of liability listed below. The Commercial General Liability policy shall also include contractual liability coverage. The Commercial General Liability policy must include separate aggregate limits per project. Excess liability coverage may be used in combination with the base policy to obtain the following limits.

Premises and Operations	\$1,000,000 per Occurrence
Products and Completed Operations	\$1,000,000 per Occurrence
Personal Injury	\$1,000,000 per Occurrence
Contractual	\$1,000,000 per Occurrence

- C. Auto Liability Insurance. The Contractor shall procure and maintain a Business Automobile Liability Policy with liability limits of not less than \$1,000,000 per

person and \$1,000,000 per occurrence or a policy with a Combined Single Limit of not less than \$1,000,000 covering any owned, non-owned or hired autos. Excess liability coverage may be used in combination with the base policy to obtain these limits. The form of coverage must be as follows and/or cover the following areas:

Comprehensive form covering all owned, non-owned, leased, hired, and borrowed vehicles
Additional Insured Endorsement
Contractual Liability

- D. Commercial Umbrella Liability Insurance. The Contractor shall provide Commercial Umbrella Liability Insurance to provide excess coverage above the Commercial General Liability, Commercial Business Automobile Liability, and the Workers' Compensation and Employers' Liability to satisfy the minimum limits set forth herein. The Umbrella coverage shall follow form with the Umbrella limits required as follows:

\$2,000,000 Combined Single Limits per Occurrence

- E. Builder's Risk Insurance. The Contractor shall secure "All-Risk" type of Builder's Risk insurance covering work performed under the Contract, and materials equipment or other items to be incorporated therein, while the same are located at the construction site, stored off-site, or at the place of manufacture. The policy limit shall be for 100% of the value of the Contract. The policy shall cover not less than losses due to fire, flood, explosion, hail, lightning, weather, vandalism, malicious mischief, wind, collapse, riot, aircraft, smoke or other cataclysmic events, until the date of final acceptance of the work.

The making of progress payments to the Contractor shall not be construed as relieving the Contractor or his subcontractors or the insurance company or companies providing the coverage described herein of responsibility for loss or direct physical loss, damage or destruction occurring prior to final acceptance.

2. OTHER INSURANCE PROVISIONS

The policies are to contain, or be endorsed to contain, the following provisions:

- A. Additional Insured Endorsement – General Liability, Automobile Liability, and Umbrella Liability
1. The "Owner, Construction Manager, Engineer and their respective officers, officials, employees, and volunteers" are to be covered as Additional Named Insureds as respects all liabilities to be insured against by the policies described in Subsections 1.B, 1.C, and 1.D above.
 2. The coverage shall contain no special limitation on the scope of protection afforded to the Owner, Construction Manager, Engineer and their respective officers, officials, employees, or volunteers. Nothing in this paragraph shall be construed to require the Contractor to provide liability insurance coverage to the Owner, Construction Manager, or Engineer for

claims asserted against the Owner, Construction Manager, or Engineer for their sole negligence.

3. The Contractor's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.
4. Provide a separate endorsement for each policy, citing individual policy numbers.
5. The coverage shall be primary and shall contain no special limitations on the scope of protection afforded to the Certificate Holder/Additional Insured.
6. Coverage shall be provided on a "pay on behalf" basis, with defense costs payable in addition to policy limits. There shall be no cross-liability exclusion.
7. In lieu of a separate endorsement, a copy of the declaration page for the Umbrella Liability Policy may be provided, listing the policy numbers for each type of insurance covered by the Umbrella.

B. Waiver of Subrogation Endorsement – Each policy of insurance required by this Contract.

1. The insurer shall agree to waive all rights of subrogation against the Owner, Construction Manager, Engineer and their respective officers, officials, employees, and volunteers for losses arising from work performed by the Contractor for the Owner under the Contract.
2. Provide a separate endorsement for the policy, citing individual policy number.

C. Notice of Cancellation Endorsements – Each policy of insurance required by this Contract.

1. Each insurance policy shall be endorsed to state that should any coverage be suspended, voided, cancelled or reduced in coverage or in limits, thirty days prior written notice will be given to the Certificate Holder. Notice of cancellation for non-payment of premium shall be not less than ten days.
2. Provide a separate endorsement for each policy, citing individual policy numbers.
3. Any failure to comply with reporting provisions of the policies shall not affect coverage provided to the Owner, Construction Manager, Engineer and their respective officers, officials, employees, or volunteers.

D. Deductibles and Self-insured Retentions

Any deductibles or self-insured retentions must be declared to and approved by the Owner. At the option of the Owner, either the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects the Owner, Construction Manager, Engineer and their respective officers, officials, and employees; or the Contractor shall procure a bond guaranteeing payment of losses and related investigations, claims administration, and defense expenses.

All deductibles shall be paid by the Contractor.

E. Failure of Insurers

The Contractor is responsible for any delay resulting from the failure of its insurance carriers to furnish proof of coverage in the prescribed form. The summary table shown below in paragraph 4.C can serve as a checklist to confirm the submittal of all required endorsements.

F. Contractor's Property and Equipment

The Contractor is responsible for insuring its own property and equipment.

3. ACCEPTABILITY

- A. The insurance purchased by the Contractor must be issued by a company licensed by the Insurance Commissioner to transact business in the State of Georgia or by a company acceptable to the State if the company is an alien insurer.
- B. Insurance is to be placed with insurers with a Best Policyholders Rating of "A" or better and with a financial size rating of Class VII or greater, or be otherwise acceptable to the Owner.

4. VERIFICATION OF COVERAGE

- A. The Contractor shall furnish the Owner with four original Certificates of Insurance, each with endorsements effecting coverage required by this Section of the Contract Documents. The certificates and endorsements for each insurance policy are to be signed by a person authorized by that insurer to bind coverage on its behalf.
- B. The insurance certificate must provide the following:
 - 1. Name and address of authorized agent.
 - 2. Name and address of insured. Name of insured must appear exactly as shown on Contractor's seal on Contract with Owner.
 - 3. Name of insurance company(ies).
 - 4. Description of policies.
 - 5. Policy number(s).
 - 6. Policy period(s).

7. Name and address of Owner as Certificate Holder (see Subsection D below).
8. Cobb County Water System Program Name and Number.
9. Signature of authorized agent.
10. Telephone number of authorized agent.

C. The required endorsements to be submitted are summarized in the following table:

ENDORSEMENT SUMMARY TABLE

Type of Insurance	Endorsement
Commercial General Liability	Owner, etc. as Additional Insured
Commercial General Liability	Waiver of Subrogation
Commercial General Liability	Notice of Cancellation
Automobile Liability	Owner, etc. as Additional Insured
Automobile Liability	Waiver of Subrogation
Automobile Liability	Notice of Cancellation
Commercial Umbrella Liability	Owner, etc. as Additional Insured ¹
Commercial Umbrella Liability	Waiver of Subrogation
Commercial Umbrella Liability	Notice of Cancellation ¹
Workers' Compensation	Waiver of Subrogation
Workers' Compensation	Notice of Cancellation
Builder's Risk	Waiver of Subrogation
Builder's Risk	Notice of Cancellation

¹Declarations pages may be submitted for Umbrella policies.

D. The Certificate Holder must be shown as:

Cobb County, Georgia
 Attention: Cobb County Water System
 Engineering & Records Division
 660 South Cobb Drive
 Marietta, GA 30060-3105

E. The certificates and endorsements naming additional insureds and indicating required waivers are to be submitted with the executed Agreement/Contract and Performance and Payment Bonds, for approval by the Owner before work commences. The Owner reserves the right to require the submittal of complete, certified copies of all required insurance policies at any time.

5. SUBCONTRACTORS

Contractor shall include all subcontractors as additional insureds under its policies or shall furnish separate certificates and endorsements for each subcontractor. Coverage for subcontractors shall be subject to all of the requirements stated herein. Owner may request evidence of subcontractor's insurance. Contractor shall ensure that all subcontractors comply with the insurance requirements and provisions of this Section.

END OF SECTION

**SECTION 00751
BUSINESS LICENSE**

Attention is drawn to Section 78-31 of the Official Code of Cobb County, Georgia which reads as follows:

Sec. 78-31. Scope and Levy.

- (a) *Generally.* Pursuant to O.C.G.A. § 36-1-22, O.C.G.A. § 48-13-6 et seq., the authority of 1986 Ga. Laws (Act No. 1364), page 5450, and H.B. 175, 1995 Ga. Laws, page 419 et seq., all persons, including professional corporations, engaged in business in the unincorporated area of the county are hereby required to register their business or office and obtain a business registration certificate therefore, and pay the amount now or hereafter fixed as the occupation tax thereon. The occupation tax levied in this section is for revenue purposes only and is not for regulatory purposes. The occupation tax applies only on businesses and occupations which are covered by the provisions of O.C.G.A. §§ 48-13-5 through 48-13-26. Other applicable businesses and occupations are subject to county taxes pursuant to pertinent general law and/or county ordinance.
- (b) *Businesses with no location or office in state.*
- (1) The provisions of this article shall apply to those businesses and practitioners of professions and occupations with no location or office in the state if the business or practitioner:
- a. Has one or more employees or agents who exert substantial efforts within the unincorporated part of the county for the purpose of soliciting business or serving customers or clients; or
- b. Owns personal or real property which generates income and which is located in the unincorporated part of the county.
- (2) In no event shall a business or practitioner subject to this subsection be required to pay an occupation tax to more than one local government in the state and then only to the local government in which the largest dollar volume of business is done or service is performed by the individual business or practitioner.
- (3) If a business or practitioner subject to this subsection provides to the supervisor of the business license office proof of payment of a local business or occupation tax in another state, or county or municipality of this state which purports to tax the business's or practitioner's sales or services in this state, the business or practitioner shall be exempt for the levy of any occupational tax under this section.
- (c) *Permit for persons exempted from paying tax.* Even though a person may be exempt under state or other law from paying an occupation tax, nevertheless, such person must apply to the business license office for a free permit to engage in or carry on any business provided for in this article and submit proper and lawful credentials exempting applicant from paying the occupation tax.

(Ord. of 10-25-94; Code 1977, § 3-7-1(a)--(c); Ord. of 6-27-95(1))

State law references: General authority to levy occupation tax, O.C.G.A. §§ 48-13-5--48-13-9.

SECTION 00752

**COBB COUNTY
SUBCONTRACTOR NOTIFICATION LIST**

List the name, address, and Business License number for each subcontractor that may perform work on this Project. Indicate whether or not the subcontractor is a Disadvantaged Business Enterprise. All Subcontractors must be reported on this form for License Inspection purposes. Submit this form with the Agreement, Bonds, and Insurance Certificates at the time of Contract execution. This information will be forwarded to the Cobb County Business License Division.

CONTRACTOR/DEVELOPER:_____

PROJECT LOCATION:_____

SUBCONTRACTOR:_____

* DBE? Yes ___ No ___ (If Yes, approx. percent of Contract Amount ___%)

SUBCONTRACTOR:_____

* DBE? Yes ___ No ___ (If Yes, approx. percent of Contract Amount ___%)

SUBCONTRACTOR:_____

* DBE? Yes ___ No ___ (If Yes, approx. percent of Contract Amount ___%)

SUBCONTRACTOR:_____

* DBE? Yes ___ No ___ (If Yes, approx. percent of Contract Amount ___%)

* DBE (Disadvantaged Business Enterprise)

BUSINESS LICENSE NO.:_____

PROJECT IMPLEMENTATION DATE:_____

ADDRESS:_____

BUSINESS LICENSE NO.:_____

ADDRESS:_____

BUSINESS LICENSE NO.:_____

ADDRESS:_____

BUSINESS LICENSE NO.:_____

ADDRESS:_____

BUSINESS LICENSE NO.:_____

ADDRESS:_____

DIVISION 1

GENERAL REQUIREMENTS

SECTION 01010 - PROJECT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

Section Includes:

1. Lands and Rights-of-Way
2. Access to and Contractor's use of the site.
3. Coordination requirements.
4. Construction procedures.

1.02 LANDS AND RIGHTS-OF-WAY

- A. Access to the work shall be limited to the right-of-way or easement area provided for execution of the work. The **Contractor** shall not enter any adjacent private property without prior written approval from the property owner. Proof of such approval shall be furnished to the **Owner** upon request.
- B. If the Contractor performs any work or service for any property owner outside the specified scope of the Contractor's agreement with the Owner or has any agreements with a private property owners for access to or for temporary use of property outside of the right-of-way or easement area, a written agreement shall be entered into, with the private property owner(s) prior to any work or service being performed or prior to any use by Contractor of the private property and such agreement shall be provided to Owner. The agreement shall contain the following language, in addition to the terms agreed to between the Contractor and the property owner.

"The Property Owner understands that Cobb County is not a party to this Agreement, exercises no control over the means, methods, and execution of this agreement, and that Cobb County assumes no responsibility for the Contractor's compliance with the terms of this agreement. The Contractor shall be solely liable for any and all claims, demands, and judgments related to loss or damage to property or person (including death) arising from or in any way related to the Contractor's acts or omissions related to the agreement".

1.03 ACCESS TO AND CONTRACTOR'S USE OF THE SITE

- A. The space available to the **Contractor** for the performance of the work, either exclusively or in conjunction with others performing other construction as part of the project, is shown on the drawings.
- B. The **Owner** will continue to occupy existing facilities during the construction period.
 1. The **Owner** will endeavor to cooperate with the **Contractor's** operations when the **Contractor** has notified the **Owner** in advance of need for changes in operations in order to accommodate construction operations.
 2. The **Contractor** shall conduct the Work so as to cause the least interference with the **Owner's** operations.

- C. Adequate signage will be provided by the **Contractor** as necessary.

1.04 COORDINATION REQUIREMENTS

- A. Coordination with Owner:
1. Limit access through occupied areas to those days and times which the **Owner** approves. Occupied areas include all areas in which the **Owner's** regular operations will be going on or to which the **Owner** requires access during the construction period.
 2. When the following must be modified, provide alternate facilities acceptable to the **Owner**:
 - a. Emergency means of egress.
 - b. Utilities which must remain in operation.
 - c. Informational signage.
 3. The **Contractor** shall notify the **Owner** of any circumstances which may jeopardize or have interrupted utility service.
- B. Security Procedures:
1. Limit access to the site to persons involved in the work.
 2. Provide secure storage for materials.
 3. Secure completed work as required to prevent loss.
- C. Coordination of Construction:
1. Inform each party involved, in writing, of procedures required for coordination of the work; include requirements for giving notice, submitting reports, and attending meetings.
 2. Inform the **Owner** when coordination of his work is required.
 3. Furnish coordination drawings, as required, where limited space available may cause conflicts in the locations of installed products, and where required to coordinate installation of products.
- D. Coordination with the Cobb County-Marietta Water Authority (CCMWA)
1. All work involving the isolation of and/or connection to a water main owned by the CCMWA must have the prior approval of the CCMWA.
 2. The **Contractor** shall notify CCMWA of any circumstances that may jeopardize or interrupt water service.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 CONSTRUCTION PROCEDURES

- A. General Examination Requirements:
1. Prior to performing work, examine the applicable substrates and the conditions under which the work is to be performed.
 2. If unsafe or otherwise unsatisfactory conditions are encountered, take corrective action before proceeding.
 3. Notify the **Owner** promptly of any modifications required due to existing conditions or previous work.

4. Before starting work which might affect existing construction, verify the existence and location of:
 - a. Underground utilities.
 - b. Other underground construction.
 - c. Location and invert elevation of points of connection to piped utilities.
5. Verify that utility requirements of operating equipment are compatible with building utilities.
6. Verify space requirements of items which are shown diagrammatically on the drawings or any other items that might impact construction.
7. Prepare preconstruction photographic documentation in conformance with the requirements of Section 01380 of these specifications.

B. General Preparation Requirements:

1. The **Contractor** shall obtain and pay for all required permits.
2. Prior to starting work, the **Contractor** shall have the limits of construction field staked by, or under the supervision of, a Georgia Registered Land Surveyor. The staking shall include, but not be limited to, easement (permanent and construction) limits, construction entrances, and any other staking that is necessary to clearly define the limits of construction.
3. Take field measurements as required to fit the work properly.
4. Recheck measurements prior to installing each product.

C. General Installation Procedures:

1. Accurately install the work and components of the work.
2. See sections describing specific parts of the work for additional requirements.
3. Where space is limited, install components to maximize space available for maintenance and to maximize ease of removal for replacement.
4. Install work in such manner to minimize cutting and patching.

D. Cleaning and Protection

1. Remove debris from concealed spaces prior to enclosing the space.
2. Keep the site and the work free of waste materials and debris.
3. Clean areas in which work is to be done to level of cleanliness necessary for proper execution of that work.
4. Keep installed work clean, and clean again when soiled by other operations.
5. Protect installed work from soiling and damage.

E. Do not cut existing mechanical and electrical services which are to remain in use until provisions have been made to relocate or reconnect them promptly; obtain approval of the **Owner of the time and duration of disconnection.**

F. Installation of Components:

1. Install products only at the time and in the sequence which will ensure the best possible results in conformance with project requirements.
2. Install products only during environmental conditions which will ensure the best possible results.
3. Install all products in accordance with manufacturer's instructions and recommendations, whether conveyed in writing or not.
4. Separate incompatible materials with suitable materials or spacing.

5. Provide all anchors and fasteners required and use methods necessary to securely fasten work.
 6. After installation, adjust operating components to proper operation.
- G.** Instruction of the **Owner's** Personnel:
1. Instruct personnel designated by the **Owner** in the operation and maintenance of equipment and systems, prior to substantial completion.
 2. Arrange times and places of instruction with the **Owner**.
 3. Provide instruction by qualified manufacturer representatives.
 4. Allow videotaping of instruction sessions by **Owner**.
- H.** Final Cleaning:
1. Remove materials and equipment which are not part of the work and all debris from the site prior to substantial completion.
 2. Dispose of debris in a lawful manner.
 3. Perform final cleaning after substantial completion has been certified, but before final payment.
 4. Clean entire project site and grounds.
 5. In spaces to be occupied, remove dirt, stains, and other foreign substances from all accessible surfaces and remove nonpermanent labels.
 6. In spaces not normally occupied, remove debris and surface dust and wipe equipment clean, removing excess lubrication, paint, and other foreign substances.
 7. Remove paint and other coatings from permanent labels and from mechanical and electrical equipment nameplates.
 8. Leave the project clean and ready for occupancy.
- I.** Substantial Completion Procedures:
Reference Section 00700 6.05 of the General Conditions
- J.** Final Completion Procedures
Reference Section 00700 6.07 of the General Conditions

3.02 HEALTH AND SAFETY CONSIDERATIONS

- A.** Take precautions to prevent fires and to facilitate fire-fighting operations.
- B.** Take precautions to prevent accidents due to physical hazards.
- C.** Maintain working conditions in order to keep the site and adjacent public ways free of hazardous and unsanitary conditions and public nuisances.
- D.** Maintain working conditions in order to control rodents and other pests; prevent infestation of adjacent sites and buildings due to pests on this site.
- E.** Keep public streets free of debris due to this work.
- F.** Provide adequate traffic control by means of signs, signals, and flaggers, as necessary.

3.03 ENVIRONMENTAL CONSIDERATIONS

- A. Take care to prevent pollution of air, water, and soil.
- B. Prevent the entry of rainwater runoff into sanitary sewer system.
- C. Control windblown dust; prevent erosion to site and nuisance to neighbors.
- D. Conduct construction operations so that waste of power, water, and fuel is avoided.
- E. Noise from the **Contractor's** operations shall not exceed limits established by applicable laws or regulations and in no event shall exceed 86 dBA at a distance of 50 feet from the noise source between 7:30 p.m. and 7:00 a.m. and on the weekends.
- F. Any created or observed situation involving discharge / spill of raw sewage shall be immediately reported to the Cobb County Water System Emergency Dispatch at (770) 419-6201.

3.04 PROTECTION OF THE WORK

- A. Conduct construction operations so that no part of the work is subjected to damaging operations or influences which are in excess of those to be expected during normal occupancy conditions.
- B. Execute work and stockpile spoils and materials to prevent flooding of excavations, below-grade construction, and adjacent properties due to rainwater runoff.
- C. Protect existing property not indicated to be removed.
- D. Provide temporary supports as required to prevent movement and structural failure.
- E. All equipment and vehicles used on Water system projects shall be clearly marked with the **Contractor's** name and telephone number. The identifying markings may be in the form of magnetic signs, decals, or painted lettering and shall be located on both sides of the equipment/vehicle. The lettering shall be legible, of a contrasting color to the background surface, and at least two inches in height. All markings shall be in place upon initiation of the work on the project site.
- F. A copy of the project's Notice to Proceed letter issued by the Water System shall be available at all times on the job site as proof of the contractual relationship of the Contractor with the Water System. The letter shall be presented for review upon request by regulatory agencies or other County departments that visit the job site.
- G. If removal and replacement of a paved private driveway is required, the replacement shall be performed within two (2) weeks of removal. The permanent pavement replacement for public roadways shall be performed within thirty (30) days or within 7 days if the roadway is a state highway or major county arterial roadway. Temporary surface maintenance is the **Contractor's** responsibility and shall be adequate for the volume and type of traffic loads imposed. Temporary asphalt cold mix application, steel traffic plates, etc. shall be utilized as necessary.

H. The Contractor shall maintain copies of all permits on the project site at all times.

3.05 NOTIFICATION OF SERVICE INTERRUPTION

During progress of work under this Contract, it may be necessary to temporarily interrupt water, sewer or other utility service to a limited number of customers in the vicinity of the work. It shall be the **Contractor's** responsibility to coordinate the service outage with the utility owner and to provide proper advance notification (a minimum of 48 hours) to the affected customers.

The **Contractor** is alerted to the fact that due to the nature of businesses and traffic in certain projects' areas, water outages for connections, service changeovers, and other work may not be allowable during normal work hours. Considerations of this are to be factored into bid price submitted. Coordination, special lighting, traffic control, employee overtime, special customer notification, etc. shall be included in these considerations by the **Contractor**.

3.06 WATER DISTRIBUTION SYSTEM VALVE OPERATION

All water distribution system service interruptions or outages, such as through water distribution system valve operation, either through pre-approved scheduling or in response to emergency situations, shall require the **Contractor** to notify the appropriate inspector/project engineer of the Cobb County Water System and the Cobb County Water System Dispatch/Emergency office at (770) 419-6201. Specifics of the outage shall be provided, including but not limited to the following information: **Contractor**, **Contractor** authorized representative providing the notice, contact number(s) of the Contractor or representative, anticipated duration of the outage, geographical limits of the outage, and definitive identification of the valves to be operated. The Cobb County Water System shall log this information for reference in the event inquiries develop and to ensure valves are repositioned correctly.

Upon conclusion of the work or repair and after service has been restored, the **Contractor** shall again notify the appropriate project representative of the Cobb County Water System and the Cobb County Water System Dispatch/Emergency office to confirm and crosscheck, as appropriate, that all affected valves have been fully and correctly repositioned. Additional **Contractor** contact information shall be provided to maintain and ensure Contractor responsibility for 24 hours or the next work day, whichever is longer. Such action does not relieve the **Contractor** from overall contract warranty responsibility.

Unauthorized operation of the Cobb County Water System water distribution system valves, hydrants, or other appurtenances, or operation in which the proper notification is not provided, is expressly forbidden and subject to penalties.

3.07 TRAFFIC CONTROL

The **Contractor** shall be responsible for traffic control during the course of each phase of the work. A Cobb County Department of Transportation (CDOT) Utility Permit shall be required for all partial and full lane closures. Road closures and / or detours shall require a CDOT Road Closure Permit. **Contractor** shall submit a traffic control plan to the **Owner** a minimum of two weeks prior to partial or full lane closures and a minimum of four weeks prior to a road closure along with other pertinent information needed for the associated

permit application. The **Owner** will submit the permit application to CDOT. The traffic control plan shall conform to CDOT requirements and be in conformance with the Manual on Uniform Traffic Control Devices for Streets and Highways. In the event the road or lane closure is necessary within the limits of a municipality or on a State of Georgia highway, the **Contractor** shall make direct application to the municipality or the Georgia Department of Transportation for the necessary road or lane closure permits. The **Contractor** shall install and maintain traffic control compliant with the approved permit, including but not limited to, trained and properly equipped flagmen, to safely control all traffic through the work zone(s). It is the **Owner's** intent that this work be accomplished with as little disturbance to traffic, private property, and the public as is reasonably possible, consistent with timely completion thereof.

3.08 WEEKLY SITE REVIEW

On a regular weekly basis, or prior to an inclement weather event forecast, the Contractor's field superintendent shall perform a full review of the construction site with the Construction Manager or his designee. This review shall examine the condition of the erosion/sedimentation control facilities, adequacy of traffic control and work zone safety facilities and procedures, restoration of disturbed areas, housekeeping of project site, proposed works plans for the coming week, and other pertinent items. Deficiencies shall be recorded and a schedule for resolution shall be established.

3.09 WATER CONSERVATION

The **Contractor** is required to exercise water conservation efforts to the fullest extent possible. These efforts shall include compliance with the current Cobb County "Drought Response Plan Regulations". The **Contractor** shall otherwise stage and sequence operations to be as effective as possible in conserving water and to collect any flushing water for reuse as dust control, backfill or roadway base consolidation, watering of landscape restoration, etc. All direct use of water from fire hydrants shall be metered via fire hydrant meters obtained from the Cobb County Water System. Any observed use of non-metered water by the **Contractor** shall be immediately reported to the **Owner**. Any observed leaks from an existing water main or fire hydrant shall be immediately reported. Leaks on newly installed, but not in service water mains, shall promptly be isolated and repaired. Best practices for irrigation shall be followed.

END OF SECTION 01010

SECTION 01012 – SPECIAL REQUIREMENTS**PART 1 - GENERAL****1.01 SUMMARY**

The intent of this Section is to provide an overview of this project and to convey to the Contractor special requirements which are unique for this Project. Some of the requirements are a result of negotiations with various entities and organizations which have an interest in this Project. Some requirements are based on technical aspects of this Project which are not otherwise conveyed elsewhere in the Contract Documents. The provisions of this Section shall supersede the provisions of the Specifications in Divisions 1 through 16.

1.02 LOCATION AND DESCRIPTION OF WORK

- A.** The Project is located at the following existing wastewater pump stations
1. Plant Atkinson Road, 4964 Plant Atkinson Road, Smyrna GA 30080
 2. Marina Trace, #1062 Taso Trail, NW, Acworth GA 30101
 3. Six Flags, 8110 Troon Circle, Austell, GA 30168
 4. Allatoona Beach, #5112 Allatoona Drive, Acworth GA 30101
 5. West Hampton #1, LL 294, #3557B West Hampton Drive, Marietta GA 30064
 6. West Hampton #2, LL 314, #170 Westwood Drive, Marietta GA 30064
 7. Wood Valley PS, LL 34, #4539 Woodvalley Drive, Acworth GA 30101
 8. Brushy Mountain Pump House, Georgia Power property near the intersection of White Circle and Noonday Church Road. Kennesaw GA 30144
- B.** The work to be performed under this Contract shall consist of furnishing all labor, materials, tools, equipment and incidentals and performing all work required to construct complete in place and ready to operate the following items:
1. Plant Atkinson Road PS,
Remove and replace two existing submersible pumps, standby diesel generator, automatic transfer switches (ATS), prefabricated electrical equipment building, remove existing fence and install new fence on correct property boundary and install a new pole mounted manual water proof light switch at the pole and connect it to the existing LED fixture. The work associated with this particular facility will require the Contractor to provide equipment to maintain normal plant operations during construction.
 2. Marina Trace PS,
Remove and replace two existing submersible pumps, guiderails and 90 deg, pump mounting elbows, standby diesel generator, automatic transfer switches, prefabricated FRP electrical equipment building, remove and replace existing wooden fence and install new external LED site light fitting with new pole mounted manual switch. The work associated with this particular facility will require the Contractor to construct a dog house manhole, provide two bypass pumps and equipment and temporary power to enable the pump station to be taken out of service during construction.

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3. Six Flags PS,
Remove and replace two existing dry pit mounted submersible pumps, reroute pump cables to new junction box installed on the upper level of the PS and provide new equipment and panels to suit new pumps. As shown on the Drawings and Specifications.
 4. Allatoona Beach,
Remove and replace standby diesel generator and automatic transfer switches and install a new pole mounted manual water proof light switch at the pole and connect it to the existing LED fixture. The work associated with this particular facility will require work to be carried out with minimal shut down time during construction. Miscellaneous conduit and conductors are required as shown on the Drawings,
 5. West Hampton #1, West Hampton #2 and Wood Valley Pump Stations,
Remove and replace standby diesel generator and automatic transfer switches, replace the existing site light fixture with a new LED fixture on the existing pole and Install a new pole mounted manual water proof light switch at the pole and connect it to the new LED fixture. The work associated with these particular facilities will require work to be carried out with minimal shut down time during construction. Miscellaneous conduit and conductors are required as shown on the Drawings.
 6. Brushy Mountain Pump House,
Remove and replace standby diesel generator and automatic transfer switches. The work associated with this particular facility will require work to be carried out with minimal shut down time during construction. Miscellaneous conduit and conductors are required as shown on the Drawings.
- C.** All of the replacement pumps are to be procured from Xylem (CCWS sole source) to minimize additional work that maybe required should the dimensions of the replacement pumps differ from the replacement pumps.
- D.** The work to be performed under this Contract shall consist of furnishing all labor, materials, tools, equipment and incidentals which are reasonable and properly inferable and necessary for the proper completion of the work whether specifically indicated in the Contract Documents or not.
- E.** Please refer to Section 01500, Temporary Facilities and Controls for additional detail on this requirement. Miscellaneous conduit and conductors are required as shown on the Drawings and Specifications.
- F.** The work shall be complete, in place and ready for continuous service. Any repairs, replacements and restoration required as a result of all damages that occur as a result of construction activities under this contract shall be the responsibility of the Contractor.
- G.** Contractor shall be responsible to provide temporary stand-by generators during the replacement of existing diesel generators. Using the portable generators or relocated existing diesel generators are acceptable options.

- H. Contractor shall identify any corroded conduits that need to be replaced. Engineer approval and instruction is required prior to ordering and replacing the conduits.
- I. All diesel generators shall be from the same source manufacturer for standardization of parts and equipment.
- J. Diesel generators shall be replaced one pump station at a time.
- K. The Contractor will be required to obtain permits from the Fire Marshall for installation of the diesel generators at each pump station. Preliminary application has been made by CCWS to minimize any comments from the Fire Marshall that may impact the requirements specified herein. The Contractor will be required to prepare and submit the final documents, secure final approval and pay all fees (\$300 per pump station site) associated with the permits.
- L. Once permits have been obtained from the Fire Marshal, the Contractor will be required to pull an electrical permit with the building department. Any questions regarding the process for electrical permits are to be discussed with the residential department at 770-528-2060.

1.03 WORK BY OTHERS

- A. The Owner will furnish the following materials:
 - 1. None.
- B. The Owner will perform the following work:
 - 1. Any shutdowns or pump station isolation shall be done by CCWS.
- C. Other contracts issued by the Owner for this Project are as follows:
 - 1. S5029 FY19 Lift Station VFD and MCC replacement (including Six Flags).
- D. Contractor shall cooperate with and coordinate his Work with the work of any other contractor, supplier, utility owners, or Owner's employees.

1.04 STATUS OF PERMITS

- A. The following status of permits and easements related to this project is presented pursuant to the requirements of OCGA § 36-91-20(b)(4)(A) and (B).
 - 1. All permits required to implement the Work as shown on the Contract Drawings and Specifications are the responsibility of the Contractor.

1.05 STATUS OF EASEMENTS

- A. There are no easements anticipated, all work to be performed in the existing easements and right-of-way as shown on the drawings.

1.06 MILESTONE DATES

- A.** Completing the work for the Six Flags Pump Station shall be given the highest priority.
- B.** All the work for the eight Pump Stations shall be completed within 270 calendar days from the Notice-to-Proceed.
- C.** The Contractor shall be required to complete the work within the contract time specified in Section 00500, Agreement/Contract for the other pump stations.

1.07 SEQUENCING OF WORK

- A.** General
 - 1. The Contractor shall be solely responsible for all construction sequencing and work planning to be submitted.
 - 2. The Contractor shall incorporate the constraints listed in Paragraph B. below
- B.** Sequencing constraints:

The following list of construction sequencing constraints is provided to emphasize critical **work** tasks in this contract; however, it is not a complete list of all of the work included in this project.

- 1. Plant Atkinson Road Pump Station:

The pumps are to be replaced one at time. The first pump is to be started and tested and shown to be operating correctly and verified as fully operational by the Owner for 48 consecutive hours before any subsequent pump at this facility can be taken out of service. The pump station may be taken off line for a maximum of 2 hours during replacement of the ATS switches or for any other work requiring temporary shutdown.

During removal and replacement of the fence, the contractor shall be required to provide either temporary fencing or on site security until the new fence has been installed and site is able to be secured.
- 2. Marina Trace Pump Station:

The measures for bypassing the pumps station during construction shall be installed and tested prior to work on this pump station commencing. Attention is drawn to the location of the pump station in close proximity to public residences and the requirement to minimize of noise, odors and high lighting levels for the bypass pumps. Each pump shall be started up, tested and verified as fully operational by the Owner for 48 consecutive hours before removing the bypass equipment.
- 3. Six Flags Pump Station:

The pumps are to be replaced one at time. The first pump is to be started, tested and verified as fully operational by the Owner for 48 consecutive hours before any subsequent pump at this facility can be taken out of service. The pump station may be taken off line for a maximum of 2 hours during for any other work requiring temporary shutdown.

4. Allatoona Beach, West Hampton #1, West Hampton #2, Wood Valley Pump Stations and Brushy Mountain Pump House:

Attention is drawn to the location of the pump stations in close proximity to public residences and the requirement to minimize of noise and access restrictions to the residents. The pump station may be taken off line for a maximum of 2 hours during replacement of the ATS switches or for any other work requiring temporary shutdown.

- C. The Contractor may elect to perform work at several of the various pump stations concurrently. However, please note that the Owner will only permit one (1) pump at each of the various pump stations to be taken out of service at the same time and only one generator may be removed at any one time.

1.08 STORMWATER DISCHARGES

- A. It is not anticipated that the area of land disturbance will be more than one acre; therefore, compliance with NPDES General Permit No. GAR 100002, as issued by the State of Georgia, Department of Natural Resources, Environmental Protection Division, is not required.

1.09 EXISTING FACILITY OPERATIONS

- A. The existing facilities shall remain in operation while the new construction is in progress. Temporary generators, temporary cables, temporary conduit, and other miscellaneous temporary equipment shall be provided and installed as required to maintain normal plant operations at each of the various facilities. A temporary power outage at any pump station will be acceptable provided that the outages do not exceed 2 consecutive hours in duration. If an outage is anticipated to exceed this duration, then all temporary generators and other miscellaneous equipment required to maintain normal plan operations shall be provided and installed by the Contractor.
- B. All diesel fuel required to operate any of the temporary generators required shall be provided and installed by the Contractor.
- C. After having coordinated the work with the Owner, the Contractor shall prepare a submittal for Owner's approval to include the time, the time limits, and the method of construction at each location. Owner approval of submittal is required before any work is undertaken.

1.10 TIE-INS OR MODIFICATION TO EXISTING SYSTEMS

- A. Any time the Contractor plans to tie into or modify an existing system, a detailed work plan shall be required. Submittal of this work plan must be a minimum of 30 days in advance of commencement of the subject work. The work plan shall include a detailed description of the work to be performed, a step-by-step plan of the modification or tie-in, a schedule, a list of materials and equipment required, demonstrated communications capacity, and a listing of any valves or equipment that must be operated or shut-down. Working drawings shall be submitted as required for any temporary or permanent structural modifications. A safety plan and a contingency plan including, but not limited to, spill prevention and containment shall also be required for the period of the work.

- B.** A coordination meeting between the Owner and Contractor must be held a minimum of 7 days prior to the commencement of tie-in work. The day before the commencement of the modification or tie-in, a final coordination meeting shall be held to review detailed work assignments for all parties involved.
- C.** The Owner reserves the right to require, at no additional cost to the Owner, stand-by equipment, piping, etc., on any item deemed critical enough to maintain service, prevent spills, or prevent delay in the work. The Contractor shall also have stand-by personnel to supplement the onsite work force in the event problems arise.

1.11 LANDSCAPE DISTURBANCE AND RESTORATION

- A.** If required and prior to disturbance of landscaped areas, the Contractor shall employ a professional landscape company to identify and list by address the predominant grass type found (or type preferred by the property owner) and existing trees, shrubs and ground covers that may be disturbed by the Contractor during construction and will require replacement. A copy of this information shall be provided to the Owner.
- B.** Disturbed lawn areas are to be replaced in kind with sod where lawns have been maintained. Seeding and mulching shall be utilized for restoration in areas where lawns are not being maintained. The Contractor shall maintain lawns and sod until growth has been established.

1.12 SALVAGE OF EXISTING EQUIPMENT

- A.** The Contractor shall temporarily store each of removed pumps, standby generators and electrical equipment that are scheduled to be demolished as part of this project at a location within each project site that is agreed to by the Owner. The Contractor shall notify the Owner when an item of equipment is available for salvage. The Owner shall have first right of refusal and shall be stored for a minimum of 48 hours to enable the Owner's staff to remove any parts that may be usable at other installations before they are removed by the Contractor. Once the Owner has removed all parts which they deem usable from each item after it has been removed by the Contractor, the Contractor shall then be responsible for removing the equipment from the project site and for proper disposal of the equipment.

END OF SECTION 01012

SECTION 01152 - APPLICATIONS FOR PAYMENT

PART 1 - GENERAL

1.01 SUMMARY

Section Includes:

1. Schedule of values.
2. Periodic payment procedures.
3. Final payment procedures.

1.02 CONTRACT CONDITIONS

- A. See the Agreement/Contract for additional information.
- B. Progress payments will be made monthly.
- C. The **Owner** will act upon the **Contractor's** application for payment upon receipt.
- D. No payment will be made for materials or equipment stored off site unless specifically approved in advance, in writing by the **Owner**.
- E. No applications for payment will be processed until the **Contractor's** Construction Schedule has been accepted by the **Owner**.

1.03 SUBMITTALS

- A. Schedule of Values: First application for payment will not be reviewed without schedule of values if a contract is lump sum.
 1. Submit 5 copies on 8 1/2 x 11 inch paper.
 2. Identify with:
 - a. Project name.
 - b. Project number.
 - c. Owner's name.
 - d. **Contractor's** name and address.
 - e. Submittal date.
- B. Applications for Progress Payments: Submit in accordance with schedule established at preconstruction conference.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 SCHEDULE OF VALUES

- A. Prepare a schedule of values, if applicable, prior to the first application for payment.

- B.** Schedule of Values: Break costs down into line items, which will be comparable with line items in applications for payment.
1. Coordinate line items in the schedule of values with portions of the Contract Documents, which identify units or subdivisions of work; provide cross-referencing if necessary to clarify.
 2. Divide major subcontracts into individual cost items.
 3. Where applications for payment are likely to include products purchased or fabricated but not yet installed, provide individual line items for submittals, material cost, installation cost, and other applicable phases of completion.
 4. Include in each line item its proportional share of overhead and profit.
 5. Include the following information for each line item.
 - a. Item name.
 - b. Applicable specification section.
 - c. Dollar value, rounded off to the nearest whole dollar (with the total equal to the Contract Price).
 - d. Proportion of the Contract Price represented by this item, to the nearest one-hundredth percent (with the total adjusted to 100 percent).
 6. Provide the following supporting data for each line item:
 - a. Subcontractor's name.
 - b. Manufacturer or fabricator's name.
 - c. Supplier's name.
- C.** The **Owner** will notify the **Contractor** if schedule is not satisfactory; revise and resubmit acceptable schedule.
- D.** Submit a revised schedule of values when modifications change the Contract Price or change individual line items.

3.02 APPLICATIONS FOR PAYMENT

- A.** Reference the General Conditions – Section 00700 7.02 C. (Progress Payments) for procedures.
- B.** Application for Payment Forms: Use the format required by the **Owner**, unless otherwise specified.
- C.** Preparation of Applications for Payment: Complete form entirely.
1. Make current application consistent with previous applications, certificates for payment, and payments made.
 2. Base application on current schedule of values, if applicable, and **Contractor's** construction schedule.
 3. Include original signatures by person authorized by the **Contractor** to sign legal documents.
 4. Submit 5 copies, unless directed otherwise.
 5. Attach copy of the schedule of materials and equipment stored offsite, and any other supporting documentation required by the **Owner** or the Contract Documents.
- D.** Transmit application for payment with a transmittal form itemizing supporting documents attached.

- E. Any required periodic construction progress photographs and updates to the construction schedule must be submitted to the **Owner** at the same intervals at which applications for payment are made. The **Owner** may delay the processing of payment applications until the required submittals are received.

3.03 RETENTION

Reference General Conditions – Section 00700 7.02 C. 3.

3.04 WITHHOLDING

Reference General Conditions – Section 00700 7.02 C. 4.

3.05 FINAL AFFIDAVIT

- A. Submit an affidavit with the final application for payment stating that the Work has been fully completed according to the terms of the Contract and that all bills incurred or labor, materials and services furnished or performed have been fully paid or have been waived in writing by any lien claimant. The affidavit will also indicate the amount of the Contract Price due as final payment.
- B. This Final Affidavit is made pursuant to O.C.G.A. §44-14-361.2 and will be submitted in a format provided by the **Owner**.

3.06 FIRST PAYMENT PROCEDURE

The first application for payment will not be processed until the following submittals have been received:

1. Schedule of values if applicable.
2. List of subcontractors, principal suppliers, and fabricators.
3. **Contractor's** construction schedule.
4. Names of the **Contractor's** principal staff and consultants assigned to the project.
5. All submittals specified to occur prior to first application for payment or prior to first payment.
6. The pre-construction video prepared by the **Contractor**.

3.07 FINAL PAYMENT PROCEDURES

- A. Submit the following prior to final application for payment:
1. Project Record Documents: To requirements of Section 01720.
 2. Operation and Maintenance Manuals: To requirements of Section 01730.
 3. Spare Parts and Maintenance Materials: To requirements of equipment specifications.
 4. Warranty and Bond Manuals: To requirements of Section 01740.
 5. Post-construction video: To requirements of Section 01380.
- B. Submit the following with the final application of payment:
1. Notice of Completion: To requirements of Section 01010.
 2. Final Affidavit.

3.08 PAYMENTS BY CONTRACTOR

Reference General Conditions – Section 00700 2.04 C.

END OF SECTION 01152

SECTION 01200 - PROJECT MEETINGS

PART 1 - GENERAL

1.01 SUMMARY

- A. The **Owner** will schedule and administer a preconstruction meeting and may schedule periodic progress meetings, and specially called meetings throughout progress of the Work. The **Owner** shall set the agenda for the meetings and preside at the meetings. The **Contractor** shall make physical arrangements for the meetings pursuant to the **Owner's** requirements.
- B. Representatives of the **Contractor**, subcontractors and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.

1.02 PRECONSTRUCTION MEETING

- A. The **Owner** will schedule a Preconstruction Meeting prior to the start of construction.
- B. The Preconstruction Meeting shall be attended by the following:
 - 1. **Owner's** representative(s).
 - 2. **Contractor's** Superintendent.
 - 3. Others as appropriate.
- C. The Preconstruction Meeting will generally have the following agenda:
 - 1. Designation of responsible personnel.
 - 2. Distribution and discussion of list of major subcontractors and suppliers.
 - 3. Projected construction schedule with critical work sequencing.
 - 4. Major equipment deliveries and priorities.
 - 5. Procedures and processing of:
 - a. Submittals
 - b. Requests for Information
 - c. Proposed Change Requests
 - d. Field Decisions
 - e. Applications for Payment
 - f. Change Orders
 - 6. Procedures for maintaining Record Documents.
 - 7. Periodic Meeting Schedule.

1.03 PERIODIC PROGRESS MEETINGS

- A. The **Owner** may schedule periodic progress meetings throughout the project duration. The necessity of and frequency of any periodic progress meetings will be determined by the **Owner** based on individual project requirements.
- B. The periodic progress meetings shall be attended by the following:
 - 1. **Owner's** representative(s).
 - 2. **Contractor's** representative(s).
 - 3. Others as appropriate.

- C.** The periodic progress meetings will generally have the following agenda:
1. Review work progress since last meeting.
 2. Discussion of Construction Schedule for next period.
 3. Status of major equipment and material deliveries.
 4. Construction problems impacting progress.
 5. Field observations.
 6. Status of pending changes.
 7. Other business.

1.04 OTHER MEETINGS

- A.** Specially-called meetings will be held as warranted by unforeseen developments during construction or as needed to coordinate special events, such as tie-ins or system shutdowns.
- B.** Specially-called meetings may be requested by either party or by other affected entities. Requests shall be made through the **Owner**, who shall coordinate the meeting schedule.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01200

SECTION 01300 - SUBMITTALS

PART 1 - GENERAL

1.01 SUMMARY

- A.** Section Includes:
 - 1. Preparing and processing of submittals for review and action.
 - 2. Preparing and processing of informational submittals.
- B.** Submit the following for the **Owner's** review and action:
 - 1. Shop drawings.
 - 2. Product data.
 - 3. Samples.
 - 4. Submittals indicated as "for approval."
- C.** Submit the following as informational submittals:
 - 1. Structural design information required by the contract documents.
 - 2. Certificates.
 - 3. Coordination drawings.
 - 4. Reports.
 - 5. Qualification statements for manufacturers/installers.
 - 6. Submittals indicated as "for information only."
- D.** Specific submittals are described in individual sections.
- E.** Do not commence work which requires review of any submittals until receipt of returned submittals with an acceptable action.
- F.** Do not allow submittals without an acceptable action marking to be used for the project.
- G.** Submit all submittals to the **Owner**.
- H.** Do not include requests for substitution (either direct or indirect) on submittals; comply with procedures for substitutions specified in Section 01600.

1.02 DEFINITIONS

- A.** "Shop drawings" are drawings and other data prepared by the entity who is to do the work, specifically to show a portion of the work.
- B.** "Product data submittals" are standard printed data which show or otherwise describe a product or system, or some other portion of the work.
- C.** "Samples" are actual examples of the products or work to be installed.
- D.** Informational Submittals: Submittals identified in the Contract Documents as for information only.

1.03 FORM OF SUBMITTALS

- A.** Sheets Larger Than 8-1/2 by 14 Inches:
 - 1. Maximum sheet size: 24 by 36 inches (except for full size pattern or template drawings).
 - 2. Number of copies:
 - a. Submittals for review: Three blue or blackline prints.
 - b. Informational submittals: Three blue or blackline prints.
- B.** Small Sheets or Pages:
 - 1. Minimum sheet size: 8-1/2 by 11 inches.
 - 2. Maximum sheet size for opaque copies: 11 by 17 inches.
 - 3. Number of copies will be the same as for larger sheets.
- C.** Samples:
 - 1. 2 sets of each shall be submitted with the original submittal.
 - 2. 1 set will be returned.
 - 3. If additional sets are needed by other entities involved in work represented by the samples, submit with original submittal.

1.04 COORDINATION OF SUBMITTALS

Coordinate submittals and activities that must be performed in sequence or of different types for the same product or system so that the **Owner** has enough information to properly review each submittal.

PART 2 - PRODUCTS (NOT USED)**PART 3 - EXECUTION****3.01 TIMING OF SUBMITTALS**

- A.** Transmit each submittal at the time indicated on the approved construction schedule.
- B.** Deliver each submittal requiring approval in time to allow for adequate review and processing time, including resubmittals if necessary; failure of the **Contractor** in this respect will not be considered as grounds for an extension of the contract time.
- C.** Deliver each informational submittal prior to start of the work involved, unless the submittal is of a type which cannot be prepared until after completion of the work; submit promptly.
- D.** If a submittal must be processed within a certain time in order to maintain the progress of the work, state so clearly on the submittal.
- E.** If a submittal must be delayed for coordination with other submittals not yet submitted, the **Owner** may at his option either return the submittal with no action or notify the **Contractor** of the other submittals which must be received before the submittal can be reviewed.

3.02 SUBMITTAL PROCEDURES - GENERAL

- A. Contractor Review: Sign each copy of each submittal certifying compliance with the requirements of the contract documents.
- B. Notify the **Owner**, in writing and at time of submittal, of all points upon which the submittal does not conform to the requirements of the contract documents, if any.
- C. Preparation of Submittals:
 - 1. Label each copy of each submittal, with the following information:
 - a. Project name.
 - b. Date of submittal.
 - c. Contractor's name and address.
 - d. Supplier's name and address.
 - e. Manufacturer's name.
 - f. Specification section where the submittal is specified.
 - g. Numbers of applicable drawings and details.
 - h. Other necessary identifying information.
 - 2. Submittals to receive **Owner's** action marking: Provide blank space on the label or on the submittal itself for action marking; minimum 4 inches wide by 5 inches high.
- D. Transmittal of Submittals:
 - 1. Submittals will be accepted from the **Contractor** only.
 - 2. Submittals received without a transmittal form will be returned without review or action.
 - 3. Transmittal form: Use a form acceptable to the **Owner**; provide space on form for:
 - a. Project name.
 - b. Submittal date.
 - c. Transmittal number.
 - d. Specification section number.
 - e. To:
 - f. From:
 - g. Contractor's name.
 - h. Subcontractor's and supplier's names.
 - i. Manufacturer's name.
 - j. Submittal type (shop drawing, product data, sample, informational submittal).
 - k. Description of submittal.
 - l. Action marking.
 - m. Comments.
 - 4. Fill out a separate transmittal form for each submittal; also include the following:
 - a. Other relevant information.
 - b. Requests for additional information.

3.03 SHOP DRAWINGS

- A.** Content: Include the following information:
 1. Dimensions, at accurate scale.
 2. All field measurements that have been taken, at accurate scale.
 3. Names of specific products and materials used.
 4. Details, identified by contract document sheet and detail numbers.
 5. Show compliance with the specific standards referenced.
 6. Coordination requirements; show relationship to adjacent or critical work.
 7. Name of preparing firm.
- B.** Preparation:
 1. Reproductions of contract documents are not acceptable as shop drawings.
 2. Copies of standard printed documents are not acceptable as shop drawings.
 3. Identify as indicated for all submittals.
 4. Space for **Owner's** action marking shall be adjacent to the title block.

3.04 PRODUCT DATA

- A.** Submit all product data submittals for each system or unit of work as one submittal.
- B.** When product data submittals are prepared specifically for this project (in the absence of standard printed information) submit such information as shop drawings and not as product data submittals.
- C.** Content:
 1. Submit manufacturer's standard printed data sheets.
 2. Identify the particular product being submitted; submit only pertinent pages.
 3. Show compliance with properties specified.
 4. Identify which options and accessories are applicable.
 5. Include recommendations for application and use.
 6. Show compliance with the specific standards referenced.
 7. Show compliance with specified testing agency listings; show the limitations of their labels or seals, if any.
 8. Identify dimensions which have been verified by field measurement.
 9. Show special coordination requirements for the product.

3.05 SAMPLES

- A.** Samples:
 1. Provide samples that are the same as proposed product.
 2. Where selection is required, provide full set of all options.
- B.** Preparation:
 1. Attach a description to each sample.
 2. Attach name of manufacturer or source to each sample.
 3. Where compliance with specified properties is required, attach documentation showing compliance.
 4. Where there are limitations in availability, delivery, or other similar

- characteristics, attach description of such limitations.
5. Where selection is required, the first submittal may be a single set of all options; after return of submittal with selection indicated, submit standard number of sets of selected item.

- C. Keep final sample set(s) at the project site, available for use during progress of the work.

3.06 REVIEW OF SUBMITTALS

- A. Submittals for approval will be reviewed, marked with appropriate action, and returned. Submittals are reviewed for conformance with project design concept and for compliance with standard of quality established in the Contract Documents. This review shall not relieve the **Contractor** from responsibilities for correctness of detail and dimension, nor from deviation from Contract Document requirements, except as noted and accepted in writing by the **Owner** at the time of submittal.
- B. Informational submittals: Submittals will be reviewed.
- C. Action markings for submittals for approval will be as follows:
 1. NO EXCEPTIONS TAKEN and EXCEPTIONS TAKEN AS NOTED: Indicate that the submitted item is released for manufacture with consideration given to any comments noted.
 2. REVISE AND RESUBMIT: Revise the submittal or prepare a new submittal complying with the comments made.
 3. REJECTED: Indicates that the submitted item does not comply with contract requirements and that another selection must be made and the submittal process repeated.

3.07 RETURN, RESUBMITTAL, AND DISTRIBUTION

- A. Submittals will be returned to the **Contractor** by mail.
- B. Perform resubmittals in the same manner as original submittals; indicate all changes other than those requested by the **Owner**.
 1. Exception: Transmittal number for resubmittal shall be the number of the original submittal plus a letter suffix.
 2. Resubmittals shall be submitted within 14 days of **Contractor's** receipt of rejected submittal.
- C. Distribution:
 1. Make one copy for project record documents.

END OF SECTION 01300

SECTION 01310 - CONSTRUCTION SCHEDULE

PART 1 - GENERAL

1.01 SUMMARY

Section includes progress documentation requirements.

1.02 SUBMITTALS

The Construction Schedule is to be submitted to the **Owner** within fourteen calendar days following the date of the Notice to Proceed.

1.03 FORM OF SUBMITTALS

- A.** Schedules - General:
 - 1. Provide legend of symbols and abbreviations for each schedule.
 - 2. Use the same terminology as that used in the contract documents.
- B.** Format - Bar Chart:
 - 1. Provide individual horizontal bars representing the duration of each major activity.
 - 2. Coordinate each element on the schedule with other construction activities.
 - 3. Show activities in proper sequence, including submittals, equipment fabrication, equipment delivery, materials delivery, installation, testing, training and start-up.
 - 4. Include cost bar at top of chart showing estimated cost of work performed at the date of each application for payment.
 - 5. Use vertical lines to mark the time scale at not more than one week intervals.
 - 6. Use sheets of sufficient number and width to show the full schedule clearly.
- C.** Copies: Submit a minimum of 2 copies.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 CONSTRUCTION SCHEDULE

- A.** Prepare and submit construction schedule.
- B.** Provide construction schedule in the form of bar charts.
- C.** The **Owner** will promptly review the schedule and notify the **Contractor** of acceptability. If schedule is not satisfactory, the **Contractor** shall revise and resubmit within 3 days.
- D.** Make and distribute copies of accepted schedule to the **Owner**, to subcontractors, and to other entities whose work will be influenced by schedule dates.

- E. Update the schedule whenever changes occur or are made, or when new information is received, but not less often than at the same intervals at which applications for payment are made. Payments may be withheld if schedule updates are not submitted as required.
- F. It should be clearly understood that the initial schedule and all update information must be provided by the **Contractor** and that this information is a representation of the best efforts of the **Contractor** and his subcontractors as to how they envision the work to be accomplished. Similarly, all progress information to be provided by and through the **Contractor** must be an accurate representation of his or his subcontractor's or supplier's actual performance. The schedule shall at all times remain an accurate reflection of the **Contractor's actual** or projected sequencing of work. Once accepted, adherence to the established schedule shall be obligatory upon the **Contractor** and his subcontractors for the work under this Contract. **Owner** may require the **Contractor** to revise the schedule if, in his judgment, the schedule does not accurately reflect the actual execution of the work, or is in violation of any provision on this scheduling specification, and the **Contractor** shall revise the schedule as often as is necessary during the course of performance of the work without additional cost to the **Owner**.

3.02 PROGRESS OF WORK

- A. The work shall be started on the date indicated in the Notice to Proceed and shall be executed with such progress as may be required to prevent delay to other contractors or to the general completion of the project. The work shall be executed at such times and in or on such parts of the project, and with such forces, material and equipment, as to assure completion of the work in the time established by the Contract. Additionally, the **Contractor** shall, at all times, schedule and direct his work so that it provides an orderly progression of the work to completion within the specified Contract Time.
- B. The **Contractor** agrees that whenever it becomes apparent from the current monthly schedule update, that delays to the project have resulted and these delays are through no fault of the **Owner**, and hence, that the Contract completion date will not be met, or when so directed by the **Owner**, the **Contractor** will take some or all of the following actions at no additional cost to the **Owner**.
 - 1. Increase construction manpower in such quantities and crafts as will substantially eliminate the backlog of work.
 - 2. Increase the number of working hours per shift; shifts per working day, or days per week; the amount of construction equipment, etc., or any combination of the foregoing to substantially eliminate the backlog of work.
 - 3. Schedule activities to achieve maximum practical concurrence of accomplishment of activities, and comply with the revised schedule.
 - 4. The **Contractor** shall submit for reviewing a written statement of the steps he intends to take, to remove or arrest the delay to the schedule. If the **Contractor** fails to submit a written statement of the steps he intends to take or fails to take such steps as required by the Contract, the **Owner** may direct the level of effort in manpower (trades), equipment, and work schedule (overtime) to remove or arrest the delay to the project in the accepted schedule, and the **Contractor** shall promptly provide such level of effort at no additional cost to the **Owner**. In addition, should schedule

delays persist, the **Contractor's** bond agent will be asked to attend meetings to update the schedule.

- C. Failure of the **Contractor** to comply with the requirements of this provision shall subject him to, at the **Owner's** sole discretion, withholding, in partial or in total, payments otherwise due the **Contractor** for work performed under this Contract. The **Contractor** agrees that any withholding of moneys is not a penalty for noncompliance, but is an assurance for the **Owner** that funds will be available to implement these requirements should the **Contractor** fail to do so, since failure of the **Contractor** to comply with these requirements shall mean that the **Contractor** failed to execute the work with such diligence as to ensure its completion within the time for completion.

END OF SECTION 01310

SECTION 01380 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.01 SCOPE OF WORK

The Contractor shall clearly document site conditions prior to the start of construction and upon the completion of construction by use of video recording. The Contractor shall document the progress of construction (including significant events such as tie-ins) with still photographs. The cost of all photographic documentation shall be included in the Contract Price.

1.02 PROCEDURES

- A. The pre/post-construction video recording and periodic still photographs shall be taken from identifiable reference points along the construction corridor. The same reference points will be used through the life of the project to achieve an accurate record of construction.
- B. The Contractor will ensure that any areas of sensitivity such as driveways, fences, hardscape and landscape areas, lake or stream banks, or areas surrounding existing structures are adequately documented. Of particular concern shall be the existence, or non-existence, of any faults, fractures or defects.

1.03 PRE/POST-CONSTRUCTION VIDEO RECORDING

- A. The pre-construction and post-construction conditions of the project corridor shall be documented by audio-video recording methods.
- B. The video portion of the recording shall reproduce bright, sharp, clear pictures with accurate colors and shall be free from distortion or any other picture imperfection. Panning, zoom-in and zoom-out rates shall be sufficiently controlled to maintain a clear view of the object. The audio portion of the recording shall reproduce precise and concise explanatory notes by the camera operator with proper volume, clarity and freedom from distortion. The Owner reserves the right to reject any audio-video recording because of poor quality, unintelligible audio, or uncontrolled pan or zoom. Any rejected video shall be re-recorded at no additional cost to the Owner.
- C. All video recordings shall, by electronic means, display on the screen the time of day, the month, day and year of the recording. This time and date information must be continuously and simultaneously generated with the actual recording.
- D. The DVDs used for the recordings shall be new, professional quality 12 cm color DVD media that conforms to either DVD-R or DVD+R recording standards using high quality DVD video and audio bitrates. Reprocessed disks will not be acceptable. The recorded DVDs shall be compatible with any standard DVD- R or DVD+R player for television viewing or with media player software for viewing on a computer.

- E. All DVDs and their storage cases shall be identified by the CCWS project number and title, date recording was made, and a unique reference number if multiple DVDs are submitted. A printed log of the recording contents shall be inserted in the storage case of each DVD. The log shall include the disc reference number and shall describe the various segments of coverage contained on that DVD in terms of the names of streets or easements, coverage beginning and end limits – either listed by station numbers or addresses, directions of travel, and the time on the recording where the particular street or easement can be found.

1.04 CONSTRUCTION PROGRESS PHOTOGRAPHS

- A. The progress of construction shall be periodically documented with still photographs. At least 24 photographs of the construction area shall be taken on a monthly basis throughout the construction period. Any significant events such as tie-ins, or other situations such as unusual underground conditions, conflicts with other utilities, etc. shall also be documented photographically.
- B. The Contractor shall use a digital camera to produce project photographs. The digital camera shall be capable of transferring digital photographs to a JPEG or TIFF electronic file format and shall produce pictures of 4.0 megapixels (2,240 x 1,680 resolution) or better with 48 Bit Color Depth. All photographs shall be date and time stamped.
- C. The Contractor shall submit compact discs containing digital photographs in “JPEG” or “TIFF” format a minimum of once monthly. Each disc shall be clearly labeled with the project name, program number, and the time period covered by the photographs contained on the disc. Hard copy prints are not to be submitted.

1.05 SUBMITTALS

- A. The Contractor shall furnish to the Owner one copy of the video recording file of pre-construction conditions before the submittal of the first request for payment. The video recording file of the completed construction will be furnished to the Owner prior to submittal of the final request for payment. The pay requests (either initial or final) will not be processed before the receipt of the respective video records.
- B. The Contractor shall submit the periodic construction photographs on a monthly basis during the life of the project, in conjunction with the periodic payment request. The Owner may delay processing the pay request until the photographs are submitted.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01380

**SECTION 01450
CONTRACTOR QUALITY CONTROL**

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
 - 1. ASTM International (ASTM):
 - a. D3740, Evaluation of Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
 - b. E329, Use in the Evaluation of Testing and Inspection Agencies as Used in Construction.

1.02 DEFINITIONS

- A. Contractor Quality Control (CQC): The means by which Contractor ensures that the construction, to include that performed by subcontractors and suppliers, complies with the requirements of the Contract.

1.03 SUBMITTALS

- A. Informational Submittals:
 - 1. CQC Plan: Submit, not later than 30 days after receipt of Notice to Proceed.
 - 2. CQC Report: Submit, weekly, an original and one copy in report form.

1.04 OWNER'S QUALITY ASSURANCE

- A. All Work is subject to Owner's quality assurance inspection and testing at all locations and at all reasonable times before acceptance to ensure strict compliance with the terms of the Contract Documents.
- B. Owner's quality assurance inspections and tests are for the sole benefit of Owner and do not:
 - 1. Relieve Contractor of responsibility for providing adequate quality control measures;
 - 2. Relieve Contractor of responsibility for damage to or loss of the material before acceptance;
 - 3. Constitute or imply acceptance; or
 - 4. Affect the continuing rights of Owner after acceptance of the completed Work.

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- C. The presence or absence of a quality assurance inspector does not relieve Contractor from any Contract requirement.
- D. Promptly furnish all facilities, labor, and material reasonably needed for performing such safe and convenient inspections and tests as may be required by Engineer.
- E. Owner may charge Contractor for any additional cost of inspection or test when Work is not ready at the time specified by Contractor for inspection or test, or when prior rejection makes re-inspection or retest necessary. Quality assurance inspections and tests will be performed in a manner that will not unnecessarily delay the Work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

- A. Maintain an adequate inspection system and perform such inspections as will ensure that the Work conforms to the Contract Documents.
- B. Maintain complete inspection records and make them available at all times to Owner and Engineer.
- C. The quality control system shall consist of plans, procedures, and organization necessary to produce an end product that complies with the Contract Documents. The system shall cover all construction and demolition operations, both onsite and offsite, including Work by subcontractors, fabricators, suppliers and purchasing agents, and shall be keyed to the proposed construction sequence.

3.02 COORDINATION MEETING

- A. After the Preconstruction Conference, but before start of construction, and prior to acceptance of the CQC Plan, schedule a meeting with Engineer and Owner to discuss the quality control system.
- B. Develop a mutual understanding of the system details, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite Work, and the interrelationship of Contractor's management and control with the Owner's Quality Assurance.
- C. There may be occasions when subsequent conferences may be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures that may require corrective action by Contractor.

3.03 QUALITY CONTROL ORGANIZATION

A. CQC System Manager:

1. Designate an individual within Contractor's organization who will be responsible for overall management of CQC and have the authority to act in CQC matters for the Contractor.
2. CQC System Manager may perform other duties on the Project.
3. CQC System Manager shall be an experienced construction person, with a minimum of 3 years construction experience on similar type Work.
4. CQC System Manager shall report to the Contractor's project manager or someone higher in the organization. Project manager in this context shall mean the individual with responsibility for the overall quality and production management of the Project.
5. CQC System Manager shall be onsite during construction; periods of absence may not exceed 2 weeks at any one time.
6. Identify an alternate for CQC System Manager to serve with full authority during the System Manager's absence. The requirements for the alternate will be the same as for designated CQC System Manager.

B. CQC Staff:

1. Designate a CQC staff, available at the Site at all times during progress, with complete authority to take any action necessary to ensure compliance with the Contract. CQC staff members shall be subject to acceptance by Engineer.
2. CQC staff shall take direction from CQC System Manager in matters pertaining to QC.
3. CQC staff must be of sufficient size to ensure adequate QC coverage of Work phases, work shifts, and work crews involved in the construction. These personnel may perform other duties, but must be fully qualified by experience and technical training to perform their assigned QC responsibilities and must be allowed sufficient time to carry out these responsibilities.
4. The actual strength of the CQC staff may vary during any specific Work period to cover the needs of the Project. Add additional staff when necessary for a proper CQC organization.

C. Organizational Changes: Obtain Engineer's acceptance before replacing any member of the CQC staff. Requests for changes shall include name, qualifications, duties, and responsibilities of the proposed replacement.

3.04 QUALITY CONTROL PHASING

- A. CQC shall include at least three phases of control to be conducted by CQC System Manager for all definable features of Work, as follows:
1. Preparatory Phase:
 - a. Notify Owner at least 48 hours in advance of beginning any of the required action of the preparatory phase.
 - b. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The CQC System Manager shall instruct applicable CQC staff as to the acceptable level of workmanship required in order to meet Contract requirements.
 - c. Document the results of the preparatory phase meeting by separate minutes prepared by the CQC System Manager and attached to the QC report.
 - d. Perform prior to beginning Work on each definable feature of Work:
 - 1) Review applicable Contract Specifications.
 - 2) Review applicable Contract Drawings.
 - 3) Verify that all materials and/or equipment have been tested, submitted, and approved.
 - 4) Verify that provisions have been made to provide required control inspection and testing.
 - 5) Examine the Work area to verify that all required preliminary Work has been completed and is in compliance with the Contract.
 - 6) Perform a physical examination of required materials, equipment, and sample Work to verify that they are on hand, conform to approved Shop Drawing or submitted data, and are properly stored.
 - 7) Review the appropriate activity hazard analysis to verify safety requirements are met.
 - 8) Review procedures for constructing the Work, including repetitive deficiencies.
 - 9) Document construction tolerances and workmanship standards for that phase of the Work.
 - 10) Check to verify that the plan for the Work to be performed, if so required, has been accepted by Engineer.
 2. Initial Phase:
 - a. Accomplish at the beginning of a definable feature of Work:
 - 1) Notify Owner at least 48 hours in advance of beginning the initial phase.

- 2) Perform prior to beginning Work on each definable feature of Work:
 - a) Review minutes of the preparatory meeting.
 - b) Check preliminary Work to verify compliance with Contract requirements.
 - c) Verify required control inspection and testing.
 - d) Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Comparison with sample panels is appropriate.
 - e) Resolve all differences.
 - f) Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.
 - 3) Separate minutes of this phase shall be prepared by the CQC System Manager and attached to the QC report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.
 - 4) The initial phase should be repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.
3. Follow-up Phase:
- a. Perform daily checks to verify continuing compliance with Contract requirements, including control testing, until completion of the particular feature of Work.
 - b. Daily checks shall be made a matter of record in the CQC documentation and shall document specific results of inspections for all features of Work for the day or shift.
 - c. Conduct final follow-up checks and correct all deficiencies prior to the start of additional features of Work that will be affected by the deficient Work. Constructing upon or concealing nonconforming Work will not be allowed.
4. Additional Preparatory and Initial Phases: Additional preparatory and initial phases may be conducted on the same definable features of Work as determined by Owner if the quality of ongoing Work is unacceptable; or if there are changes in the applicable QC staff or in the onsite production supervision or work crew; or if work on a definable feature is resumed after a substantial period of inactivity, or if other problems develop.

3.05 CONTRACTOR QUALITY CONTROL PLAN

A. General:

1. Plan shall identify personnel, procedures, control, instructions, test, records, and forms to be used.
2. An interim plan for the first 30 days of operation will be considered.
3. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of Work to be started.
4. Work outside of the features of Work included in an accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional features of Work to be started.

B. Content:

1. Plan shall cover the intended CQC organization for the entire Contract and shall include the following, as a minimum:
 - a. Organization: Description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff will implement the three-phase control system (see Paragraph QC Phasing) for all aspects of the Work specified.
 - b. CQC Staff: The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a QC function.
 - c. Letters of Authority: A copy of a letter to the CQC System Manager signed by an authorized official of the firm, describing the responsibilities and delegating sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop Work which is not in compliance with the Contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities and responsibilities. Copies of these letters will also be furnished to Owner.
 - d. Submittals: Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers and purchasing agents.
 - e. Testing: Control, verification and acceptance testing procedures for each specific test to include the test name, frequency, specification paragraph containing the test requirements, the personnel and laboratory responsible for each type of test, and an estimate of the number of tests required.

- f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests, including documentation.
 - g. Procedures for tracking deficiencies from identification through acceptable corrective action. These procedures will establish verification that identified deficiencies have been corrected.
 - h. Reporting procedures, including proposed reporting formats; include a copy of the CQC report form.
- C. Acceptance of Plans: Acceptance of the Contractor's basic and addendum CQC plans is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. Owner reserves the right to require Contractor to make changes in the CQC plan and operations including removal of personnel, as necessary, to obtain the quality specified.
- D. Notification of Changes: After acceptance of the CQC plan, Contractor shall notify Engineer, in writing, a minimum of 7 calendar days prior to any proposed change. Proposed changes are subject to acceptance by Engineer.

3.06 CONTRACTOR QUALITY CONTROL REPORT

- A. As a minimum, prepare a CQC report for every 7 calendar days. Account for all days throughout the life of the Contract. Reports shall be signed and dated by CQC System Manager. Include copies of test reports and copies of reports prepared by QC staff.
- B. Maintain current records of quality control operations, activities, and tests performed, including the Work of subcontractors and suppliers.
- C. Records shall be on an acceptable form and shall be a complete description of inspections, the results of inspections, daily activities, tests, and other items, including but not limited to the following:
 - 1. Contractor/subcontractor and their areas of responsibility.
 - 2. Operating plant/equipment with hours worked, idle, or down for repair.
 - 3. Work performed today, giving location, description, and by whom. When a network schedule is used, identify each phase of Work performed each day by activity number.
 - 4. Test and/or control activities performed with results and references to specifications/plan requirements. The control phase should be identified (Preparatory, Initial, Follow-up). List deficiencies noted along with corrective action.
 - 5. Material received with statement as to its acceptability and storage.
 - 6. Identify submittals reviewed, with Contract reference, by whom, and action taken.

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7. Offsite surveillance activities, including actions taken.
8. Job safety evaluations stating what was checked, results, and instructions or corrective actions.
9. List instructions given/received and conflicts in Drawings and/or Specifications.
10. Contractor's verification statement.
11. Indicate a description of trades working on the Project; the number of personnel working; weather conditions encountered; and any delays encountered.
12. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in file work and workmanship comply with the Contract.

3.07 SUBMITTAL QUALITY CONTROL

- A. Submittals shall be as specified in Section 01300, Submittals. The CQC organization shall be responsible for certifying that all submittals are in compliance with the Contract requirements. Owner will furnish copies of test report forms upon request by Contractor. Contractor may use other forms as approved.

3.08 TESTING QUALITY CONTROL

- A. Testing Procedure:
 1. Perform tests specified or required to verify that control measures are adequate to provide a product which conforms to Contract requirements. Perform the following activities and record the following data:
 - a. Verify testing procedures comply with contract requirements.
 - b. Verify facilities and testing equipment are available and comply with testing standards.
 - c. Check test instrument calibration data against certified standards.
 - d. Verify recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
 - e. Documentation:
 - 1) Record results of all tests taken, both passing and failing, on the CQC report for the date taken.
 - 2) Include specification paragraph reference, location where tests were taken, and the sequential control number identifying the test.
 - 3) Actual test reports may be submitted later, if approved by Engineer, with a reference to the test number and date taken.

- 4) Provide directly to Engineer an information copy of tests performed by an offsite or commercial test facility. Test results shall be signed by an engineer registered in the state where the tests are performed.
- 5) Failure to submit timely test reports, as stated, may result in nonpayment for related Work performed and disapproval of the test facility for this Contract.

B. Testing Laboratories: Laboratory facilities, including personnel and equipment, utilized for testing soils, concrete, asphalt and steel shall meet criteria detailed in ASTM D3740 and ASTM E329, and be accredited by the American Association of Laboratory Accreditation (AALA), National Institute of Standards and Technology (NIST), National Voluntary Laboratory Accreditation Program (NVLAP), the American Association of State Highway and Transportation Officials (AASHTO), or other approved national accreditation authority. Personnel performing concrete testing shall be certified by the American Concrete Institute (ACI).

3.09 COMPLETION INSPECTION

- A. CQC System Manager shall conduct an inspection of the Work at the completion of all Work or any milestone established by a completion time stated in the Contract.
- B. Punchlist:
 1. CQC System Manager shall develop a punchlist of items which do not conform to the Contract requirements.
 2. Include punchlist in the CQC report, indicating the estimated date by which the deficiencies will be corrected.
 3. CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected and so notify the Owner.
 4. These inspections and any deficiency corrections required will be accomplished within the time stated for completion of the entire Work or any particular increment thereof if the Project is divided into increments by separate completion dates.

END OF SECTION

**SECTION 01451
QUALITY ASSURANCE AND INSPECTION**

PART 1 GENERAL

1.01 SUMMARY

- A. This section covers requirements for Special Inspection, Observation, and Testing required in accordance with Chapter 17 of the 2018 IBC as amended by the State of Georgia and each of the cities in which the eight pump stations are located and is in addition to and supplements requirements included in Statement of Special Inspections shown in the supplement located at end of this section.

1.02 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
 - 1. American Society of Civil Engineers (ASCE): 7, Minimum Design Loads for Buildings and Other Structures.
 - 2. International Code Council (ICC):
 - a. International Building Code (IBC).
 - b. Evaluation Service (ICC-ES) Reports and Legacy Reports.

1.03 DEFINITIONS

- A. Agencies and Personnel:
 - 1. Agency Having Jurisdiction (AHJ): Permitting building agency; may be a federal, state, local, or other regional department, or individual including building official, fire chief, fire marshal, chief of a fire prevention bureau, labor department, or health department, electrical inspector; or others having statutory authority. AHJ may be Owner when authorized to be self-permitting by governmental permitting agency or when no governmental agency has authority.
 - 2. Approved Agency: An established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved.

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3. Registered Design Professional in Responsible Charge: An individual who is registered or licensed to practice their respective design profession as defined by statutory requirements of professional registration laws of state or jurisdiction in which Project is to be constructed.
 4. Special Inspector: Qualified person employed by Owner who will demonstrate competence to the satisfaction of AHJ for inspection of a particular type of construction or operation requiring Special Inspection.
- B. Statement of Special Inspections: Detailed written procedure contained on the Drawings and in the supplement located at end of this section establishing systems and components subject to Special Inspection, Observation, and Testing during construction, type and frequency of testing, extent and duration of Special Inspection, and reports to be completed and distributed by Special Inspector.
- C. Special Inspection:
1. Special Inspection: Inspection required of materials, installation, fabrication, erection, or placement of components and connections requiring special expertise to ensure compliance with approved Contract Documents and referenced standards.
 2. Special Inspection, Continuous: Full-time observation of work requiring Special Inspection by an approved Special Inspector who is present in area where the Work is being performed.
 3. Special Inspection, Periodic: Part-time or intermittent observation of the Work requiring Special Inspection by an approved Special Inspector who is present in area where the Work has been or is being performed, and at completion of the Work.
- D. Structural Systems and Components:
1. Seismic-Force-Resisting System: That part of structural lateral load resisting system that has been considered in the design to provide required resistance to seismic forces identified on Drawings.
 2. Wind Force Resisting System: That part of the structural system that has been considered in the design to provide required resistance to wind forces identified on Drawings.
- E. Nonstructural Components:
1. Architectural Component Supports: Structural members or assemblies of members which transmit loads and forces from architectural systems or components to structure, including braces, frames, struts, and attachments.

2. Electrical Component Supports: Structural members or assemblies which transmit loads and forces from electrical equipment to structure, including braces, frames, legs, pedestals, and tethers, as well as elements forged or cast as part of component for anchorage.
3. Mechanical Component Supports: Structural members or assemblies which transmit loads and forces from mechanical equipment to structure, including braces, frames, skirts, legs, saddles, pedestals, snubbers, and tethers, as well as elements forged or cast as part of component for anchorage.

F. Professional Observation:

1. Does not include or waive responsibility for required Special Inspection or inspections by building official.
2. Requirements are indicated on Statement of Special Inspections provided in the supplement located at the end of this section.
3. Geotechnical Observation: Visual observation of selected subgrade bearing surfaces and installation of deep foundation elements by a registered design professional for general conformance to Contract Documents.

1.04 SUBMITTALS

A. None required:

1.05 STATEMENT OF SPECIAL INSPECTIONS REQUIREMENTS

A. Designated Systems for Inspection:

1. Seismic-force-resisting systems designated under IBC Section 1705 and subject to Special Inspection under Section 1705: None required.
2. Wind-force-resisting systems designated under IBC Section 1705: None required.
 - a. Concrete anchorage for Prefabricated FRP Building and Diesel Generator System.

B. Statement of Special Inspections:

1. As included in supplement located at the end of this section and in support of building permit application, Project-specific requirements were prepared by Registered Design Professional in Responsible Charge. The following identifies elements of inspection, observation, and testing program to be followed in construction of the Work:
 - a. Special Inspection and testing required by IBC Section 1705 and other applicable sections and referenced standards therein.
 - b. Type and frequency of Special Inspection required.

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- c. Type and frequency of testing required.
 - d. Required frequency and distribution of testing and Special Inspection reports to be distributed by Special Inspector to
 - e. Geotechnical Observation to be Performed: Required frequency and distribution of Geotechnical Observation reports by registered design professional to Contractor, building official, and Owner.
 - f. Structural Observations to be Performed: Not required for this Project.
- C. Special Inspection and associated testing of shop fabrication and field construction will be performed by an approved accredited independent agency or by Authority Having Jurisdiction's (AHJ) approved, qualified inspection staff. Owner will secure and pay for services of agency to perform Special Inspection and associated testing.
- D. Code required Special Inspection with associated testing with associated testing, as provided in Statement of Special Inspections on the Drawings and in the supplement located at the end of this section and further provided in this section, is for benefit of Owner and does not:
 - 1. Relieve Contractor of responsibility for providing adequate quality control measures.
 - 2. Relieve Contractor of responsibility for damage to or loss of material before acceptance.
 - 3. Constitute or imply acceptance.
 - 4. Affect continuing rights of Owner after acceptance of completed Work.
- E. The presence or absence of code required Special Inspector does not relieve Contractor from Contract requirements.
- F. Contractor is responsible for additional costs associated with Special Inspection and Testing and Observation when Work is not ready at time identified by Contractor and Special Inspectors and Professional Observer are onsite, but not able to provide contracted services.
- G. Contractor is responsible for associated costs for additional Special Inspection and Testing and Professional Observation by Special Inspectors and Professional Observers required because of rejection of materials of in place Work that cannot be made compliant to Contract Document without additional inspections and testing.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

- A. Requirements of the Statement of Special Inspections are provided by the Owner. All other testing and inspections, unless noted otherwise, are provided by Contractor.
- B. Provide access to shop or Site for Special Inspection and Testing and Professional Observation requirements.
- C. Notify Engineer in advance of required Special Inspection and Professional Observation no later than 48 hours prior to date of Special Inspection and Professional Observation.
- D. Provide access for Special Inspector to construction documents.
- E. Retain special inspection records on-site to be readily available for review.
- F. Cooperate with Special Inspector and provide safe access to the Work to be inspected.
- G. Submit Fabricator's Certificates of Compliance for approved fabricators.
- H. Provide reasonable auxiliary services as requested by the Special Inspector. Auxiliary services required include, but not limited to:
 - 1. Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests to assist the Special Inspector in performing test/inspections.
 - 2. Providing storage space for the Special Inspector's exclusive use, such as for storing and curing concrete test samples and delivery of samples to testing laboratories.
 - 3. Providing the Special Inspector with access to all approved submittals.
 - 4. Providing security and protection of samples and test equipment at the Project Site.
 - 5. Provide samples of materials to be tested in required quantities.
- I. Materials and systems shall be inspected during placement where Continuous Special Inspection is required.

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- J. Where Periodic Special Inspection is indicated in the Statement of Special Inspections:
1. Schedule inspections for either during or at completion of their placement or a combination or both.
 2. Schedule periodically inspected Work (either inspected during or after its placement) so that corrections can be completed and re-inspected before Work is inaccessible.
 3. Sampling a portion of the Work is not allowed. Schedules shall provide for inspection of all Work requiring periodic inspection.

3.02 SUPPLEMENTS

- A. The supplements listed below, following “End of Section,” are a part of this Specification:
1. Statement of Special Inspection.

END OF SECTION

STATEMENT OF SPECIAL INSPECTIONS

GENERAL NOTES

1. THE STATEMENT OF SPECIAL INSPECTIONS PROVIDE PROJECT COMPLIANCE WITH THE PROVISIONS OF THE **2018** INTERNATIONAL BUILDING CODE (IBC) CHAPTER 17 AS AMENDED BY THE STATE OF GEORGIA FOR SPECIAL INSPECTION AS APPLICABLE. EXCEPT WHERE OTHERWISE NOTED, THIS INSPECTION IS OWNER FURNISHED.
2. STANDARD SPECIAL INSPECTION REQUIREMENTS FOR NONSTRUCTURAL COMPONENTS ARE CONTAINED IN TABLE 1.
3. STANDARD SPECIAL INSPECTION REQUIREMENTS FOR STRUCTURAL COMPONENTS, REGARDLESS OF WIND OR SEISMIC DESIGN CATEGORIES, ARE CONTAINED IN TABLE 2. STANDARD TESTING REQUIREMENTS FOR STRUCTURAL COMPONENTS ARE CONTAINED IN TABLE 3.
4. PROJECT SPECIFIC REQUIREMENTS FOR STRUCTURES ASSIGNED TO SEISMIC DESIGN CATEGORIES C, D, E, OR F ARE CONTAINED IN TABLE 4. ADDITIONAL TESTING REQUIREMENTS FOR STRUCTURAL RESISTANCE ARE CONTAINED IN TABLE 6.
5. PROJECT SPECIFIC REQUIREMENTS FOR STRUCTURES SUBJECT TO BASIC WIND SPEEDS (V) IN EXCESS OF 110 MPH ARE CONTAINED IN TABLE 5.
6. FOR ADDITIONAL REQUIREMENTS, REFER TO SPECIFICATION SECTION 01451 QUALITY ASSURANCE AND INSPECTION. THESE INCLUDE:
 - A. CONTRACTOR'S REQUIREMENTS TO PROVIDE ACCESS TO THE WORK FOR REQUIRED INSPECTIONS, AND TO PROVIDE NOTICE OF REQUIRED INSPECTIONS AND STRUCTURAL OBSERVATION.
 - B. CONTRACTOR'S STATEMENT OF RESPONSIBILITY FOR WORK TO BE PERFORMED ON SYSTEMS DESIGNATED UNDER THE STATEMENT OF SPECIAL INSPECTIONS FOR WIND OR SEISMIC RESISTANCE.
 - C. DEFINITIONS AND TERMINOLOGY USED IN THIS STATEMENT OF SPECIAL INSPECTIONS.

SPECIAL INSPECTION

1. SPECIAL INSPECTION WILL BE IN ACCORDANCE WITH IBC SECTIONS 1704 AND 1705 TOGETHER WITH LOCAL AND STATE AMENDMENTS. REFER TO THE FOLLOWING TABLES FOR PROJECT SPECIFIC INSPECTION TYPES AND FREQUENCIES.

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2. SPECIAL INSPECTIONS WILL BE PROVIDED BY A CERTIFIED OR QUALIFIED INSPECTOR AND ASSOCIATED TESTING WILL BE PERFORMED BY AN APPROVED ACCREDITED INDEPENDENT AGENCY. THE OWNER WILL SECURE AND PAY FOR THE SERVICES OF THE AGENCY TO PERFORM ALL SPECIAL INSPECTION AND ASSOCIATED TESTS. INSPECTORS FOR EACH SYSTEM AND MATERIAL WILL BE INTERNATIONAL CODE COUNCIL (ICC) CERTIFIED OR OTHERWISE APPROVED BY THE BUILDING OFFICIAL.
3. THE SPECIAL INSPECTOR WILL OBSERVE THE INDICATED WORK FOR COMPLIANCE WITH THE APPROVED CONTRACT DOCUMENTS AND SUBMIT RECORDS OF INSPECTION. ALL DISCREPANCIES WILL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE CONTRACTOR FOR CORRECTION.
4. SPECIAL INSPECTION AND ASSOCIATED TESTING REPORTS WILL BE SUBMITTED TO THE ENGINEER, CONTRACTOR, BUILDING OFFICIAL, AND OWNER WITHIN ONE WEEK OF INSPECTION OR WITHIN ONE WEEK OF TEST COMPLETION. INSPECTIONS FOR WHICH REPORTING WILL BE REQUIRED ARE NOTED IN THE FOLLOWING TABLES.
5. AT THE CONCLUSION OF CONSTRUCTION, A FINAL REPORT DOCUMENTING REQUIRED SPECIAL INSPECTIONS AND CORRECTION OF PREVIOUSLY NOTED DISCREPANCIES WILL BE SUBMITTED.

GEOTECHNICAL OBSERVATION

1. ALL FOUNDATION BEARING SURFACES SHALL BE INSPECTED BY GEOTECHNICAL ENGINEER PRIOR TO PLACEMENT OF REINFORCING STEEL. ADDITIONAL SPECIAL INSPECTION REQUIREMENTS ARE LISTED IN TABLE 1.
2. GEOTECHNICAL TESTING REQUIREMENTS ARE LISTED IN TABLE 3.

STRUCTURAL OBSERVATION

1. STRUCTURAL OBSERVATION IS NOT REQUIRED FOR THIS PROJECT.

SPECIAL INSPECTIONS FOR WIND RESISTANCE

1. SPECIAL INSPECTIONS REQUIREMENTS FOR WIND RESISTANCE IN ACCORDANCE WITH IBC SECTION 1705.11 ARE NOT APPLICABLE TO THIS PROJECT.

SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE

1. SPECIAL INSPECTIONS REQUIREMENTS FOR SEISMIC RESISTANCE IN ACCORDANCE WITH IBC SECTION 1705.12 AND 1705.13 ARE NOT APPLICABLE TO THIS PROJECT.

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Statement of Special Inspections Prepared by:

Type or Print Name

Signature

Date

Preparer's Seal

STRUCTURAL OBSERVATION TABLE

	SYSTEM FOR FACILITY XXXXXXX	STAGE	ITEMS	COMMENTS
1.	FOUNDATION SLAB OF STRUCTURE	PRIOR TO FIRST CONCRETE PLACEMENT OF FIRST SECTION WHEN ITEMS CAN STILL BE REVISED	REINFORCING STEEL, CONCRETE AND MASONRY WALL DOWELS, WATERSTOPS, EMBEDS, AND SIMILAR ITEMS	NOTE 1
2.	CONCRETE WALLS OF STRUCTURE	PRIOR TO FIRST CONCRETE PLACEMENT OF FIRST SECTION WHEN ITEMS CAN STILL BE REVISED	REINFORCING STEEL, WALL DOWELS, WATERSTOPS, EMBEDS, AND SIMILAR ITEMS	NOTE 1
3.	WALL TO FOUNDATION CONNECTIONS PRIOR TO FORM CLOSURE	PRIOR TO FIRST CONCRETE PLACEMENT OF FIRST SECTION WHEN ITEMS CAN STILL BE REVISED		NOTE 1
4.	ELEVATED CONCRETE SLABS AND BEAMS PRIOR TO CONCRETE PLACEMENT	PRIOR TO FIRST CONCRETE PLACEMENT OF FIRST SECTION WHEN ITEMS CAN STILL BE REVISED	REINFORCING STEEL, WALL DOWELS, WATERSTOPS, EMBEDS, AND SIMILAR ITEMS	NOTE 1
5.	CONCRETE STRUCTURES	PRIOR TO FIRST CONCRETE PLACEMENT ON FIRST LIQUID HOLDING STRUCTURE WHEN ITEMS CAN STILL BE REVISED	REINFORCING STEEL, WALL DOWELS, WATERSTOPS, EMBEDS, AND SIMILAR ITEMS	NOTE 1
6.	CONCRETE STRUCTURES	AT COMPLETION OF PLACEMENT OF ALL CONCRETE COMPONENTS FOR THE FIRST LIQUID HOLDING STRUCTURE	CONCRETE TOLERANCES, FINISHING, LIQUID TIGHTNESS, AND SIMILAR ITEMS	NOTE 1
7.	MASONRY WALL, BEAM, PIER, AND COLUMN REINFORCING STEEL	[PRIOR TO GROUTING AND PRIOR TO CLOSING OF CLEANOUTS] [DURING THE INITIAL CONSTRUCTION OF THE FIRST MASONRY STRUCTURE WHEN ITEMS CAN STILL BE REVISED]	REINFORCING STEEL, GROUTED CELLS, EMBEDS, COURSE PREPARATION AND SIMILAR ITEMS	NOTE 1

8.	SYSTEM CONNECTION EMBEDS	PRIOR TO GROUT OR CONCRETE PLACEMENT		NOTE 1
9.	CONCRETE WALL TO FLOOR AND ROOF CONNECTIONS	PRIOR TO FORM CLOSURE [OR CLADDING INSTALLATION] OR OTHER COVER		NOTE 1
10.	PLYWOOD ROOF DIAPHRAGM	PRIOR TO STANDING SEAM ROOF COVER WHEN ITEMS CAN STILL BE REVISED	NAILING PATTERNS, FASTENER TYPE, REQUIRED BLOCKING, STRAP TIES, AND SIMILAR ITEMS	NOTE 1
11.	STRUCTURAL STEEL FRAMING	DURING INITIAL CONSTRUCTION OF STEEL FRAMING AT FIRST STEEL FRAMED BUILDING PRIOR TO ENCLOSURE OF FRAMING BEHIND FINAL FINISHES	MEMBER LOCATIONS AND CONFIGURATIONS, BOLTED AND WELDED CONNECTIONS, AND SIMILAR ITEMS	NOTE 1
12.	TANK SHELL	INITIAL WELDING OF VERTICAL CJP JOINTS	JOINT PREPARATION, WELDING PROCEDURES, AND ENVIRONMENTAL CONTROLS	NOTE 1
13.	TANK SHELL	INITIAL WELDING OF HORIZONTAL CJP JOINTS	JOINT PREPARATION, WELDING PROCEDURES, AND ENVIRONMENTAL CONTROLS	NOTE 1
14	AT ADDITIONAL TIMES DURING CONSTRUCTION AT WHICH THE ENGINEER OF RECORD OR OWNER DEEM THE NEED FOR ADDITIONAL STRUCTURAL OBSERVATION			NOTE 1

15.	AT SUBSTANTIAL COMPLETION OF PRIMARY STRUCTURAL SYSTEM FOR DETERMINATION OF FINAL CONDITION OF STRUCTURE			NOTE 1
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NOTES:

1. STRUCTURAL OBSERVER TO DISCUSS ITEMS AND SITE SPECIFIC CONDITIONS WITH SPECIAL INSPECTOR AND FIELD INSPECTION STAFF DURING OBSERVATION.

TABLE 1 REQUIRED NON-STRUCTURAL SPECIAL INSPECTION REFER TO SPECIFICATION SECTION 01 45 33						
SYSTEM OR MATERIAL	2018 IBC CODE REFERENCE	REFERENCED STANDARD	PERIODIC OWNER FURNISHED SPECIAL INSPECTION (SEE NOTE 1)	CONTINUOUS OWNER FURNISHED SPECIAL INSPECTION	COMMENTS	TESTING FOR SPECIAL INSPECTION
GEOTECHNICAL						
1. SOILS:						
A. VERIFY MATERIALS BELOW SHALLOW FOUNDATIONS ARE ADEQUATE TO ACHIEVE THE DESIGN BEARING CAPACITY	1705.6, 1803.5.8, 1803.5.9, 1804.6		X		PROFESSIONAL OBSERVATION BY GEOTECHNICAL ENGINEER	
STRUCTURAL						
SEE TABLE 2.						

NOTES:

1. PERIODIC INSPECTION IS DEFINED AS INSPECTION BY THE SPECIAL INSPECTOR OF ALL MATERIALS AND SYSTEMS, IN SOME CASES PERFORMED DURING THEIR PLACEMENT AND IN ALL CASES PERFORMED UPON COMPLETION OF THEIR PLACEMENT. THE COMPLETION INSPECTION SHALL BE PERFORMED SO THAT WORK CAN BE CORRECTED PRIOR TO OTHER RELATED WORK PROCEEDING AND COVERING INSPECTED WORK.

TABLE 2 REQUIRED STRUCTURAL SPECIAL INSPECTION REFER TO SPECIFICATION SECTION 01 45 33						
SYSTEM	2018 IBC CODE REFERENCE	REFERENCED STANDARD	PERIODIC OWNER FURNISHED SPECIAL INSPECTION (SEE NOTE 1)	CONTINUOUS OWNER FURNISHED SPECIAL INSPECTION	COMMENTS	TESTING FOR SPECIAL INSPECTION
CONCRETE						
1. INSPECT REINFORCING STEEL AND VERIFY PLACEMENT	1705.3,	ACI 318: Ch. 20, 25.2, 25.3, 26.6.1-26.6.3	X			SEE TABLE 6 FOR REINFORCING STEEL TESTING
2. INSPECT ANCHORS POST-INSTALLED IN HARDENED CONCRETE MEMBERS		ACI 318: 26.7				
A. ADHESIVE ANCHORS INSTALLED IN HORIZONTALLY OR UPWARDLY INCLINED ORIENTATIONS TO RESIST SUSTAINED TENSION LOADS	1705.3	ACI 318: 17.8.2.4, ICC-ES EVALUATION REPORTS		X		
B. MECHANICAL ANCHORS AND ADHESIVE ANCHORS NOT DEFINED IN 4A.	1705.3	ACI 318: 17.8.2, ICC-ES EVALUATION REPORTS	X			
3. VERIFY USE OF REQUIRED DESIGN MIX	1705.3, 1904.1, 1904.2,	ACI 318: Ch. 19, 26.4.3, 26.4.4	X			
4. PRIOR TO CONCRETE PLACEMENT, FABRICATE SPECIMENS FOR STRENGTH TESTS, PERFORM SLUMP AND AIR CONTENT TESTS, AND DETERMINE THE TEMPERATURE OF THE CONCRETE	1705.3	ASTM C 172, ASTM C 31, ACI 318: 26.5, 26.12		X		SEE TABLE 3 FOR CONCRETE TEST REQUIREMENTS

5. INSPECT CONCRETE PLACEMENT FOR PROPER APPLICATION TECHNIQUES	1705.3,	ACI 318: 26.5		X		
6. VERIFY MAINTENANCE OF SPECIFIED CURING TEMPERATURE AND TECHNIQUES	1705.3	ACI 318: 26.5.3 - 26.5.5	X			
7. INSPECT FORMWORK FOR SHAPE, LOCATION AND DIMENSIONS OF THE CONCRETE MEMBER BEING FORMED	1705.3	ACI 318: 26.11.1.2(b)	X			

NOTES:

1. PERIODIC INSPECTION IS DEFINED AS INSPECTION BY THE SPECIAL INSPECTOR OF ALL MATERIALS AND SYSTEMS, IN SOME CASES PERFORMED DURING THEIR PLACEMENT AND IN ALL CASES PERFORMED UPON COMPLETION OF THEIR PLACEMENT. THE COMPLETION INSPECTION SHALL BE PERFORMED SO THAT WORK CAN BE CORRECTED PRIOR TO OTHER RELATED WORK PROCEEDING AND COVERING INSPECTED WORK.

TABLE 3 TESTING FOR REQUIRED SPECIAL INSPECTION REFER TO SPECIFICATION SECTION 01 45 33					
MATERIAL	TYPE OR SCOPE	STANDARD	2018 IBC CODE REFERENCE	FREQUENCY	BY WHOM
GEOTECHNICAL					
COMPACTED FILL	COMPACTION	ASTM [D698] [D1557]	1705.6	PRIOR TO PLACING FORMWORK AND REINFORCING	OWNER'S TESTING AGENCY
COMPACTED FILL	DENSITY	ASTM [D1556] [D6938]	1705.6	PRIOR TO PLACING FORMWORK AND REINFORCING	OWNER'S TESTING AGENCY
CONCRETE					
CONCRETE	STRENGTH	ASTM C39	1705.3	ONCE EACH DAY, BUT NOT LESS THAN ONE SAMPLE FOR EACH 150 CUBIC YARDS	OWNER'S TESTING AGENCY
CONCRETE	SLUMP	ASTM C143, C94	1705.3	ONE SAMPLE PER STRENGTH TEST	OWNER'S TESTING AGENCY
CONCRETE	AIR CONTENT	ASTM C231, C94	1705.3	ONE SAMPLE PER STRENGTH TEST	OWNER'S TESTING AGENCY
CONCRETE	TEMPERATURE	ASTM C1064	1705.3	ONE SAMPLE PER STRENGTH TEST	OWNER'S TESTING AGENCY

TABLE 4

**REQUIRED SPECIAL INSPECTION FOR SEISMIC RESISTANCE FOR STRUCTURAL SYSTEMS
REFER TO TABLE 2 FOR STANDARD STRUCTURAL SPECIAL INSPECTION REQUIREMENTS
NOT REQUIRED**

<p>TABLE 5 REQUIRED SPECIAL INSPECTION FOR WIND RESISTANCE FOR STRUCTURAL SYSTEMS NOT REQUIRED</p>

TABLE 6
TESTING FOR SEISMIC RESISTANCE
NOT REQUIRED

SECTION 01500
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. American Association of Nurserymen (AAN): American Standards for Nursery Stock.
 2. Federal Emergency Management Agency (FEMA).
 3. National Fire Prevention Association (NFPA): 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations.
 4. Telecommunications Industry Association (TIA); Electronic Industries Alliance (EIA): 568B, Commercial Building Telecommunications Cabling Standard.
 5. U.S. Department of Agriculture (USDA): Urban Hydrology for Small Watersheds.
 6. U.S. Weather Bureau: Rainfall-Frequency Atlas of the U.S. for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years.

1.02 SUBMITTALS

- A. Informational Submittals:
1. Copies of permits and approvals for construction as required by Laws and Regulations and governing agencies.
 2. Temporary Utility Submittals:
 - a. Electric power supply and distribution plans.
 - b. Sanitary.

1.03 MOBILIZATION

- A. Mobilization includes, but is not limited to, these principal items:
1. Obtaining required permits.
 2. Providing onsite sanitary facilities and potable water facilities as specified and as required by Laws and Regulations, and governing agencies.
 3. Posting OSHA required notices and establishing safety programs and procedures.

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- B. No area is available at either of the eight existing pump stations to locate a construction trailer for the Contractor. Therefore, if deemed necessary by the Contractor, provide lands and access to lands for temporary facilities for use by Contractor for duration of Project.

1.04 PROTECTION OF WORK AND PROPERTY

- A. Comply with Owner's safety rules while on Owner's property.
- B. Keep Owner informed of serious onsite accidents and related claims.
- C. Use of Explosives: No blasting or use of explosives will be allowed onsite.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 TEMPORARY UTILITIES FOR THE MARINA TRACE PUMP STATION.

- A. Power: The replacement of the pumps and guiderails will require the wet well to be bypassed during Work in the wet well. Temporary power will be required for bypass pumps and lighting. As such, the Contractor will need to provide a means of temporary power and all materials, equipment, and labor necessary to energize the bypass pumps, lighting and pump control while the work in on the pump replacement is being implemented. Additionally, the Contractor must also include all materials, equipment, and labor necessary to maintain the power the bypass pumps and lighting while the modifications required are being implemented. The Contractor is to determine the electrical power load associated with the bypass pumps, control equipment and lighting at the Marina Trace PS that must remain fully operational throughout the duration of the work being implemented at this particular facility.
- B. All temporary cables, conduit, and other electrical equipment required to meet the requirements of this item shall be provided by the Contractor.
- C. Bypass: The Contractor shall be required to provide all pumping equipment, pump control, temporary piping, equipment protection, lighting, security, safety barricading and all labor and materials for the installation, operation for the duration that the bypass is required (to be determined by the Contractor), and removal of all temporary equipment and materials upon agreement with the Owner that the bypass equipment is no longer required. Contractor is to reference Specification Section 11305, Submersible Pumps and the Drawings and 02750 Bypass Pumping for additional details on the bypass requirements.
- D. Water: No construction or potable water is available at any of the eight existing pump stations. Make arrangements for and bear costs of providing water required for construction purposes and for drinking by construction personnel during construction.

- E. Sanitary and Personnel Facilities: No sanitary facilities are available at any of the eight existing pump stations. The Contractor shall provide and maintain facilities for Contractor's employees, Subcontractors, and other onsite employers' employees. Service, clean, and maintain facilities and enclosures.

3.02 PROTECTION OF WORK AND PROPERTY

A. General:

1. Perform Work within right-of-way and easements in a systematic manner that minimizes inconvenience to property owners and the public.
2. Maintain in continuous service existing oil and gas pipelines, underground power, telephone or communication cable, water mains, irrigation lines, sewers, poles and overhead power, and other utilities encountered along line of the Work, unless other arrangements satisfactory to owners of said utilities have been made.
3. Where completion of the Work requires temporary or permanent removal or relocation of existing utility, coordinate activities with owner of said utility and perform work to their satisfaction.
4. Protect, shore, brace, support, and maintain underground pipes, conduits, drains, and other underground utility construction uncovered or otherwise affected by construction operations.
5. Keep fire hydrants and water control valves free from obstruction and available for use at all times.
6. In areas where Contractor's operations are adjacent to or near a utility, such as gas, telephone, television, electric power, water, sewer, or irrigation system, and such operations may cause damage or inconvenience, suspend operations until arrangements necessary for protection have been made by Contractor.
7. Notify property owners and utility offices that may be affected by construction operation at least 2 days in advance: Before exposing a utility, obtain utility owner's permission. Should service of utility be interrupted due to Contractor's operation, notify proper authority immediately. Cooperate with said authority in restoring service as promptly as possible and bear costs incurred.
8. Do not impair operation of existing sewer system. Prevent construction material, pavement, concrete, earth, volatile and corrosive wastes, and other debris from entering sewers, pump stations, or other sewer structures.
9. Maintain original Site drainage wherever possible.

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B. Site Security:

1. Maintain existing fencing currently installed at each of the existing pump stations throughout construction period.
2. Provide and maintain additional temporary security fences as necessary to protect the Work and Contractor-furnished products not yet installed.

C. Finished Construction: Protect finished concrete floors/surfaces exposed as well as those that are to be covered by equipment.

D. Waterways: Keep ditches, culverts, and natural drainages continuously free of construction materials and debris.

3.03 STORAGE YARDS AND BUILDINGS

A. Temporary Storage Yards: Storage space on all the existing pump station Sites except the Six Flags Pump Station Site is limited. The Six Flags Pump Station and surrounding area is within the flood plain of the Chattahoochee River and that any stored material is subject to inundation during flood events. If considered necessary, provide off site temporary facilities or yards for storage of products that are not subject to damage by weather conditions.

B. Temporary Storage Facilities:

1. Provide environmental control systems that meet recommendations of manufacturers of equipment and materials stored.
2. Arrange or partition to provide security of contents and ready access for inspection and inventory.
3. Store combustible materials (paints, solvents, fuels) in a well-ventilated and remote building meeting safety standards.

3.04 PARKING AREAS

A. Control vehicular parking to preclude interference with public traffic or parking, access by emergency vehicles, Owner's operations, or construction operations. There is limited space for parking on each of the Sites, and six of the Sites are in residential areas. Contractor shall minimize parking facilities for personnel working on a pump station Site to suit the location and adjacent areas.

3.05 CLEANING DURING CONSTRUCTION

A. In accordance with General Conditions, as may be specified in other Specification sections, and as required herein.

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- B. Wet down exterior surfaces prior to sweeping to prevent blowing of dust and debris. At least weekly, sweep areas within facility floors (concrete pads, covers, platforms, walkways, roof surfaces etc.), and pick up and dispose of debris.
- C. Provide approved containers for collection and disposal of waste materials, debris, and rubbish at each pump station facility for the duration of the Work at that facility. At least weekly, dispose of such waste materials, debris, and rubbish offsite.
- D. At least weekly, brush sweep entry drive, roadways, and other streets and walkways affected by the Work and where adjacent to the Work.

END OF SECTION

SECTION 01600 - PRODUCT REQUIREMENTS**PART 1 - GENERAL****1.01 SUMMARY**

Section Includes:

1. General product requirements, including:
 - a. General specification requirements for all products.
 - b. Product options.
 - c. Procedures for substitution requests.
2. General procedures for products including:
 - a. Procedures for transportation and handling.
 - b. Procedures for delivery and receiving.
 - c. Procedures for storage.

1.02 DEFINITIONS

Damage: Any sort of deterioration whether due to weather, normal wear and tear, accident, or abuse, resulting in soiling, marring, breakage, corrosion, rotting, or impairment of function.

1.03 SUBMITTALS

- A. Schedule of Products: Submit for approval.
- B. Final Schedule of Products: Submit for project record.

PART 2 - PRODUCTS**2.01 GENERAL**

- A. Components required to be supplied in quantity within a specification section shall be identical, interchangeable, and made by the same manufacturer.
- B. Do not use products removed from existing construction, unless specifically permitted by the contract documents or approved by the **Owner**.
- C. When material or equipment is specified by reference to two (2) or more brand names or catalog numbers, it shall be understood that these references are for the purpose of defining the performance, or other salient requirements, and that other materials or equipment, of equal capacities, quality and function, shall be considered by the **Owner** upon the **Contractor's** request for substitution.
- D. If material or equipment is specified by only one patent or proprietary name or by the name of only one manufacturer, it is for the purpose of standardization, or because the **Owner** knows of no equal.

- E. Any material, article or equipment of other manufacturers and vendors, which will perform adequately the duties imposed by the general design, will be considered equally acceptable provided the material, article or equipment so proposed, is in the opinion of the **Owner**, of equal substance and function. It shall not be purchased or installed by the **Contractor** without the **Owner's** written approval.

PART 3 - EXECUTION

3.01 PRODUCT OPTIONS

- A. It is the **Contractor's** responsibility to select products which comply with the contract documents and which are compatible with one another, with existing work, and with products selected by other contractors.
- B. Do not use any substitute products which have not been approved in accordance with the requirements of the contract documents.
- C. Definition of Substitute Product: Any product which does not meet the requirements of the contract documents, whether in product characteristics, performance, quality, or manufacturer or brand names, is considered a substitute.
- D. Product Options: Where products are specified using more than one method, such as description with a manufacturer list, use a product meeting the requirements of both specification methods.
- E. Products Specified by Reference Standard: Use any product meeting the specification.
- F. Products Specified by Description: Use any product meeting the specification.
- G. Products Specified by Performance Requirements: Use any product meeting the specification.
- H. Products Specified by Listing a Brand Name Product as the "Basis of Design": Provide a product equivalent to the product specified within the limits of variation specified. Use of a product other than that specified constitutes a representation by the **Contractor** that he will comply with all the conditions specified for acceptance of substitutions.
- I. Language indicating that substitutions are not allowed includes:
 1. "Provide one of the following products."
 2. "Provide products made by one of the manufacturers listed."
 3. "Provide products complying with the contract documents and made by one of the following."
 4. "No substitutions."
 5. Other similar language.
- J. Language indicating that substitutions are allowed includes:
 1. Substitutions will be considered.
 2. "... will be among those considered acceptable."
 3. Other similar language.

3.02 PRODUCT SUBSTITUTION

- A. Reference the General Conditions – Section 00700 4.05 (Requests for Substitution).
- B. Submission of request for substitution shall constitute a representation that the **Contractor**:
 - 1. Has investigated the proposed product and determined that it is equal to or better than the specified product.
 - 2. Will provide the same warranty for the proposed product as for the specified product.
 - 3. Will coordinate the installation and make other changes which may be required for the work to be complete in all respects, including:
 - a. Redesign.
 - b. Additional components and capacity required by other work affected by the change.
- C. Substitutions will not be considered when:
 - 1. Acceptance would require substantial revision of the contract documents.
 - 2. They are indicated or implied on shop drawing or product data submittals without separate written request.
- D. Substitution Request Submission:
 - 1. Submit 3 copies of each request and accompanying data.
 - 2. Submit all requests on a standard form.
 - 3. Only one request for substitution will be considered for each product.
- E. Data Required with Substitution Request: Submit written request with complete data substantiating compliance of the proposed product with the requirements of the Contract Documents. Provide at least the following data:
 - 1. Identify product by specification section and paragraph number.
 - 2. Manufacturer's name and address, trade name and model number of product (if applicable), and name of fabricator or supplier (if applicable).
 - 3. Complete product data.
 - 4. A list of other projects on which the proposed product has been used, with project name, the design professional's name, and **Owner** contact.
 - 5. An itemized comparison of the proposed product to the specified product.
 - 6. Net amount of change to the contract sum.
 - 7. List of maintenance services and replacement materials available.
 - 8. Statement of the effect of the substitution on the construction schedule.
 - 9. Description of changes that will be required in other work or products if the substitute product is approved.

3.03 SCHEDULE OF PRODUCTS

- A. Prepare a complete schedule of products used, including the following for each product:
 - 1. Manufacturer's name.
 - 2. Brand or trade name.
 - 3. Model number, if applicable.

- 4. Reference standard, if more than one is applicable.
 - 5. Arrange products in the schedule by specification sections; indicate paragraph where specified.
- B.** Schedule of products shall not be used to obtain approval of substitute products; make separate request for substitution.

3.04 TRANSPORTATION AND HANDLING

- A.** Require supplier to package finished products in a manner which will protect from damage during shipping, handling, and storage.
- B.** Transport products by methods which avoid damage.
- C.** Deliver in dry, undamaged condition in manufacturer's unopened packaging.
- D.** Provide equipment and personnel adequate to handle products by methods which prevent damage.
- E.** Provide additional protection during handling where necessary to prevent damage to products and packaging.
- F.** Lift large and heavy components at designated lift points only.

3.05 DELIVERY AND RECEIVING

- A.** If storage area is not available on site, arrange deliveries so that storage is not required.
- B.** Arrange deliveries of products to allow time for inspection prior to installation.
- C.** Coordinate delivery to avoid conflict with the work and to take into account both the conditions at the site and the availability of personnel, handling equipment, and storage space.
- D.** Clearly mark partial deliveries to identify contents, to permit easy accumulation of entire delivery, and to facilitate assembly.
- E.** Promptly inspect shipments and remedy damage, incorrect quantity, incompleteness, improper or illegible labeling, and noncompliance with requirements of contract documents and approved submittals.

3.06 STORAGE

- A.** If authorized by the **Owner**, partial payment may be made for off-site storage of products. The **Contractor** shall provide evidence of full coverage insurance for any products stored at a facility outside of the project site.

B. General Storage Procedures:

1. Store products immediately on delivery.
2. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible.
3. Store in a manner to prevent damage to the stored products and to the work.
4. Store moisture-sensitive products in weathertight enclosures.
5. Store indoors if necessary to keep temperature and humidity within ranges required by manufacturer.
6. Store unpacked and loose products on shelves, in bins, or in neat groups of like items.
7. Arrange storage to provide access for inspection and inventory.
8. Periodically inspect and remedy damage and noncompliance with required conditions.

END OF SECTION 01600

**SECTION 01611
ANCHORAGE AND BRACING**

PART 1 GENERAL

1.01 SUMMARY

- A. This section covers requirements for anchorage and bracing of equipment, distribution systems, and other nonstructural components required in accordance with the ICC 2018 International Building Code (IBC), for seismic, wind, gravity, soil, and operational loads.

1.02 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
 - 1. American Institute of Steel Construction (AISC) 360, Specification for Structural Steel Buildings.
 - 2. American Society of Civil Engineers (ASCE): ASCE 7, Minimum Design Loads for Buildings and Other Structures.
 - 3. International Code Council (ICC): International Building Code (IBC).

1.03 DEFINITIONS

- A. Authority Having Jurisdiction (AHJ): Permitting building agency; may be a federal, state, local, or other regional department, or individual including building official, fire chief, fire marshal, chief of a fire prevention bureau, labor department, or health department, electrical inspector; or others having statutory authority. AHJ may be Owner when authorized to be self-permitting by governmental permitting agency or when no governmental agency has authority.
- B. Designated Seismic System: Architectural, electrical, and mechanical system or their components for which component importance factor is greater than 1.0.

1.04 DESIGN AND PERFORMANCE REQUIREMENTS

- A. General:
 - 1. Anchorage and bracing systems shall be designed by a qualified professional engineer registered in the State of Georgia.
 - 2. Design anchorage into concrete including embedment in accordance with ACI 318-14; Chapter 17 (or other industry standard approved by Engineer), and Project Specifications.
 - a. Unless otherwise noted, design for cracked concrete condition.

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3. Design anchorage and bracing of architectural, mechanical, and electrical components and systems in accordance with this section, unless a design is specifically provided within Contract Documents or where exempted hereinafter.
4. Design attachments, braces, and anchors for equipment, components, and distribution systems to structure for gravity, seismic, wind, and operational loading.
5. Architectural Components: Includes, but are not limited to, nonstructural walls and elements, partitions, cladding and veneer, access flooring, signs, cabinets, suspended ceilings, and glass in glazed curtain walls and partitions.
6. Provide supplementary framing where required to transfer anchorage and bracing loads to structure.
7. Adjust equipment pad sizes or provide additional anchorage confinement reinforcing to provide required anchorage capacities.
8. Anchor existing equipment as noted on Drawings.
9. Design anchorage and bracing for mechanical, and electrical components:
 - a. Equipment and components that weigh more than 800 pounds and have center of mass located more than 4 feet above adjacent finished floor.
 - b. Mechanical and electrical components that are not provided with flexible connections between components and associated ductwork, piping, or conduit.
10. For components exempted from design requirements of this section, provide bolted, welded, or otherwise positively fastened attachments to supporting structure.

B. Design Loads:

1. Gravity: Design anchorage and bracing for self-weight and superimposed loads on components and equipment.
2. Wind: Design anchorage and bracing for wind criteria provided on General Structural Notes on Drawings for fabricated structures, exposed architectural components and exterior and wind-exposed mechanical and electrical equipment. Alternately, manufacturer certification may be provided for components such as roofing and flashing to verify attachments meet Project-specific design criteria.
3. Operational:
 - a. For loading supplied by equipment manufacturer for IBC required load cases.
 - b. Loads may include equipment vibration, torque, thermal effects, effects of internal contents (weight and sloshing), water hammer, and other load-inducing conditions.

- c. Locate braces to minimize vibration to or movement of structure.
 - d. For vibrating loads, use anchors meeting requirements of Section 05019, Post-Installed Anchors, for anchors with designated capacities for vibratory loading per manufacturer's ICC-ES report.
4. Seismic:
- a. In accordance with 2018 IBC, Section 1613, and Chapter 13 of ASCE 7.
 - b. Design anchorage and bracing for design criteria listed on General Structural Notes on Drawings.

1.05 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:
- a. Manufacturers' engineered seismic and non-seismic hardware product data.
 - b. Attachment assemblies' drawings; include connection hardware, braces, and anchors or anchor bolts.
 - c. List of existing architectural, mechanical, and electrical equipment or components to be modified in Project requiring Contractor-designed anchorage and bracing in final retrofitted condition.
 - d. Submittal will be rejected if proposed anchorage method would create excessive stress to supporting member. Revise anchorages and strengthen structural support to eliminate overstressed condition.

B. Informational Submittals:

- 1. Anchorage and Bracing Calculations: For attachments, braces, and anchorages, include IBC and Project-specific criteria as noted on General Structural Notes on Drawings, in addition to manufacturer's specific criteria used for design; sealed by a Civil Engineer registered in the State of Georgia.
- 2. Manufacturer's hardware installation requirements.

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1.06 SOURCE QUALITY CONTROL

- A. Contractor and s\Supplier responsibilities to accommodate Owner-furnished shop fabrication related special inspections and testing are provided in Project's Statement of Special Inspections in Supplement located at the end of Section 01451, Quality Assurance and Inspection.
- B. Provide all other specified, regulatory required, or required repair verification inspection and testing that is not listed in Statement of Special Inspections in accordance with Section 01450, Contractor Quality Control.

PART 2 PRODUCTS

2.01 GENERAL

- A. Design and construct attachments and supports transferring seismic and non-seismic loads to structure of materials and products suitable for application and in accordance with design criteria shown on Drawings and nationally recognized standards.
- B. Provide post-installed concrete and masonry anchors for anchorage of equipment to concrete or masonry in accordance with Section 05019, Post-Installed Anchors. Provide post-installed anchors of the size, minimum embedment, and spacing designated in calculations submitted by Contractor and accepted by Engineer.
- C. Do not use powder-actuated fasteners or sleeve anchors for seismic attachments and anchorage where resistance to tension loads is required. Do not use expansion anchors, other than undercut anchors, for non-vibration isolated mechanical equipment rated over 10 horsepower.

PART 3 EXECUTION

3.01 GENERAL

- A. Make attachments, bracing, and anchorage in such a manner that component lateral force is transferred to structure through a complete load path.
- B. Design, provide, and install overall anchorage system to provide restraint in all directions, including vertical, for each component or system so anchored.

- C. Calculations shall limit anchor bolt concrete edge distance to a maximum of 4 inches or as required to provide sufficient anchor bolt capacity to resist the applied loads.
- D. Do not attach architectural, mechanical, or electrical components to more than one element of a building structure at a single restraint location where such elements may respond differently during a seismic event. Do not make such attachments across building expansion and contraction joints.

3.02 INSTALLATION

- A. Do not install components or their anchorages or restraints prior to review and acceptance by Engineer and AHJ.
- B. Notify Engineer upon completion of installation of seismic restraints in accordance with Section 01451, Quality Assurance and Inspection.

3.03 FIELD QUALITY ASSURANCE AND QUALITY CONTROL

- A. In accordance with Section 05019, Post-Installed Anchors.
- B. Owner-Furnished Quality Assurance, in accordance with IBC Chapter 17 requirements, is provided in Statement of Special Inspections Plan in Supplement located at end of Section 01451, Quality Assurance and Inspection. Contractor responsibilities and related information are included in Section 01451, Quality Assurance and Inspection.
- C. Provide any other specified, regulatory required, or required repair verification inspection and testing that is not listed in Statement of Special Inspections in accordance with Section 01450, Contractor Quality Control.

END OF SECTION

**SECTION 01640
MANUFACTURERS' SERVICES**

PART 1 GENERAL

1.01 DEFINITIONS

- A. Person-Day: One person for 8 hours within regular Contractor working hours.

1.02 SUBMITTALS

- A. Informational Submittals: Training Schedule (if required): Submit, in accordance with requirements of this Specification, not less than 21 days prior to start of equipment installation and revise as necessary for acceptance.

1.03 QUALIFICATION OF MANUFACTURER'S REPRESENTATIVE

- A. Authorized representative of the manufacturer, factory trained, and experienced in the technical applications, installation, operation, and maintenance of respective equipment, subsystem, or system, with full authority by the equipment manufacturer to issue the certifications required of the manufacturer. Additional qualifications may be specified in the individual Specification section.
- B. Representative subject to acceptance by Owner and Engineer. No substitute representatives will be allowed unless prior written approval by such has been given.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 FULFILLMENT OF SPECIFIED MINIMUM SERVICES

- A. Furnish manufacturers' services, when required by an individual Specification section, to meet the requirements of this section.
- B. Where time is necessary in excess of that stated in the Specifications for manufacturers' services, or when a minimum time is not specified, time required to perform specified services shall be considered incidental.
- C. Schedule manufacturer' services to avoid conflict with other onsite testing or other manufacturers' onsite services.
- D. Determine, before scheduling services, that conditions necessary to allow successful testing have been met.

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- E. Only those days of service approved by Engineer will be credited to fulfill specified minimum services.
- F. When specified in individual Specification sections, manufacturer's onsite services shall include:
 - 1. Assistance during product (system, subsystem, or component) installation to include observation, guidance, instruction of Contractor's assembly, erection, installation or application procedures.
 - 2. Inspection, checking, and adjustment as required for product (system, subsystem, or component) to function as warranted by manufacturer and necessary to furnish Manufacturer's Certificate of Proper Installation.
 - 3. Providing, on a daily basis, copies of manufacturers' representatives field notes and data to Engineer.
 - 4. Revisiting the Site as required to correct problems and until installation and operation are acceptable to Engineer.
 - 5. Resolution of assembly or installation problems attributable to or associated with respective manufacturer's products and systems.
 - 6. Assistance during functional and performance testing, and facility startup and evaluation.
 - 7. Training of Owner's personnel in the operation and maintenance of respective product as required.

3.02 MANUFACTURER'S CERTIFICATE OF PROPER INSTALLATION

- A. A Manufacturer's Certificate of Proper Installation form, a copy of which is attached to this section, shall be completed and signed by equipment manufacturer's representative for each new standby diesel generator and pump installation.
- B. Such form shall certify signing party is a duly authorized representative of manufacturer, is empowered by manufacturer to inspect, approve, and operate their equipment and is authorized to make recommendations required to ensure equipment is complete and operational.

3.03 TRAINING

- A. General:
 - 1. Furnish manufacturers' representatives for detailed classroom and hands-on training to Owner's personnel on operation and maintenance of specified product (system, subsystem, component) and as may be required in applicable Specifications.

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2. Furnish trained, articulate personnel to coordinate and expedite training, to be present during training coordination meetings with Owner, and familiar with operation and maintenance manual information specified in Section 01730, Operation and Maintenance Data.
3. Manufacturer's representative shall be familiar with facility operation and maintenance requirements as well as with specified equipment.
4. Furnish complete training materials, to include operation and maintenance data, to be retained by each trainee.

B. Training Schedule:

1. List specified equipment and systems that require training services and show:
 - a. Respective manufacturer.
 - b. Estimated dates for installation completion.
 - c. Estimated training dates.
2. Allow for multiple sessions when several shifts are involved.
3. Adjust schedule to ensure training of appropriate personnel as deemed necessary by Owner, and to allow full participation by manufacturers' representatives. Adjust schedule for interruptions in operability of equipment.
4. Coordinate with Section 01810, Equipment Testing and Facility Startup.

C. Prestartup Training:

1. Coordinate training sessions with Owner's operating personnel and manufacturers' representatives, and with submission of operation and maintenance manuals in accordance with Section 01730, Operation and Maintenance Data.
2. Complete at least 5 days prior to beginning of facility startup.

D. Post-startup Training: If required in Specifications, furnish and coordinate training of Owner's operating personnel by respective manufacturer's representatives.

E. Recording of Training Sessions:

1. Furnish recording of prestartup and post-startup instruction sessions, including manufacturers' representatives' hands-on equipment instruction.
2. Use DVD format suitable for playback on standard equipment available commercially in the United States. Blu-ray® DVD format is not acceptable without Engineer's prior approval.

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3.04 SUPPLEMENTS

A. The supplement listed below, following “End of Section,” is part of this Specification.

1. Manufacturer’s Certificate of Proper Installation.

END OF SECTION

MANUFACTURER'S CERTIFICATE OF PROPER INSTALLATION

OWNER _____ EQPT SERIAL NO: _____

EQPT TAG NO: _____ EQPT/SYSTEM: _____

PROJECT NO: _____ SPEC. SECTION: _____

I hereby certify that the above-referenced equipment/system has been:

(Check Applicable)

- ☐ Installed in accordance with Manufacturer's recommendations.
- ☐ Inspected, checked, and adjusted.
- ☐ Serviced with proper initial lubricants.
- ☐ Electrical and mechanical connections meet quality and safety standards.
- ☐ All applicable safety equipment has been properly installed.
- ☐ Functional tests.
- ☐ System has been performance tested, and meets or exceeds specified performance requirements. (When complete system of one manufacturer)

Note: Attach any performance test documentation from manufacturer.

Comments: _____

I, the undersigned Manufacturer's Representative, hereby certify that I am (i) a duly authorized representative of the manufacturer, (ii) empowered by the manufacturer to inspect, approve, and operate their equipment and (iii) authorized to make recommendations required to ensure equipment furnished by the manufacturer is complete and operational, except as may be otherwise indicated herein. I further certify that all information contained herein is true and accurate.

Date: _____, 20____

Manufacturer: _____

By Manufacturer's Authorized Representative: _____
(Authorized Signature)

SECTION 01720 - PROJECT RECORD DOCUMENTS**PART 1 - GENERAL****1.01 SUMMARY**

Record documents refer to those documents maintained and annotated by the **Contractor** during construction to provide a record of the Work as installed. The Record Drawings are defined as a neatly and legibly marked set of Contract Drawings showing the final location of piping, valves, fittings, and equipment. The Record Drawings shall show field changes, changes by change order, and details not shown on the original Contract Drawings.

1.02 SUBMITTALS

Submit one set of Record Drawings and one copy of the Record Survey (if required) in accordance with General Requirements (00700, 6.05). The **Owner** may withhold declaring the project substantially complete and shall withhold Final Payment until acceptable Record Drawings are submitted.

1.03 QUALITY ASSURANCE

- A.** The Record Drawings shall be maintained continuously. Prior to each request for partial progress payment, the **Owner** may review the Record Drawings with the **Contractor**. Progress payments may be withheld or reduced if Record Drawings are not current.

PART 2 - PRODUCTS (NOT USED)**PART 3 - EXECUTION****3.01 GENERAL**

- A.** Unless otherwise required, the Record Drawings shall be a full-size set of the Contract Drawings maintained in a clean, dry and legible condition. Each Drawing shall be marked "RECORD DRAWING" in large, clear print. Annotations on the drawings should be made with red pencil or red ink. Record Drawings shall not be used for construction purposes.
- B.** Marking of the Drawings shall be kept current and shall be done at the time the material and equipment are installed. Do not conceal any work until required information is recorded.
- D.** The **Contractor's** name, address and telephone number shall be shown on each sheet. The date(s) of installation of the Work shall also be shown on each sheet of the plan set.

END OF SECTION 01720

SECTION 01730 - OPERATING AND MAINTENANCE DATA SUBMITTALS

PART 1 - GENERAL

1.01 SUMMARY

- A. Compile product data and related information appropriate for **Owner's** maintenance and operation of products furnished under Contract.
- B. Instruct **Owner's** personnel in maintenance of products and in operation of equipment and systems.

1.02 QUALITY ASSURANCE

Preparation of data shall be done by personnel trained and experienced in maintenance and operation of described products. The manual shall be provided in a printed format and an electronic format.

1.03 FORM OF SUBMITTALS

- A. Prepare data in form of an instructional manual for use by **Owner's** personnel as required.
- B. Printed Format:
 - 1. Size: 8-1/2 inches x 11 inches.
 - 2. Paper: 20 pound minimum, white, for typed pages.
 - 3. Text: Manufacturer's printed data, or neatly typewritten.
 - 4. Drawings:
 - a. Provide reinforced punched binder tap, bind in with text.
 - b. Reduce larger drawings and fold to size of text pages but not larger than 11 inches x 17 inches.
 - 5. Provide fly-leaf for each separate product, or each piece of operating equipment.
 - a. Provide typed description of product, and major component parts of equipment.
 - b. Provide indexed tabs.
 - 6. Cover: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". List:
 - a. Title of Project.
 - b. Identity of separate structure as applicable.
 - c. Identity of general subject matter covered in the manual.
 - 7. Binders:
 - a. Commercial quality three post binders with durable, cleanable covers.
 - b. Maximum Post Width: 2 inches.
 - c. Color of binders to be selected by the Owner.
 - d. When multiple binders are used, correlate the data into related consistent groupings.

C. Electronic Format:

1. Operations & Maintenance Manual – The facility O&M manual shall be in PDF format, compliant with the Adobe PDF Specification Version 1.3. The manual shall be PDF Formatted Text and Graphics (formerly Normal) or PDF Searchable Image (formerly Image+Text). If submitted in Searchable Image format the Optical Character Recognition shall be at a 95% confidence level, using Adobe Acrobat® Capture® 3.x or an equivalent product. The manual shall be linked and bookmarked as follows:
 - a. Provide links from all Table of Contents, List of Tables, List of Figures, etc., entries to the actual occurrence in the body of the manual.
 - b. Provide internal links from table, paragraph, or figure references within the body of the manual to the actual table, paragraph, or figure.
 - c. Provide external links from the references within the body of the manual to other documents (vendor manual, photograph, drawing, etc.)
 - d. Create bookmarks for all linked Table of Content entries.
2. Vendor Manuals – The Vendor provided equipment, sub-system, or system manuals shall be in PDF format, compliant with the Adobe PDF Specification Version 1.3. The manual shall be PDF Formatted Text and Graphics (formerly Normal) or PDF Searchable Image (formerly Image+Text). If submitted in Searchable Image format the Optical Character Recognition shall be at a 95% confidence level, using Adobe Acrobat® Capture® 3.x or an equivalent product. The manuals shall be linked and bookmarked as follows:
 - a. Provide links from all Table of Contents, List of Tables, List of Figures, etc., entries to the actual occurrence in the body of the manual.
 - b. Create bookmarks for all linked Table of Content entries.
3. Drawings – All facility drawings shall be in PDF format, compliant with the Adobe PDF Specification Version 1.3. The manual shall be PDF Formatted Text and Graphics (formerly Normal) or PDF Searchable Image (formerly Image+Text). If submitted in Searchable Image format the Optical Character Recognition shall be at a 95% confidence level, using Adobe Acrobat® Capture® 3.x or an equivalent product. The drawings shall be linked as follows:
 - a. External links from the Drawing Index (if it exists) to each drawing.
 - b. External links from references within drawings to other drawings.
4. Drawings (CAD) – All facility drawings available in native format (i.e. AutoCAD) shall be provided as electronic files, in a native format supported by available viewers.
5. Photographs – Any available digital photographs that support facility operations and maintenance shall be provided in JPEG format.
6. Videos – Any available videos that support facility operations and maintenance shall be provided in AVI or MOV format.
7. Other – Any other documents that support facility operations and maintenance manual shall be in PDF format, compliant with the Adobe PDF Specification Version 1.3. The manual shall be PDF

Formatted Text and Graphics (formerly Normal) or PDF Searchable Image (formerly Image+Text). If submitted in Searchable Image format the Optical Character Recognition shall be at a 95% confidence level, using Adobe Acrobat® Capture® 3.x or an equivalent product. The manual shall be linked and bookmarked per paragraph 1.03.C.2.

1.04 CONTENT OF MANUAL

- A.** Neatly typewritten table of contents for each volume, arranged in systematic order.
 - 1. Design/Builder, name of responsible principal, address and telephone number.
 - 2. A list of each product required to be included, indexed to content of the volume.
 - 3. List, with each product, name, address and telephone number of:
 - a. Subcontractor or installer.
 - b. Maintenance Contractor, as appropriate.
 - c. Identify area of responsibility of each.
 - d. Local source of supply for parts and replacement.
 - 4. Identify each product by product name and other identifying symbols as set forth in Contract Documents.
- B.** Product Data:
 - 1. Include only those sheets which are pertinent to the specific product.
 - 2. Annotate each sheet to:
 - a. Clearly identify specific product or part installed.
 - b. Clearly identify data applicable to installation.
 - c. Delete references to inapplicable information.
- C.** Drawings:
 - 1. Supplement product data with drawings as necessary to clearly illustrate:
 - a. Relations and component parts of equipment and systems.
 - b. Control and flow diagrams.
 - 2. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.
 - 3. Do not use Project Record Documents as maintenance drawings.
- D.** Written text, as required to supplement product data for the particular installation:
 - 1. Organize in consistent format under separate headings for different procedures.
 - 2. Provide logical sequence of instructions of each procedure.
- E.** Copy of each warranty, bond and service contract issued.
 - 1. Provide information sheet for **Owner's** personnel, give:
 - a. Proper procedures in event of failure.
 - b. Instances which might affect validity of warranties or bonds.

1.05 SUBMITTAL SCHEDULE

- A.** Submit two copies (printed and electronics) of the Operation and Maintenance Manuals to the **Owner** for review no later than sixty days prior to the anticipated date for start-up of the equipment. Applications for Payment will not be processed if timely submittals are not made.
- B.** Submit two copies (printed and electronic) of the final Operation and Maintenance Manuals, incorporating any review comments by the **Owner**. The final Application for Payment will not be processed until the proper material is submitted.

1.06 INSTRUCTION OF OWNER'S PERSONNEL

Prior to inspection for substantial completion, fully instruct **Owner's** designated operating and maintenance personnel in operation, adjustment and maintenance of products, equipment and systems supplied under this Contract.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01730

SECTION 01730 - OPERATING AND MAINTENANCE DATA**PART 1 - GENERAL****1.01 SUMMARY**

- A.** Compile product data and related information appropriate for **Owner's** maintenance and operation of products furnished under Contract.
- B.** Instruct **Owner's** personnel in maintenance of products and in operation of equipment and systems.

1.02 QUALITY ASSURANCE

Preparation of data shall be done by personnel trained and experienced in maintenance and operation of described products. The manual shall be provided in a printed format and an electronic format.

1.03 FORM OF SUBMITTALS

- A.** Prepare data in form of an instructional manual for use by **Owner's** personnel as required.
- B.** Printed Format:
 - 1. Size: 8-1/2 inches x 11 inches.
 - 2. Paper: 20 pound minimum, white, for typed pages.
 - 3. Text: Manufacturer's printed data, or neatly typewritten.
 - 4. Drawings:
 - a. Provide reinforced punched binder tap, bind in with text.
 - b. Reduce larger drawings and fold to size of text pages but not larger than 11 inches x 17 inches.
 - 5. Provide fly-leaf for each separate product, or each piece of operating equipment.
 - a. Provide typed description of product, and major component parts of equipment.
 - b. Provide indexed tabs.
 - 6. Cover: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". List:
 - a. Title of Project.
 - b. Identity of separate structure as applicable.
 - c. Identity of general subject matter covered in the manual.
 - 7. Binders:
 - a. Commercial quality three post binders with durable, cleanable covers.
 - b. Maximum Post Width: 2 inches.
 - c. Color of binders to be selected by the **Owner**.
 - d. When multiple binders are used, correlate the data into related consistent groupings.

C. Electronic Format:

1. Operations & Maintenance Manual – The facility O&M manual shall be in PDF format, compliant with the Adobe PDF Specification Version 1.3. The manual shall be PDF Formatted Text and Graphics (formerly Normal) or PDF Searchable Image (formerly Image+Text). If submitted in Searchable Image format the Optical Character Recognition shall be at a 95% confidence level, using Adobe Acrobat® Capture® 3.x or an equivalent product. The manual shall be linked and bookmarked as follows:
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 - b. Provide internal links from table, paragraph, or figure references within the body of the manual to the actual table, paragraph, or figure.
 - c. Provide external links from the references within the body of the manual to other documents (vendor manual, photograph, drawing, etc.)
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 - a. Provide links from all Table of Contents, List of Tables, List of Figures, etc., entries to the actual occurrence in the body of the manual.
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3. Drawings – All facility drawings shall be in PDF format, compliant with the Adobe PDF Specification Version 1.3. The manual shall be PDF Formatted Text and Graphics (formerly Normal) or PDF Searchable Image (formerly Image+Text). If submitted in Searchable Image format the Optical Character Recognition shall be at a 95% confidence level, using Adobe Acrobat® Capture® 3.x or an equivalent product. The drawings shall be linked as follows:
 - a. External links from the Drawing Index (if it exists) to each drawing.
 - b. External links from references within Drawings to other drawings.
4. Drawings (CAD) – All facility drawings available in native format (i.e. AutoCAD) shall be provided as electronic files, in a native format supported by available viewers.
5. Photographs – Any available digital photographs that support facility operations and maintenance shall be provided in JPEG format.

6. Videos – Any available videos that support facility operations and maintenance shall be provided in AVI or MOV format.
7. Other – Any other documents that support facility operations and maintenance manual shall be in PDF format, compliant with the Adobe PDF Specification Version 1.3. The manual shall be PDF Formatted Text and Graphics (formerly Normal) or PDF Searchable Image (formerly Image+Text). If submitted in Searchable Image format the Optical Character Recognition shall be at a 95% confidence level, using Adobe Acrobat® Capture® 3.x or an equivalent product. The manual shall be linked and bookmarked per paragraph 1.03.C.2.

1.04 CONTENT OF MANUAL

- A. Neatly typewritten table of contents for each volume, arranged in systematic order.
 1. Design/Builder, name of responsible principal, address and telephone number.
 2. A list of each product required to be included, indexed to content of the volume.
 3. List, with each product, name, address and telephone number of:
 - a. Subcontractor or installer.
 - b. Maintenance **Contractor**, as appropriate.
 - c. Identify area of responsibility of each.
 - d. Local source of supply for parts and replacement.
 4. Identify each product by product name and other identifying symbols as set forth in Contract Documents.
- B. Product Data:
 1. Include only those sheets which are pertinent to the specific product.
 2. Annotate each sheet to:
 - a. Clearly identify specific product or part installed.
 - b. Clearly identify data applicable to installation.
 - c. Delete references to inapplicable information.
- C. Drawings:
 1. Supplement product data with drawings as necessary to clearly illustrate:
 - a. Relations and component parts of equipment and systems.
 - b. Control and flow diagrams.
 2. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.
 3. Do not use Project Record Documents as maintenance drawings.
- D. Written text, as required to supplement product data for the particular installation:
 1. Organize in consistent format under separate headings for different procedures.
 2. Provide logical sequence of instructions of each procedure.

- E. Copy of each warranty, bond and service contract issued.
 - 1. Provide information sheet for **Owner's** personnel, give:
 - a. Proper procedures in event of failure.
 - b. Instances which might affect validity of warranties or bonds.

1.05 SUBMITTAL SCHEDULE

- A. Submit two copies (printed and electronics) of the Operation and Maintenance Manuals to the **Owner** for review no later than sixty days prior to the anticipated date for start-up of the equipment. Applications for Payment will not be processed if timely submittals are not made.
- B. Submit two copies (printed and electronic) of the final Operation and Maintenance Manuals, incorporating any review comments by the **Owner**. The final Application for Payment will not be processed until the proper material is submitted.

1.06 INSTRUCTION OF OWNER'S PERSONNEL

Prior to inspection for substantial completion, fully instruct **Owner's** designated operating and maintenance personnel in operation, adjustment and maintenance of products, equipment and systems supplied under this Contract.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01730

SECTION 01740 - WARRANTIES AND BONDS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Compile specified warranties and bonds.
- B. Co-execute submittals when so specified.
- C. Review submittals to verify compliance with Contract Documents.
- D. Submit to the **Owner** for review.

1.02 SUBMITTAL REQUIREMENTS

- A. Assemble warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors.
- B. Number of original signed copies required: Two each.

1.03 FORM OF SUBMITTALS

- A. Prepare in duplicate packets.
- B. Format:
 - 1. Size 8-1/2 inches x 11 inches, punch sheets for standard 3-post binder.
 - a. Fold larger sheets to fit into binders.
 - 2. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS." List:
 - a. Title of Project.
 - b. Name of Contractor.
- C. Binders: Commercial quality, three-post binder, with durable and cleanable plastic covers and maximum width of 2 inches.

1.04 WARRANTY REQUIREMENTS

- A. For all major pieces of equipment, submit a warranty from the equipment manufacturer. The manufacturer's warranty period shall be concurrent with the **Contractor's** for one (1) year commencing at the time of acceptance by the **Owner**.
- B. The **Contractor** shall be responsible for obtaining certificates for equipment warranty for all major equipment specified herein which lists for more than \$1,000. The **Owner** reserves the right to request warranties for equipment not classified as major. The **Contractor** shall still warrant equipment not considered to be "major" in the **Contractor's** one-year warranty period even though certificates of warranty may not be required.
- C. Equipment shall be warranted to be free from defects in workmanship, design, and materials. If any part of the equipment should fail during the warranty period, it

shall be replaced and the equipment restored to service at no expense to the **Owner**.

- D. The manufacturer's warranty period shall run concurrently with the **Contractor's** warranty or guarantee period. No exception to this provision shall be allowed.
- E. Upon determination that work covered by a warranty has failed, replace or rebuild the work to an acceptable condition complying with requirements of Contract Documents. The **Contractor** is responsible for the cost of replacing or rebuilding defective work regardless of whether the **Owner** has benefited from use of the work through a portion of its anticipated useful service life.
- F. When correcting warranted work that has failed, remove and replace other work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted work.
- G. When work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- H. Written warranties made to the **Owner** are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
- I. The **Owner** reserves the right to reject warranties and to limit selections to Products with warranties not in conflict with requirements of the Contract Documents.
- J. The **Owner** reserves the right to refuse to accept work for the project where a special warranty, certification, or similar commitment is required on such work or part of the work, until evidence is presented that entities required to countersign such commitments are willing to do so.
- K. Manufacturer's disclaimers and limitations on product warranties do not relieve the **Contractor** of the warranty on the work that incorporates the products, nor does it relieve suppliers, manufacturers and subcontractors required to countersign special warranties with the **Contractor**.
- L. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the **Owner**.
- M. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the **Owner**.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01740

**SECTION 01810
EQUIPMENT TESTING AND FACILITY STARTUP**

PART 1 GENERAL

1.01 DEFINITIONS

- A. Facility: Entire Project, or an agreed-upon portion, including all of its unit processes.
- B. Functional Test: Test or tests in presence of Engineer and Owner to demonstrate that installed equipment meets manufacturer's installation, calibration, and adjustment requirements and other requirements as specified.
- C. Performance Test: Test or tests performed after any required functional test in presence of Engineer and Owner to demonstrate and confirm individual equipment meets performance requirements specified in individual sections.
- D. Unit Process: As used in this section, a unit process is a portion of the facility that performs a specific process function.
- E. Facility Performance Demonstration:
 - 1. A demonstration, conducted by Contractor, with assistance of Owner, to demonstrate and document the performance of the entire operating facility, both manually and automatically (if required), based on criteria developed in conjunction with Owner and as accepted by Engineer.
 - 2. Such demonstration is for the purposes of (i) verifying to Owner entire facility performs as a whole, and (ii) documenting performance characteristics of completed facility for Owner's records. Neither the demonstration nor the evaluation is intended in any way to make performance of a unit process or entire facility the responsibility of Contractor, unless such performance is otherwise specified.

1.02 SUBMITTALS

- A. Informational Submittals:
 - 1. Facility Startup and Performance Demonstration Plan.
 - 2. Functional and performance test results.
 - 3. Completed Unit Process Startup Form for each unit process.
 - 4. Completed Facility Performance Demonstration/Certification Form.

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1.03 FACILITY STARTUP AND PERFORMANCE DEMONSTRATION PLAN

- A. Develop a written plan, in conjunction with Owner's operations personnel; to include the following:
 - 1. Step-by-step instructions for startup of each unit process and the complete facility.
 - 2. Unit Process Startup Form (sample attached), to minimally include the following:
 - a. Description of the unit process, including equipment numbers/nomenclature of each item of equipment and all included devices.
 - b. Detailed procedure for startup of the unit process, including valves to be opened/closed, order of equipment startup, etc.
 - c. Startup requirements for each unit process, including water, power, chemicals, etc.
 - d. Space for evaluation comments.
 - 3. Facility Performance Demonstration/Certification Form (sample attached), to minimally include the following:
 - a. Description of unit processes included in the facility startup.
 - b. Sequence of unit process startup to achieve facility startup.
 - c. Description of computerized operations, if any, included in the facility.
 - d. Contractor certification facility is capable of performing its intended function(s), including fully automatic operation.
 - e. Signature spaces for Contractor and Engineer.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

- A. Facility Startup Meetings: Schedule, in accordance with requirements of Section 01200, Project Meetings, to discuss test schedule, test methods, materials, chemicals and liquids required, facilities operations interface, and Owner involvement.
- B. Contractor's Testing and Startup Representative:
 - 1. Designate and furnish one or more personnel to coordinate and expedite testing and facility startup.
 - 2. Representative(s) shall be present during startup meetings and shall be available at all times during testing and startup.

- C. Provide temporary valves, gauges, piping, test equipment and other materials and equipment required for testing and startup.
- D. Provide Subcontractor and equipment manufacturers' staff adequate to prevent delays. Schedule ongoing work so as not to interfere with or delay testing and startup.
- E. Owner will:
 - 1. Provide water, power, chemicals, and other items as required for startup, unless otherwise indicated.
 - 2. Operate process units and facility with support of Contractor.
 - 3. Provide labor and materials as required for laboratory analyses.

3.02 EQUIPMENT TESTING

- A. Preparation:
 - 1. Complete installation before testing.
 - 2. Furnish qualified manufacturers' representatives, when required by individual Specification sections.
 - 3. Obtain and submit from equipment manufacturer's representative Manufacturer's Certificate of Proper Installation Form, in accordance with Section 01640, Manufacturers' Services, when required by individual Specification sections.
 - 4. Equipment Test Report Form: Provide written test report for each item of equipment to be tested, to include the minimum information:
 - a. Owner/Project Name.
 - b. Equipment or item tested.
 - c. Date and time of test.
 - d. Type of test performed (Functional or Performance).
 - e. Test method.
 - f. Test conditions.
 - g. Test results.
 - h. Signature spaces for Contractor and Engineer as witness.
 - 5. Cleaning and Checking: Prior to beginning functional testing:
 - a. Calibrate testing equipment in accordance with manufacturer's instructions.
 - b. Inspect and clean equipment, devices, connected piping, and structures to ensure they are free of foreign material.
 - c. Lubricate equipment in accordance with manufacturer's instructions.
 - d. Turn rotating equipment by hand when possible to confirm that equipment is not bound.

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- e. Open and close valves by hand and operate other devices to check for binding, interference, or improper functioning.
 - f. Check power supply to electric-powered equipment for correct voltage.
 - g. Adjust clearances and torque.
 - h. Test piping for leaks.
6. Ready-to-test determination will be by Engineer based at least on the following:
- a. Acceptable Operation and Maintenance Data.
 - b. Notification by Contractor of equipment readiness for testing.
 - c. Receipt of Manufacturer's Certificate of Proper Installation, if so specified.
 - d. Adequate completion of work adjacent to, or interfacing with, equipment to be tested.
 - e. Availability and acceptability of manufacturer's representative, when specified, to assist in testing of respective equipment.
 - f. Satisfactory fulfillment of other specified manufacturer's responsibilities.
 - g. Equipment and electrical tagging complete.
 - h. Delivery of all spare parts and special tools.

B. Functional Testing:

- 1. Conduct as specified in individual Specification sections.
- 2. Notify Owner and Engineer in writing at least 10 days prior to scheduled date of testing.
- 3. Prepare Equipment Test Report summarizing test method and results.
- 4. When, in Engineer's opinion, equipment meets functional requirements specified, such equipment will be accepted for purposes of advancing to performance testing phase, if so required by individual Specification sections. Such acceptance will be evidenced by Engineer/Owner's signature as witness on Equipment Test Report.

C. Performance Testing:

- 1. Conduct as specified in individual Specification sections.
- 2. Notify Engineer and Owner in writing at least 10 days prior to scheduled date of test.
- 3. Performance testing shall not commence until equipment has been accepted by Engineer as having satisfied functional test requirements specified.
- 4. Type of fluid, gas, or solid for testing shall be as specified.

5. Unless otherwise indicated, furnish labor, materials, and supplies for conducting the test and taking samples and performance measurements.
6. Prepare Equipment Test Report summarizing test method and results.
7. When, in Engineer's opinion, equipment meets performance requirements specified, such equipment will be accepted as to conforming to Contract requirements. Such acceptance will be evidenced by Engineer's signature on Equipment Test Report.

3.03 STARTUP OF UNIT PROCESSES

- A. Prior to unit process startup, equipment within unit process shall be accepted by Engineer as having met functional and performance testing requirements specified.
- B. Startup sequencing of unit processes shall be as chosen by Contractor to meet schedule requirements.
- C. Make adjustments, repairs, and corrections necessary to complete unit process startup.
- D. Startup shall be considered complete for each pump, when, in opinion of Engineer, each unit has operated continuously for 48 consecutive hours without significant interruption. This period is in addition to functional or performance test periods specified elsewhere. The performance testing associated with each of the proposed pumps aligns with the requirement that only one pump at each pump station can be taken out of service at any point in time. The associated pump must be tested and accepted by the Owner before any subsequent pumps at that particular pump station can be taken out of service.
- E. Startup of the generators and ATS shall be undertaken once all Work requiring electrical power at the pump station has been completed. Startup shall be considered complete for each generator, when, in opinion of Engineer, each generator has operated continuously for 48 consecutive hours without significant interruption. This period is in addition to functional or performance test periods specified elsewhere.
- F. Significant Interruption: May include any of the following events:
 1. Failure of Contractor to provide and maintain qualified onsite startup personnel as scheduled.
 2. Failure to meet specified functional operation for more than 2 consecutive hours.
 3. Failure of any critical equipment or unit process that is not satisfactorily corrected within 5 hours after failure.

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4. Failure of any noncritical equipment or unit process that is not satisfactorily corrected within 8 hours after failure.
 5. As determined by Engineer.
- G. A significant interruption will require startup then in progress to be stopped. After corrections are made, startup test period to start from beginning again.

3.04 FACILITY PERFORMANCE DEMONSTRATION

- A. When, in the opinion of Engineer, startup of all unit processes has been achieved, sequence each unit process to the point that facility is operational.
- B. Demonstrate proper operation of required interfaces within and between individual unit processes.
- C. After facility is operating, complete performance testing of equipment and systems not previously tested.
- D. Document, as defined in Facility Startup and Performance Demonstration Plan, the performance of the facility including its computer system, until all existing and new raw sewage pumps and the associated pump station control are operable and under control when on mains or standby electrical power.
- E. Certify, on the Facility Performance Demonstration/Certification Form, that facility is capable of performing its intended function(s), including fully automatic operation.

3.05 SUPPLEMENTS

- A. Supplements listed below, following “End of Section,” are a part of this Specification:
 1. Unit Process Startup Form.
 2. Facility Performance Demonstration/Certification Form.

END OF SECTION

UNIT PROCESS STARTUP FORM

OWNER:_____ **PROJECT:**_____

Unit Process Description: (Include description and equipment number of all equipment and devices):

Startup Procedure (Describe procedure for sequential startup and evaluation, including valves to be opened/closed, order of equipment startup, etc.):

Startup Requirements (Water, power, chemicals, etc.):_____

Evaluation Comments:_____

FACILITY PERFORMANCE DEMONSTRATION/CERTIFICATION FORM

OWNER: _____ **PROJECT:** _____

Unit Processes Description (List unit processes involved in facility startup):

Unit Processes Startup Sequence (Describe sequence for startup, including computerized operations, if any):

Contractor Certification that Facility is capable of performing its intended function(s), including fully automatic operation:

Contractor: _____ **Date:** _____, 20__

Engineer: _____ **Date:** _____, 20__
(Authorized Signature)

DIVISION 2

SITE WORK

SECTION 02750 – BYPASS PUMPING

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Provide all materials, labor, and equipment to install, test, and maintain a temporary by-pass pumping system for the purpose of all diverting sewer flows around the work area.
- B. It is imperative that the functioning of the wastewater collection system be maintained throughout the construction period. A reliable temporary by-pass pumping system must be provided to ensure uninterrupted sewer service in the area.

1.02 RELATED WORK

- A. Section 01500: Temporary Facilities and Controls

1.03 UNIT RESPONSIBILITY

The by-pass pumps, piping, and associated accessories shall be provided by a single supplier to ensure a completely integrated and functional system.

1.04 SUBMITTALS

- A. Submittals shall be made in accordance with Section 01300 Submittals
- B. The Contractor shall develop a by-pass pumping plan, provide all equipment necessary for by-pass pumping, and maintain the equipment throughout the duration of the work. The Contractor shall submit the by-pass pumping plan, including all product and design data and operating calculations, to CCWS Engineering for verification. The by-pass pumping plan shall include the following information as a minimum:
 - 1. By-pass pump sizing criteria (i.e. force main size and length, static and dynamic head, flow velocity, maximum wastewater level depths in manholes upstream of by-pass pump operations) and resulting capacity, number of each size to be on site, and power/fuel requirements.
 - 2. Pump curves showing the pump operating range shall be submitted.
 - 3. Method of noise control for each pump and/or generator; calculations demonstrating the expected attenuated noise levels (in decibels) at nearest residence.
 - 4. Staging area for pumps and piping.

5. Number, size, material, location, and method of installation of suction and discharge piping; sewer plugging method and types of plugs; thrust and restraint block sizes and locations; temporary pipe supports and anchoring.
6. Schedule for installation and maintenance of by-pass pumping system.

1.05 ENVIRONMENTAL PROTECTION

- A. The Contractor shall take necessary precautions to ensure that by-pass operations do not result in sewer overflows, sewer backups, or related threats to the public health and do not cause flooding or damage to public or private property.
- B. The pumped sewage shall be in an enclosed hose or pipe that is adequately protected from traffic and shall be redirected to the sanitary sewer system. The dumping or free flow of sewage on public and private property, gutters, streets, sidewalks, or into storm sewers is prohibited.
- C. Should any liquid or solid matter from the sewer collection system be spilled, discharged, leaked, or otherwise deposited to the environment, the Contractor shall immediately clean and disinfect the affected area and notify the Owner.
- D. Any sewer overflows, backups, leaks, or property damage resulting from improper setup or failure of the by-pass pumping system shall be the responsibility of the Contractor. The Contractor shall be responsible for any fines, for the complete clean up of such spills, and for restoration of damaged property at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 BY-PASS PUMPS

- A. The by-pass pumps used shall be fully automatic, self-priming or submersible units. The pumps shall possess dry-running capabilities or dry running protection to accommodate the diurnal, cyclic nature of wastewater flow.
- B. By-pass pumps shall be of sufficient capacity to accommodate the daily peak sanitary sewer flows plus any additional flows due to rain events.

- C. The by-pass pumps may be driven by either electric motor or diesel engine.
 - 1. Diesel engines must be provided with acoustic enclosures to minimize noise.
 - 2. The Contractor is responsible for providing all necessary and required power and control wiring and associated electrical devices when using electric motors.
- D. Unless otherwise specified or approved by the Owner, the pumping equipment shall be sound attenuated; noise levels shall not exceed 75 decibels at 23 feet.
- E. The Contractor shall also provide a back up, on-site by-pass pumping system that will automatically energize upon a high water level, indicating the failure of the primary by-pass pumping unit. The back-up system shall be equal in all respects to the primary system.
- F. The Contractor shall provide all signal wiring and connections from the by-pass pump system to the existing local SCADA panel. The Contractor shall make any temporary provisions to keep the existing SCADA panel operational while by-pass pumping, including, but not limited to, supports and electrical and signal wiring. The Contractor shall notify the Water System's Water Protection Division Information Technology Group prior to making final connections to the SCADA panel. The following signals will be provided to the SCADA panel:
 - 1. Primary by-pass pump: On/Off
 - 2. Back-up by-pass pump: On/Off
 - 3. High water level
- G. The by-pass pump equipment supplier shall provide technical support and service 24 hours/day, 7 days/week.

PART 3 - EXECUTION

3.01 BY-PASS PUMPING

- A. The Contractor shall coordinate the by-pass pump installation and start-up with the Owner, specifically to include Water Protection Division personnel.
 - 1. A minimum of 48 hours advance written notice must be given before starting by-pass operations. The by-pass pumping system must be tested for a minimum of 24 hours without incident prior to taking any part of the collection system, including pump stations, out of service; any incident shall restart the test period. By-pass operations may not start or restart on Fridays.

2. The Owner reserves the right to delay the start of by-pass operations (e.g. in the event of forecasted adverse weather).
- B. The complete by-pass pumping system shall be inspected daily by qualified personnel.
 - C. The Contractor assumes operational responsibility of the affected portions of the collection system throughout the duration of by-pass pumping operations. The Contractor shall be on-call at all times to respond to all alarm conditions and/or failure of the by-pass pumping system.
 - D. The by-pass pumping system shall remain on-site for immediate connection and use, if necessary, until the start-up testing period (24 hour minimum) for the completed work has been successfully completed.

END OF SECTION 02750

SECTION 02821
CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. ASTM International (ASTM):
 - a. A121, Standard Specification for Metallic-Coated Carbon Steel Barbed Wire.
 - b. A313/A313M, Standard Specification for Stainless Steel Spring Wire.
 - c. A392, Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
 - d. A491, Standard Specification for Aluminum-Coated Steel Chain-Link Fence Fabric.
 - e. A497/A497M, Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
 - f. A615/A615M, Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - g. A780, Standard Specification for Repair of Damaged and Uncoated Areas of Hot-Dipped Galvanized Coatings.
 - h. A824, Standard Specification for Metallic-Coated Steel Marcellled Tension Wire for Use with Chain Link Fence.
 - i. A1011/A1011M, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
 - j. C94/C94M, Standard Specification for Ready-Mixed Concrete.
 - k. C150, Standard Specification for Portland Cement.
 - l. C387, Standard Specifications for Packaged, Dry, Combined Materials for Mortar and Concrete.
 - m. F552, Standard Terminology Relating to Chain Link Fencing.
 - n. F567, Standard Practice for Installation of Chain-Link Fence.
 - o. F626, Standard Specification for Fence Fittings.
 - p. F668, Standard Specification for Polyvinyl Chloride (PVC) and Other Organic Polymer-Coated Steel Chain-Link Fence Fabric.
 - q. F900, Standard Specification for Industrial and Commercial Swing Gates.
 - r. F934, Standard Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials.
 - s. F1043, Standard Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.

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- t. F1083, Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
- u. F1183, Standard Specifications for Aluminum Alloy Chain Link Fence Fabric.
- v. F1184, Standard Specifications for Industrial and Commercial Horizontal Slide Gates.
- w. F1379, Standard Terminology Relating to Barbed Tape.
- x. F1911, Standard Practice for Installation of Barbed Tape.
- y. F1916, Standard Specification for Selecting Chain Link Barrier Systems with Coated Chain Link Fence Fabric and Round Posts for Detention Applications.
- 2. Institute of Electrical and Electronic Engineers (IEEE), Inc.: C2, National Electrical Safety Code.
- 3. National Electrical Manufacturers Association (NEMA): 250, Enclosures for Electrical Equipment (1,000 volts max.).

1.02 DEFINITIONS

- A. Terms as defined in ASTM F552.

1.03 SUBMITTALS

- A. Action Submittals:

- 1. Shop Drawings:
 - a. Product Data: Include construction details, material descriptions, dimensions of individual components, and finishes for chain link fences and gates.
 - 1) Fence, gate posts, rails, and fittings.
 - 2) Chain link fabric.
 - 3) Gates and hardware.
- 2. Samples:
 - a. Chain Link Fabric: Approximately 6 inches square.
 - b. Posts, Rails, Braces, Wire, and Ties: Approximately 6 inches long.
 - c. Fittings: 1 each.
 - d. Vinyl or Polymer Coated Fabric Including Manufacturer's Color Selections: Approximately 6 inches square.
- 3. Test Reports: Field test result for compliance of installation of chain link fence and gates.

- B. Informational Submittals:

- 1. Manufacturer's recommended installation instructions.
- 2. Evidence of Supplier and installer qualifications.

1.04 QUALITY ASSURANCE

- A. Design, supply of equipment and components, installation, and on-call service shall be product of individual company with record of installations meeting requirements specified.
- B. Preinstallation Conference: Conduct conference at project Site with fence installer to verify layout and gate location and operation.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Site in undamaged condition. Store materials off the ground to provide protection against oxidation caused by ground contact.

1.06 SCHEDULING AND SEQUENCING

- A. Complete necessary Site preparation and grading before installing chain link fence and gates.
- B. Interruption of Existing Utility Service: Notify owner of utility 72 hours prior to interruption of any utility services. Do not proceed with interruption of utility service without written permission from utility owner.

1.07 SPECIAL GUARANTEE

- A. Provide manufacturer's extended guarantee or warranty, with Owner named as beneficiary, in writing, as special guarantee. Special guarantee shall provide for correction, or at the option of the Owner, removal and replacement of the following items found defective during a period of 5 years after the date of Substantial Completion. Duties and obligations for correction or removal and replacement of defective Work shall be as specified in the General Conditions.
 - 1. Faulty operations of gate.
 - 2. Deterioration of metals, vinyl finishes, and other materials beyond normal weathering.
 - 3. Deflection of fence fabric beyond limits.

PART 2 PRODUCTS

2.01 GENERAL

- A. Match style, finish, and color of each fence component with that of other fence components.

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2.02 CHAIN LINK FENCE FABRIC

- A. Vinyl-coated conforming to ASTM F668, Class 1 or Class 2a over metallic-coated steel wire.
 - 1. Color: Brown, complying with ASTM F934.
- B. Height: 84 inches, unless otherwise shown.
- C. Core Wire Gauge: No. 9.
- D. Pattern: 2-inch diamond or square-mesh.
- E. Diamond Count: Manufacturer's standard and consistent for fabric furnished of same height.
- F. Wires of Twisted Selvages:
 - 1. Twisted in a closed helix three full turns.
 - 2. Cut at an angle to provide sharp barbs that extend minimum 1/4 inch beyond twist.

2.03 POSTS

- A. General:
 - 1. Strength and Stiffness Requirements: ASTM F1043, light industrial fence, except as modified in this section.
 - 2. Round Steel Pipe, Schedule 40: ASTM F1083.
 - 3. Roll-Formed Steel Shapes: Roll-formed from ASTM A1011/A1011M, Grade 45, High-Strength Low-Alloy steel.
 - 4. Lengths: Manufacturer's standard with allowance for minimum embedment below finished grade of 34 inches.
 - 5. Color Coating: ASTM F1043, minimum 10 mils thickness over zinc coating to match color of chain link fabric.
- B. Line Posts:
 - 1. Round Steel Pipe:
 - a. Outside Diameter: 3.0 inches.
 - b. Weight: 2.96 pounds per foot.

C. End, Corner, Angle, and Pull Posts:

1. Round Steel Pipe:
 - a. Outside Diameter: 4.0 inches.
 - b. Weight: 6.56 pounds per foot.

D. Posts for Horizontal Sliding Gates:

1. ASTM F1184, Type II, Class 1.
2. Round Steel Pipe:
 - a. Outside Diameter: 4.0 inches.
 - b. Weight: 6.56 pounds per foot.
3. Guide posts for Class 1 horizontal-slide gates, equal gate post height, one size smaller, but weight is not less than 3.11 pounds per foot, installed adjacent to gate post to permit gate to slide in space between.

2.04 TOP AND BRACE RAILS

- A. Vinyl Top Rail: See attachment at the end of document for sizing.
- B. Protective Coatings: As specified for posts.
- C. Color Coating: Vinyl.
- D. Strength and Stiffness Requirements: ASTM F1043, top rail, light industrial fence.

2.05 FENCE FITTINGS

- A. General: In conformance with ASTM F626, except as modified by this article.
- B. Post and Line Caps: Designed to accommodate passage of top rail through cap, where top rail required.
- C. Tension and Brace Bands: No exceptions to ASTM F626.
- D. Tension Bars:
 1. One-piece vinyl-clad.
 2. Length not less than 2 inches shorter than full height of chain link fabric.
 3. Provide one bar for each gate and end post, and two for each corner and pull post.

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- E. Truss Rod Assembly: 3/8-inch diameter, steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.
- F. Tie Wires, Clips, and Fasteners: According to ASTM F626.
- G. Barbed Wire Supporting Arms: Pressed steel or cast iron with clips, slots, or other means for attaching strands of barbed wire integral with post cap for each post, with single 45-degree arms for supporting three strands of barbed wire. Arms shall withstand 250 pounds of downward pull at outermost ends of the arms without failure.

2.06 TENSION WIRE

- A. Coating: Vinyl.

2.07 BARBED WIRE

- A. Vinyl-Coated Steel Barbed Wire.

2.08 GATES

- A. General:
 - 1. Gate Operation: Opened and closed easily by one person.
 - 2. Metal Pipe and Tubing: Galvanized steel. Comply with ASTM F1043 and ASTM F1083 for materials and protective coatings.
 - 3. Frames and Bracing: Fabricate members from round galvanized steel tubing with outside dimension and weight according to ASTM F900.
 - 4. Gate leaves more than 8-feet wide shall have intermediate tubular members and diagonal truss rods to provide rigid construction, free from sag or twist.
 - 5. Gate Fabric Height: Same as for adjacent fence height.
 - 6. Welded Steel Joints: Paint with zinc-based paint.
 - 7. Chain Link Fabric: Attached securely to gate frame at intervals not exceeding 15 inches.
 - 8. Gate Posts and Frame Members: Extend gateposts and frame end members above top of chain-link fabric at both ends of gate frame to attach barbed wire assemblies.
 - 9. Latches: Arranged for padlocking so padlock will be accessible from both sides of gate.

B. Cantilever Horizontal Sliding Gates:

1. Comply with ASTM F1184 for single slide gate types II, Class 2 with external roller assemblies.
2. Cantilever Gate Support Posts: Spaced on maximum 12-foot centers.

2.09 CONCRETE

- A. Materials: ASTM C387, packaged, dry, combined ingredients with Type I cement.
- B. Mixing: In a clean metal container, mix package of dry materials by hand or machine. Following manufacturer's instructions, add clean water in sufficient quantity to produce a slump of 2 inches to 3 inches.

2.10 FENCE GROUNDING

- A. Conductors: Bare, solid wire for 6 AWG and smaller; stranded wire for 4 AWG and larger.
1. Material above Finished Grade: Copper.
 2. Material on or below Finished Grade: Copper.
 3. Bonding Jumpers: Braided copper tape, 1-inch wide, woven of 30 AWG bare copper wire, terminated with copper ferrules.
- B. Connectors and Grounding Rods: Comply with UL 467.
1. Connectors for Below-Grade Use: Exothermic welded type.
 2. Grounding Rods: Copper-clad steel.

PART 3 EXECUTION

3.01 PREFERRED INSTALLERS

- A. The Following are preferred in fencing contractors:
1. Groover Fence Co.
 2. Mauldin & Cook Fence Co.
 3. Martin-Robbins Fence Co. Inc.

3.02 GENERAL

- A. Install chain link fences and gates in accordance with ASTM F567, except as modified in this section, and in accordance with fence manufacturer's recommendations, as approved by Engineer. Erect fencing in straight lines between angle points.

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- B. Provide necessary hardware for a complete fence and gate installation.
- C. Any damage to galvanized surfaces, including welding, shall be repaired with paint containing zinc dust in accordance with ASTM A780.
- D. Drainage Crossings: Where the chain-link fence must cross drainage ditches or swales, the main fence shall be carried across a ditch or swale with additional fence added below.
 - 1. Frames and Bracing: The fence added below shall be fabricated with galvanized round steel pipe conforming to the requirements for top and brace rails.
 - 2. The construction of the frame shall be welded or assembled with corner fittings. The frame shall be rigid and to the extent necessary to maintain a 2-inch clearance between bottom of the frame and finish grade. If necessary to maintain rigidity, attach to the frame a series of 3/8-inch diameter galvanized steel pipe stakes that are embedded a minimum of 2 feet to the sides and bottom of the ditch.
 - 3. Attach chain link fabric securely to frame at intervals not exceeding 12 inches.

3.03 PREPARATION

- A. Clear area on either side of fence, Site Clearing. Eliminate ground surface irregularities along fence line to the extent necessary to maintain a 2-inch clearance between bottom of fabric and finish grade.
- B. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.
- C. Embedment Coating: Coat portion of galvanized or aluminum-coated steel posts that will be embedded in concrete. Extend coating 1 inch above top of concrete.

3.04 POST SETTING

- A. Drill or hand-excavate holes for posts to diameters and spacing indicated, in firm, undisturbed soil. Driven posts are not acceptable. Postholes shall be clear of loose materials. Waste materials from postholes shall be removed from Site or regraded into slopes on Site.

- B. Posthole Depth:
 - 1. Minimum 3 feet below finished grade.
 - 2. 2 inches deeper than post embedment depth below finish grade.
- C. Set posts with minimum embedment below finished grade of 34 inches and with top rail at proper height above finished grade. Verify posts are set plumb, aligned, and at correct height and spacing. Brace posts, as necessary, to maintain correct position and plumbness until concrete sets.
- D. Backfill postholes with concrete to 2 inches above finished grade. Vibrate or tamp concrete for consolidation. Protect above ground portion of posts from concrete splatter.
- E. Before concrete sets, crown and finish top of concrete to readily shed water.
- F. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more.
- G. Line Posts: Space line posts uniformly at 10 feet on centers between terminal end, corner, and gate posts.

3.05 POST BRACING

- A. Install according to ASTM F567, maintaining plumb position, and alignment of fencing. Install braces at gate, end, pull, and corner posts diagonally to adjacent line posts to ensure stability. Install braces on both sides of corner and pull posts.
 - 1. Locate horizontal braces at mid-height of fabric or higher, on fences with top rail, and 2/3-fabric height on fences without top rail. Install so posts are plumb when diagonal truss rod assembly is under proper tension.

3.06 TOP RAILS

- A. Install according to ASTM F567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps and terminating into rail end attached to posts or posts caps fabricated to receive rail at terminal posts. Install top rail sleeves with springs at 105 feet maximum spacing to permit expansion in rail.

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3.07 BARBED WIRE SUPPORTING ARMS

- A. Barbed wire supporting arms shall be installed as indicated and as recommended by manufacturer. Bolt or rivet supporting arm to top of post in a manner to prevent easy removal with hand tools. Angle single arms to outside of fence.

3.08 TENSION WIRE

- A. Install according to ASTM F567 and ASTM F1916, maintaining plumb position and alignment of fencing. Pull wire taut, without sags. Fasten fabric to tension wire with tie wires at a maximum spacing of 24 inches on center.
- B. Install tension wire within 6 inches of bottom of fabric and tie to each post with not less than same diameter and type of wire.

3.09 CHAIN LINK FABRIC

- A. Do not install fabric until concrete has cured minimum 7 days.
- B. Install fabric with twisted and barbed selvage at top.
- C. Apply fabric to outside of enclosing framework. Pull fabric taut to provide a smooth and uniform appearance free from sag, without permanently distorting fabric diamond or reducing fabric height. Tie fabric to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.
- D. Splicing shall be accomplished according to ASTM F1916 by weaving a single picket into the ends of the rolls to be joined.
- E. Leave 2 inches between finish grade or surface and bottom selvage, unless otherwise indicated.
- F. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15 inches on center.
- G. Tie Wires: Fasten ties to wrap a full 360 degrees around rail or post and a minimum of one complete diamond of fabric. Twist ends of tie wire three full twists, and cut off protruding ends to preclude untwisting by hand.
 - 1. Maximum Spacing: Tie fabric to line posts at 12 inches on center and to brace and top rails at 24 inches on center.

3.10 BARBED WIRE

- A. Install barbed wire uniformly in configurations of three strands of barbed wire on supporting arms. Pull wire taut and install securely to supporting arms and secure to end terminal post or terminal arms.

3.11 GATES

- A. Install gates according to manufacturer's written instructions, level, plumb and secure for full opening without interference. Attach fabric and hardware to gate using tamper-resistant or concealed means. Adjust hardware for smooth operation and lubricate where necessary so gates operate satisfactorily from open or closed position.
- B. Set gate stops in concrete to engage center drop rod or plunger bar.

3.12 ELECTRICAL GROUNDING

- A. Ground fences at a maximum interval of 1,000 feet in accordance with applicable requirements of IEEE C2, National Electrical Safety Code.
- B. Protection at Crossings of Overhead Electrical Power Lines: Ground fence at location of crossing and at a maximum distance of 150 feet on each side of crossing.
- C. Grounding Method: At each grounding location, drive a grounding rod vertically until top is 6 inches below finished grade. Connect rod to fence with 6 AWG conductor. Connect conductor to each fence component at grounding location.

3.13 FIELD QUALITY CONTROL

- A. Post and Fabric Testing: Test fabric tension and line post rigidity according to ASTM F1916.
- B. Gate Tests:
 - 1. Prior to acceptance of installed gates, demonstrate proper operation of gates under each possible open and close condition specified.
 - 2. Adjust gate to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range.
 - 3. Confirm that latches and locks engage accurately and securely without forcing and binding.

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3.14 MANUFACTURER'S SERVICES

- A. Provide manufacturer's representative at Site in accordance with Section 01640, Manufacturers' Services, to train Owner's personnel to adjust, operate, and maintain gates.

3.15 CLEANUP

- A. Remove excess fencing materials and other debris from Site.

END OF SECTION

DIVISION 3

CONCRETE

**SECTION 03310
STRUCTURAL CONCRETE**

PART 1 GENERAL

1.01 GENERAL

- A. Work shall conform to requirements of ACI 301, Specifications for Structural Concrete, unless otherwise specified.

1.02 REFERENCES

- A. In accordance with ACI 301 and the following:
 - 1. American Concrete Institute (ACI):
 - a. 301, Specifications for Structural Concrete.
 - b. 305.1, Specification for Hot Weather Concreting.
 - c. 306.1, Specification for Cold Weather Concreting.
 - d. 308.1, Specification for Curing Concrete.
 - e. SP-66, Detailing Manual.
 - 2. ASTM International (ASTM):
 - a. C1260, Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method).
 - b. D1056, Specification for Flexible Cellular Materials—Sponge or Expanded Rubber.
 - 3. Concrete Reinforcing Steel Institute (CRSI):
 - a. Manual of Standard Practice.Placing Reinforcing Bars.
 - b. ANSI/CRSI – RB 4.1, CRSI Standard for Supports for Reinforcement Used in Concrete.
 - 4. Corps of Engineers (COE): CRD-C-572, Corps of Engineers Specifications for Polyvinylchloride Waterstop.
 - 5. National Ready Mixed Concrete Association (NRMCA).

1.03 DEFINITIONS

- A. Cold Weather: When ambient temperature is below 40 degrees F or is approaching 40 degrees F and falling.

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- B. Defective Area: Surface defects that include honeycomb, rock pockets, indentations, and surface voids greater than 3/16-inch deep, surface voids greater than 3/4 inch in diameter, cracks in liquid containment structures and below grade habitable spaces that are 0.005-inch wide and wider, spalls, chips, embedded debris, sand streaks, mortar leakage from form joints, deviations in formed surface that exceed specified tolerances and include but are not limited to fins, form pop-outs, and other projections. At exposed concrete, defective areas also include texture irregularities, stains, and other color variations that cannot be removed by cleaning.
- C. Exposed Concrete: Concrete surface that can be seen inside or outside of structure regardless of whether concrete is above water, dry at all times, or can be seen when structure is drained.
- D. Hot Weather: As defined in ACI 305.1.
- E. Hydraulic Structure: Liquid containment structure.
- F. New Concrete: Concrete less than 60 days old.
- G. Top Bars: Horizontal bars placed such that 12 inches of fresh concrete is cast below in single placement.

1.04 SUBMITTALS

- A. Action Submittals:
 - 1. Shop Drawings:
 - a. Formwork and Formwork Accessories: Unless otherwise specified, conform to requirements of ACI 301.
 - b. Reinforcing steel prepared in accordance with CRSI Manual of Standard Practice and ACI SP-66 Detailing Manual:
 - 1) Bending lists.
 - 2) Placing drawings.
 - c. Construction Joints, Expansion Joints, and Control Joints: Layout and location for each type.
 - 2. Mix Design:
 - a. Contain proportions of materials and admixtures to be used on Project, signed by mix designer.
 - b. Documentation of average strength for each proposed mix design in accordance with ACI 301.
 - c. Manufacturer's Certificate of Compliance, in accordance with Division 01, General Requirements, for the following:
 - 1) Portland cement.
 - 2) Fly ash.

- 3) Slag cement.
 - 4) Aggregates, including specified class designation for coarse aggregate.
 - 5) Admixtures.
 - 6) Concrete producer has verified compatibility of constituent materials in design mix.
- d. Test Reports:
- 1) Cement: Chemical analysis report.
 - 2) Supplementary Cementitious Materials: Chemical analysis report and report of other specified test analyses.
 - 3) Aggregates:
 - a) Deleterious substances in fine aggregate per ASTM C33/C33M, Table 2.
 - b) Deleterious substances in coarse aggregate per ASTM C33/C33M, Table 4.
 - 4) Water-Soluble Chloride-Ion Content in Hardened Concrete: One of the following:
 - a) Test report in accordance with ASTM C1218/C1218M at an age between 28 days and 42 days.
 - b) Calculation of water-soluble chloride content based on certified chloride content of each constituent material and proportion of constituent material in concrete mixture.
 - c) All of the following:
 - (1) Manufacturer's Certificate of Compliance that each admixture does not intentionally add chlorides and/or that the chloride content of each admixture does not exceed trace amounts.
 - (2) Verification that potable water is used in the concrete mix or test data documenting the chloride content of the water.
 - (3) Letter from the concrete supplier stating that fine and coarse aggregates are from sources that are not known to be susceptible to chlorides in the aggregates.
 - 5) Alkali Aggregate Reactivity: Where required, in accordance with Article Concrete Mix Design. Include documentation of test results per applicable standards.
- e. Product Data:
- 1) Admixtures: Manufacturer's product data sheets for each admixture used in proposed mix designs.

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3. Detailed plan for curing and protection of concrete placed and cured in cold weather. Details shall include, but not be limited to, the following:
 - a. Procedures for protecting subgrade from frost and accumulation of ice or snow on reinforcement, other metallic embeds, and forms prior to placement.
 - b. Documentation of embeds that must be at a temperature above freezing prior to placement of concrete.
 - c. Procedures for measuring and recording temperatures of reinforcement and other embedded items prior to concrete placement.
 - d. Methods for temperature protection during placement.
 - e. Types of covering, insulation, housing, or heating to be provided.
 - f. Curing methods to be used during and following protection period.
 - g. Use of strength accelerating admixtures.
 - h. Methods for verification of in-place strength.
 - i. Procedures for measuring and recording concrete temperatures.
 - j. Procedures for preventing drying during dry, windy conditions.
4. Detailed plan for hot-weather placements including curing and protection for concrete placed in ambient temperatures over 80 degrees F. Plan shall include, but not be limited to, the following:
 - a. Procedures for measuring and recording temperatures of reinforcement and other embedded items prior to concrete placement.
 - b. Use of retarding admixture.
 - c. Methods for controlling temperature of reinforcement and other embedded items and concrete materials before and during placement.
 - d. Types of shading and wind protection to be provided.
 - e. Curing methods, including use of evaporation retardant.
 - f. Procedures for measuring and recording concrete temperatures.
 - g. Procedures for preventing drying during dry, windy conditions.
5. Concrete repair techniques.

B. Informational Submittals:

1. Preinstallation Conference minutes.
2. Manufacturer's application instructions for bonding agent and bond breaker.
3. Manufacturer's Certificate of Compliance to specified standards:
 - a. Bonding agent.
 - b. Bond breaker.
 - c. Repair materials.

4. Statement of Qualification:
 - a. Batch Plant: Certification as specified herein.
 - b. Mix designer.
 - c. Installer.
 - d. Testing agency.
5. Concrete Delivery Tickets:
 - a. For each batch of concrete before unloading at Site.
 - b. In accordance with ASTM C94/C94M, including Requirement 14.2.1. through Requirement 14.2.10.
 - c. Indicate amount of mixing water withheld and maximum amount that may be permitted to be added at Site.

1.05 QUALITY ASSURANCE

A. Qualifications:

1. Batch Plant: NRMCA Program for Certification of Ready-Mixed Concrete Production Facilities or approved equivalent program.
2. Mix Designer: Person responsible for developing concrete mixture proportions certified as NRMCA Concrete Technologist Level 2 or DOT certified mix designer in jurisdiction of the Work. Requirement may be waived if individual is Contractor's Licensed Design Engineer.
3. Flatwork Finisher: Unless otherwise permitted, at least one person on finishing crew shall be certified as an ACI Flatwork Finisher, or equivalent.
4. Testing Agency: Unless otherwise permitted, an independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C1077 and ASTM E329 for testing indicated.
 - a. Where field testing is required of Contractor, personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 - b. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician–Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician–Grade II.

B. Preinstallation Conference:

1. Required Meeting Attendees:
 - a. Contractor, including pumping, placing and finishing, and curing subcontractors.
 - b. Ready-mix producer.

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- c. Testing and sampling personnel.
 - d. Engineer who authored Statement of Special Inspection Plan or Engineer's designee.
2. Schedule and conduct prior to incorporation of respective products into Project. Notify Engineer of location and time.
3. Agenda shall include:
 - a. Admixture types, dosage, performance, and redosing at Site.
 - b. Mix designs, test of mixes, and Submittals.
 - c. Placement methods, techniques, equipment, consolidation, and form pressures.
 - d. Slump or slump flow and placement time to maintain slump and slump flow.
 - e. Finish, curing, and water retention.
 - f. Steel reinforcement details.
 - g. Protection procedures for weather conditions.
 - h. Other specified requirements requiring coordination.
4. Conference minutes as specified in Section 01200, Project Meetings.

PART 2 PRODUCTS

2.01 FORMWORK

- A. Form Materials:
 1. For exposed areas, use hard plastic finished plywood, overlaid waterproof particle board, or steel in new and undamaged condition, of sufficient strength and surface smoothness to produce specified finish.
 2. For unexposed areas, use new shiplap or plywood.
 3. Earth cuts may be used for forming footings.
- B. Beveled Edge Corner Strips: Nonabsorbent material, compatible with form surface, fully sealed on all sides prohibiting loss of paste or water between the two surfaces.
- C. Form Ties:
 1. Material: Steel.
 2. Spreader Inserts:
 - a. Conical or spherical type.
 - b. Design to maintain positive contact with forming material.
 - c. Furnish units that will leave no metal closer than 1-1/2 inches to concrete surface when forms, inserts, and tie ends are removed.

3. Wire ties not permitted.
4. Form Ties with Water Stop: For water-holding structures, basements, pipe galleries, and accessible spaces below finish grade, furnish one of the following:
 - a. Integral steel waterstop 0.103-inch thick and 0.625-inch diameter tightly and continuously welded to tie.
 - b. Neoprene waterstop 3/16-inch thick and 15/16-inch diameter whose center hole is one half diameter of tie or molded plastic water stop of comparable size.
 - c. Orient waterstop perpendicular to tie and symmetrical about center of tie.
 - d. Design ties to prevent rotation or disturbance of center portion of tie during removal of ends and to prevent water leaking along tie.

2.02 CONCRETE

A. Materials:

1. Cementitious Materials:
 - a. Cement:
 - 1) Portland Cement: Unless otherwise specified, conform to requirements of ASTM C150/C150M.
 - 2) Blended Hydraulic Cement:
 - a) Unless otherwise specified, conform to requirements of ASTM C595/C595M.
 - b) Portland cement used in blended hydraulic cement; conform to requirements of ASTM C150/C150M.
 - 3) Furnish from one source.
 - b. Supplementary Cementitious Materials (SCM):
 - 1) Fly Ash (Pozzolan): Class F and Class C fly ash in accordance with ASTM C618, except as modified herein:
 - a) ASTM C618, Table 1, Loss on Ignition: Unless permitted otherwise, maximum 3 percent.
 - 2) Slag Cement: In accordance with ASTM C989/C989M, Grade 100 or Grade 120.
2. Aggregates: Unless otherwise permitted, furnish from one source for each aggregate type used in a mix design.
 - a. Aggregates:
 - 1) In accordance with ASTM C33/C33M, except as modified herein.
 - a) Class Designation: 4M unless otherwise specified.
 - b) Free of materials and aggregate types causing popouts, discoloration, staining, or other defects on surface of concrete.
 - c) Alkali Silica Reactivity: See Article Concrete Mix Design.

- 2) Fine Aggregates:
 - a) Clean, sharp, natural sand.
 - b) ASTM C33/C33M.
 - c) Limit deleterious substances in accordance with ASTM C33/C33M, Table 2 and as follows:
 - (1) Limit material finer than 75- μ m (No. 200) sieve to 3 percent mass of total sample.
 - (2) Limit coal and lignite to 0.5 percent.
- 3) Coarse Aggregate:
 - a) Natural gravels, combination of gravels and crushed gravels, crushed stone, or combination of these materials containing no more than 15 percent flat or elongated particles (long dimension more than five times the short dimension).
 - b) Limit deleterious substances in accordance with ASTM C33/C33M, Table 4 for specified class designation.
3. Admixtures:
 - a. Characteristics:
 - 1) Compatible with other constituents in mix.
 - 2) Contain at most, only trace amount chlorides in solution.
 - 3) Furnish type of admixture as recommended by manufacturer for anticipated temperature ranges.
 - b. Air-Entraining Admixture: ASTM C260/C260M.
 - c. Water-Reducing Admixture: ASTM C494/C494M, Type A or Type D.
 - d. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - e. Accelerating Admixture: ASTM C 494/C 494M, Type C.
 - f. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F or Type G.
 - g. Plasticizing Admixture: ASTM C1017/C1017M, Type I or Type II.
 - h. Shrinkage Reducing Admixture:
 - 1) Manufacturers and Products:
 - a) BASF Admixtures Inc., Shakopee, MN; MasterLife SRA 20.
 - b) Euclid Chemical Co., Cleveland, OH; Eucon SRA Series.
 - c) W. R. Grace & Co., Cambridge, MA; Eclipse Series.
 - i. Do not use calcium chloride as an admixture.
 - j. Admixtures with no standard, ASTM or other, designation may be used where permitted.

4. Water and Ice: Mixing water for concrete and water used to make ice shall be potable water, unless alternative sources of water are permitted.
 - a. Water from alternative sources shall comply with requirements of ASTM C1602/C1602M, and concentration of chemicals in combined mixing water shall be less than:
 - 1) Chloride Content: 1,000 ppm.
 - 2) Sulfate Content as SO_4 : 3,000 ppm.
 - 3) Alkalis as $(\text{Na}_2\text{O} + 0.658 \text{ K}_2\text{O})$: 600 ppm.
 - 4) Total Solids by Mass: Less than 50,000 ppm.

B. Concrete Mix Design:

1. General:
 - a. See Supplement at the end of this section for mix design requirements for each class of concrete used on Project.
 - b. Prepare design mixtures for each type and strength of concrete, selecting and proportioning ingredients in accordance with requirements of ACI 301, unless otherwise specified.
 - c. Selection of constituent materials and products in mix design are optional, unless specified otherwise.
 - d. Unless otherwise permitted, use water-reducing admixture or water-reducing admixture and high-range, water-reducing admixture, or plasticizing admixture in pumped concrete, in concrete with a water-cementitious materials ratio below 0.50, and in concrete that is part of a liquid-containment structure.
 - e. Unless otherwise permitted, use water-reducing admixture and high-range, water-reducing admixture, or plasticizing admixture in columns, piers, pilasters, and walls.
 - f. Use water-reducing admixture or high-range, water-reducing admixture, or plasticizing admixture to achieve fresh properties that facilitate handling, placing, and consolidating of concrete, and specified hardened properties.
 - g. Use water-reducing and retarding admixture when anticipated high temperatures, low humidity, or other adverse placement conditions can adversely affect fresh properties of concrete.
 - h. Unless otherwise specified, desired fresh properties of concrete shall be determined by Contractor, and coordinated with concrete producer. Fresh properties of concrete shall remain stable to satisfaction of Contractor, for duration of placement and consolidation, and shall remain in conformance with requirements of Contract Documents.
 - i. Contractor is encouraged to consider using environmentally sustainable concrete mix design technologies such as use of supplementary cementitious materials, aggregate packing, and self-consolidating concrete.

2. Potential Alkali-Aggregate Reactivity of Concrete:
 - a. Do not use aggregates known to be susceptible to alkali-carbonate reaction (ACR).
 - b. Unless otherwise specified, or unless members are assigned to Exposure Class C0, use one of the three options below for qualifying concrete mixtures to reduce the potential of alkali-silica reaction. Option 3) shall not be used with natural pozzolans, or fly ash that has a CaO content more than 18 percent, or for aggregates with expansions greater than or equal to 0.24 percent when tested in accordance with ASTM C1293. Fly ash with an alkali content greater than 4.0 percent shall not be used in option 2) or 3).
 - 1) For each aggregate used in concrete, the expansion result determined in accordance with ASTM C1293 shall not exceed 0.04 percent at 1 year.
 - 2) For each aggregate used in concrete, the expansion result of the aggregate and cementitious materials combination determined in accordance with ASTM C1567 shall not exceed 0.10 percent at an age of 16 days. Submit supporting data for each aggregate showing expansion in excess of 0.10 percent at 16 days when tested in accordance with ASTM C1260.
 - 3) Alkali content in concrete (LBA), excluding that from supplementary cementitious materials and the pozzolans and slags in blended cements, shall not exceed 4 lb/yd³ for aggregates with expansions more than or equal to 0.04 percent and less than 0.12 percent or 3 lb/yd³ for aggregates with expansions greater than or equal to 0.12 percent and less than 0.24 percent. Reactivity shall be determined by testing in accordance with ASTM C1293. Alkali content shall be calculated as follows:
 - a) $LBA = (\text{cement content, lb/yd}^3) \times (\text{equivalent alkali content of portland cement in percent}/100 \text{ percent})$.
3. Proportions:
 - a. Design mix to meet aesthetic, durability, and strength requirements.
 - b. Where fly ash is included in mix, minimum fly ash content shall be a minimum of 15 percent of weight of total cementitious materials.

4. Slump:
 - a. Unless otherwise specified, and prior to submitting mix design, select a target slump at the point of delivery for concrete mixtures used for Work. Selected target slump shall not exceed 9 in. Concrete shall not show visible signs of segregation. The target slump indicated on the submittal shall be used as the basis for acceptance during the project. Determine the slump by ASTM C143/C143M.
 - b. Slump tolerance shall meet requirements of ACI 117.
5. Self-Consolidating Concrete:
 - a. Unless otherwise specified, select a target slump flow at the point of delivery for self-consolidating concrete mixtures. Selected target slump flow shall not exceed 30 in. Concrete shall not show visible signs of segregation. The target slump flow value indicated on the submittal shall be used as the basis for acceptance during the project. Determine slump flow in accordance with ASTM C1611/C1611M.
 - b. Slump flow tolerances shall be in accordance with ASTM C94/C94M.

C. Concrete Mixing:

1. General: In accordance with ACI 301, except as modified herein.
2. Truck Mixers:
 - a. For every truck, test slump, or slump flow of samples taken per ASTM C94/C94M, Paragraph 12.5.1.
 - b. Where specified slump is more than 4 inches, and if slump tests differ by more than 2 inches, discontinue use of truck mixer, unless causing condition is corrected and satisfactory performance is verified by additional slump tests.

2.03 REINFORCING STEEL

- A. Deformed Steel Reinforcing Bars: ASTM A615/A615M, Grade 60.
Welding of reinforcing bars is not permitted.
- B. Fabrication: Follow CRSI Manual of Standard Practice.

2.04 ANCILLARY MATERIALS

- A. Bonding Agent:
 1. Unless otherwise specified, in accordance with the following:
 - a. ASTM C881/C881M, Type V.

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- b. Two-component, moisture-insensitive, 100 percent solids epoxy.
- c. Consult manufacturer for surface finish, pot life, set time, vertical or horizontal application, and forming restrictions.
- d. Manufacturers and Products:
 - 1) BASF Building Systems Inc., Shakopee, MN; MasterInject 1500.
 - 2) Euclid Chemical Co., Cleveland, OH; Euco # 352 Epoxy System LV.
 - 3) Prime Resins, Conyers, GA; Prime Bond 3000 to 3900 Series.
 - 4) Sika Chemical Corp., Lyndhurst, NJ; Sikadur 32 Hi-Mod.

B. Bond Breaker:

- 1. Nonstaining type, providing positive bond prevention.
- 2. Manufacturers and Products:
 - a. Dayton Superior Corporation, Kansas City, KS; EDOCO Clean Lift Bond Breaker.
 - b. Nox-Crete Products Group, Omaha, NE; Silcoseal Select.

C. Reinforcing Steel Accessories:

- 1. Plastic Protected Wire Bar Supports: In compliance with ANSI/CRSI – RB 4.1 Class 1 Reinforcement Supports.
- 2. Stainless Steel Protected Wire Bar Supports: In compliance with ANSI/CRSI – RB 4.1 Class 2 Reinforcement Supports, except legs shall be made wholly from stainless steel wire.
- 3. Precast Concrete Bar Supports: In compliance with ANSI/CRSI – RB 4.1 Cementitious (Precast) Reinforcement Supports.
 - a. Precast concrete bar supports shall have equal or greater strength than the surrounding concrete.
 - b. Precast concrete bar supports shall be four square inches minimum, in plan.
 - c. Precast concrete bar supports shall have tie wires.

D. Tie Wire:

- 1. Black, soft-annealed 16-gauge wire.
- 2. Nylon-coated, epoxy-coated, or plastic-coated wire.

E. Premolded Joint Filler:

1. Bituminous Type: ASTM D994/D994M or ASTM D1751.
2. Sponge Rubber:
 - a. Neoprene, closed-cell, expanded; ASTM D1056, Type 2C5, with compression deflection, 25 percent deflection (limits), 119 kPa to 168 kPa (17 psi to 24 psi) minimum.
 - b. Manufacturer and Product: Monmouth Rubber and Plastics Corporation, Long Branch, NJ; Durafoam DK515IHD.

F. Curing Compound:

1. Water-based, high-solids content, nonyellowing, curing compound meeting requirements of ASTM C1315 Type I, Class A.
2. Manufacturers and Products:
 - a. Euclid Chemical Co., Cleveland, OH; Super Diamond Clear VOX.
 - b. WR Meadows, Inc., Hampshire, IL; VOCOMP-30.
 - c. Vexcon Chemical, Inc., Philadelphia, PA; Starseal 1315.
 - d. Dayton Superior; Safe Cure and Seal 1315 EF.

G. Evaporation Retardant:

1. Optional: Fluorescent fugitive dye color tint that disappears completely upon drying.
2. Manufacturers and Products:
 - a. BASF Construction Chemicals, Shakopee, MN; MasterKure ER 50.
 - b. Euclid Chemical Co., Cleveland, OH; Eucobar.

H. Nonshrink Grout:

1. Nonmetallic, nongas-liberating.
2. Prepackaged natural aggregate grout requiring only the addition of water.
3. Aggregate shall show no segregation or settlement at fluid consistency at specified times or temperatures.
4. Test in accordance with ASTM C1107/C1107M:
 - a. Fluid consistency 20 seconds to 30 seconds in accordance with ASTM C939.
 - b. Temperatures of 40 degrees F, 80 degrees F, and 100 degrees F.
5. Pass fluid grout through flow cone with continuous flow 1 hour after mixing.

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6. Minimum Strength of Fluid Grout:
 - a. 3,500 psi at 1 day.
 - b. 4,500 psi at 3 days.
 - c. 7,500 psi at 28 days.
7. Maintain fluid consistency when mixed in 1 yard to 9 yard loads in ready-mix truck.
8. Manufacturers and Products:
 - a. BASF Building Systems, Inc., Shakopee, MN; MasterFlow 928.
 - b. Five Star Products Inc., Fairfield, CT; Five Star Fluid Grout 100.
 - c. Euclid Chemical Co., Cleveland, OH; Hi Flow Grout.
 - d. Dayton Superior Corp., Miamisburg, OH; Sure Grip High Performance Grout.

I. Repair Material:

1. Contain only trace amounts of chlorides and other chemicals that can potentially cause steel to oxidize.
2. Where repairs of exposed concrete are required, prepare mockup using proposed repair materials and methods, for confirmation of appearance compatibility prior to use.
3. Obtain Manufacturer's Certificate of Compliance that products selected are appropriate for specific applications.
4. Repair mortar shall be Site mixed.
5. Prepare concrete substrate and mix, place, and cure repair material in accordance with manufacturer's written recommendations.
6. Manufacturers and Products:
 - a. BASF Building Systems Inc., Shakopee, MN; MasterEmaco S Series products.
 - b. Sika Chemical Corp., Lyndhurst, NJ; SikaTop Series.

J. Crack Repair:

1. Obtain Letter of Certification from manufacturer's technical representative, that products selected are appropriate for the specific applications.
2. Prepare concrete substrate and mix, place, and cure repair material in accordance with manufacturer's written recommendations.
3. Use part epoxy injection resin for structural crack repairs.
 - a. Manufacturers:
 - 1) BASF Construction Chemicals, LLC-Building Systems Shakopee, MN; MasterInject Series.
 - 2) Euclid Chemical Co., Cleveland, OH.; Euco Series (#452).
 - 3) Sika Chemical Corp., Lyndhurst, NJ.; Sikadur Series.

4. Use hydrophilic polyurethane injection resin for non-structural crack repairs.
 - a. Manufacturers:
 - 1) BASF Construction Chemicals, LLC-Building Systems Shakopee, MN; MasterInject 1210 IUG.
 - 2) Euclid Chemical Co., Cleveland, OH.; Dural Aqua-Fil.
 - 3) Sika Chemical Corp., Lyndhurst, NJ.; SikaFix HH Hydrophilic.
 - 4) Prime Resins, Inc., Conyers, GA.; Prime Flex 900 XLV.

2.05 SOURCE QUALITY CONTROL

- A. Source Quality Control Inspection: Engineer shall have access to and have right to inspect batch plants, cement mills, and supply facilities of suppliers, manufacturers, and subcontractors, providing products included in this section.

PART 3 EXECUTION

3.01 FORMWORK

- A. Form Construction:
 1. Construct forms and provide smooth-form finish.
 2. Form 3/4-inch bevels at concrete edges, unless otherwise shown.
 3. Make joints tight to prevent escape of mortar and to avoid formation of fins.
 4. Brace as required to prevent distortion during concrete placement.
 5. On exposed surfaces, locate form ties in uniform pattern or as shown.
 6. Construct so ties remain embedded in the member with no metal within 1 inch of concrete surface when forms, inserts, and tie ends are removed.
- B. Form Removal:
 1. Nonsupporting forms (walls and similar parts of Work) may be removed after cumulatively curing at not less than 50 degrees F for 24 hours from time of concrete placement if:
 - a. Concrete is sufficiently hard so as not to sustain damage by form removal operations.
 - b. Curing and protection operations are maintained.
 2. Remove forms with care to prevent scarring and damaging the surface.
 3. Prior to form removal, provide thermal protection for concrete being placed under the requirements of cold weather concreting.

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3.02 PLACING REINFORCING STEEL

- A. Unless otherwise specified, in accordance with ACI 301.
- B. Accessories:
 - 1. Bar Supports in Contact with Ground: Provide precast concrete block supports.
 - a. Do not use brick, broken concrete masonry units, spalls, rocks, construction debris, or similar material for supporting reinforcing steel.
 - 2. Bar Supports in Contact with Forms: Unless otherwise noted, bar supports shall be plastic protected wire bar supports, stainless steel protected wire bar supports, or precast concrete block bar supports.
 - a. Use stainless steel protected wire bar supports or precast concrete block bar supports at formed surfaces that will receive abrasive blasting, hydro-blasting, or grinding.
 - 3. Bar supports shall have sufficient strength and stiffness to carry loads without failure, displacement, or significant deformation. Space bar supports so minimum concrete cover is maintained for reinforcing between supports, and location of reinforcement remains within tolerance throughout work.
- C. Splices and Laps:
 - 1. Lap Splice Reinforcing: Refer to Structural General Notes on Drawings for additional information.
 - 2. Tie splices with 18-gauge annealed wire as specified in CRSI Standard.

3.03 CONCRETE PLACEMENT INTO FORMWORK

- A. Inspection: Notify Engineer and Special Inspector at least 1 work day in advance before starting to place concrete.
- B. Placement into Formwork:
 - 1. Reinforcement: Secure in position before placing concrete.
 - 2. Place concrete as soon as possible after leaving mixer, without segregation or loss of ingredients, without splashing forms or steel above, and in layers not over 1.5 feet deep, except for slabs that shall be placed full depth. Place and consolidate successive layers prior to initial set of first layer to prevent cold joints.
 - 3. Placement frequency shall be such that lift lines will not be visible in exposed concrete finishes.

4. Use placement devices (such as, chutes, pouring spouts, and pumps) as required to prevent segregation.
5. Vertical Free Fall Drop to Final Placement:
 - a. Forms 8 Inches or Less Wide: 5 feet.
 - b. Forms Wider than 8 Inches: 8 feet, except as specified.
6. For placements where drops are greater than specified, use placement device such that free fall below placement device conforms to required value.
 - a. Limit free fall to prevent segregation caused by aggregates hitting steel reinforcement.
7. Provide sufficient illumination in the interior of forms so concrete deposition is visible, permitting confirmation of consolidation quality.
8. Joints in Footings and Slabs:
 - a. Ensure space beneath plastic waterstop completely fills with concrete.
 - b. During concrete placement, make visual inspection of entire waterstop area.
 - c. Limit concrete placement to elevation of waterstop in first pass, vibrate concrete under waterstop, lift waterstop to confirm full consolidation without voids, and place remaining concrete to full height of slab.
 - d. Apply procedure to full length of waterstop.
9. Trowel and round off top exposed edges of walls with 1/4-inch radius steel edging tool.

C. Conveyor Belts and Chutes:

1. Design and arrange ends of chutes, hopper gates, and other points of concrete discharge throughout conveying, hoisting, and placing system for concrete to pass without becoming segregated.
2. Do not use chutes longer than 50 feet.
3. Wipe clean with device that does not allow mortar to adhere to belt.
4. Cover conveyor belts and chutes.

D. Retempering: Not permitted for concrete where cement has partially hydrated.

E. Pumping of Concrete:

1. Provide standby pump, conveyor system, crane and concrete bucket, or other system onsite during pumping, for adequate redundancy to ensure completion of concrete placement without cold joints in case of primary placing equipment breakdown.
2. Minimum Pump Hose (Conduit) Diameter: 4 inches.

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3. Replace pumping equipment and hoses (conduits) that are not functioning properly.

F. Maximum Size of Concrete Placements:

1. Limit size of each placement to allow for strength gain and volume change as a result of shrinkage.
2. Locate expansion, control, and contraction joints where shown.
3. Construction Joints:
 - a. Unless otherwise shown or permitted, locate construction joints as follows:
 - 1) Locate construction joints as shown on Drawings or where approved in the joint location submittal.
 - 2) Locate expansion, control, and contraction joints where shown on Drawings.
 - 3) Provide vertical construction joints at maximum spacing of 40 feet unless shown or approved otherwise.
 - 4) When vertical expansion, contraction, or control joint spacing does not exceed 60 feet, intermediate construction joints are not required.
 - 5) Uniformly space vertical construction joints within straight sections of walls, avoiding penetrations.
4. Consider beams, girders, brackets, column capitals, and haunches as part of floor or roof system and place monolithically with floor or roof system.
5. Should placement sequence result in cold joint located below finished water surface, install waterstop in joint.

G. Minimum Time between Adjacent Placements:

1. Typical Unless Noted Otherwise: As soon as can safely be done without damaging previously cast concrete or interrupting curing thereof, but not less than 24 hours.
2. Concrete Over Columns or Walls:
 - a. Unless otherwise specified, do not place concrete until columns and walls have reached final set.
 - b. For columns and walls with a height in excess of 10 feet, wait at least 2 hours before depositing concrete in beams, girders, or slabs supported thereon.
 - c. For columns and walls 10 feet in height or less, wait at least 1 hour prior to depositing concrete in beams, girders, brackets, column capitals, or slabs supported thereon.

3.04 CONSOLIDATION AND VISUAL OBSERVATION

- A. Provide at least one standby vibrator in operable condition at placement site prior to placing concrete.

3.05 COLD WEATHER PLACEMENT

- A. Unless otherwise permitted, shall be in accordance with requirements of ACI 301, ACI 306.1, and as follows:
 - 1. Cold weather requirements shall apply when ambient temperature is below 40 degrees F or approaching 40 degrees F and falling.
 - 2. Do not place concrete over frozen earth or against surfaces with frost or ice present. Frozen earth shall be thawed to acceptance of Engineer.
 - 3. Unless otherwise permitted, do not place concrete in contact with surfaces less than 35 degrees F; requirement is applicable to all surfaces including reinforcement and other embedded items.
 - 4. Provide supplemental external heat as needed when other means of thermal protection are unable to maintain minimum surface temperature of concrete as specified in ACI 306.1.
 - 5. Maintain minimum surface temperature of concrete as specified in ACI 306.1 for no less than 3 days during cold weather conditions.
 - 6. Protect concrete from freezing until end of curing period and until concrete has attained a compressive strength of 3,500 psi or design compressive strength if less than 3,500 psi.
- B. Provide maximum and minimum temperature sensors placed on concrete surfaces spaced throughout Work to allow monitoring of concrete surface temperatures representative of Work. Unless otherwise permitted, record surface temperature of concrete at least once every 12 hours during specified curing period.
- C. External Heating Units: Do not exhaust heater flue gases directly into enclosed area as it causes concrete carbonation as a result of concentrated carbon dioxide.
- D. Cure as specified.

3.06 HOT WEATHER PLACEMENT

- A. Prepare ingredients, mix, place, cure, and protect in accordance with ACI 301, ACI 305.1, and as follows:
 - 1. Maintain concrete temperature below 95 degrees F at time of placement, or furnish test data or other proof that admixtures and mix ingredients do not produce flash set plastic shrinkage, or cracking as a result of heat

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of hydration. Cool ingredients before mixing to maintain fresh concrete temperatures as specified or less.

2. Internal concrete temperature in structure shall not exceed 158 degrees F, and maximum temperature differential between center of section and external surfaces of concrete shall not exceed 35 degrees F.
3. Provide for windbreaks, shading, fog spraying, sprinkling, ice, wet cover, or other means as necessary to maintain concrete at or below specified temperature.
4. Cure as specified.

3.07 CONCRETE BONDING

A. Construction Joints at Existing Concrete:

1. Thoroughly clean and roughen existing concrete surfaces to roughness profile of 1/4 inch.
2. Saturate surface with water for 24 hours prior to placing new concrete.

3.08 PREMOLDED JOINT FILLER INSTALLATION

- A. Sufficient in width to completely fill joint space where shown.
- B. Drive nails approximately 1 foot 6 inches on center through filler, prior to installing, to provide anchorage embedment into concrete during concrete placement.
- C. Secure premolded joint filler in forms before concrete is placed.

3.09 FINISHING FORMED SURFACES

- A. Provide surface finish 2.0 (SF-2.0) in accordance with ACI 301 and as herein specified.
- B. Tie Holes: Unless otherwise specified, fill with specified repair material.
- C. Prepare substrate and mix, place, and cure repair material per manufacturer's written recommendations.
- D. Repair defective areas of concrete.
 1. Cut edges perpendicular to surface at least 1/2 inch deep. Do not feather edges. Soak area with water for 24 hours.
 2. Patch with specified repair material.
 3. Repair concrete surfaces using specified materials. Select system, submit for review, and obtain approval from Engineer prior to use.

4. Develop repair techniques with material manufacturer on surface that will not be visible in final construction prior to starting actual repair work and show how finish color will blend with adjacent surfaces. Obtain approval from Engineer.
5. Obtain quantities of repair material and manufacturer's detailed instructions for use to provide repair with finish to match adjacent surface or apply sufficient repair material adjacent to repair to blend finish appearance.
6. Repair of concrete shall provide structurally sound surface finish, uniform in appearance or upgrade finish by other means until acceptable to Engineer.

E. Crack injection.

1. When crack repair is deemed by Engineer as requiring a structural repair, use part epoxy injection resin.
2. When crack repair is deemed by Engineer as requiring a nonstructural repair, use hydrophilic polyurethane injection resin.

3.10 FINISHING UNFORMED SURFACES

A. General:

1. Use manual screeds, vibrating screeds, or roller compacting screeds to place concrete level and smooth.
2. Do not use "jitterbugs" or other special tools designed for purpose of forcing coarse aggregate away from surface and allowing layer of mortar, which will be weak and cause surface cracks or delamination, to accumulate.
3. Do not dust surfaces with dry materials nor add water to surfaces.
4. Cure concrete as specified.

B. Slab Tolerances:

1. Exposed Slab Surfaces: Comprise of flat planes as required within tolerances specified.
2. Slab Finish Tolerances and Slope Tolerances: Crowns on floor surface not too high as to prevent 10-foot straightedge from resting on end blocks, nor low spots that allow block of twice the tolerance in thickness to pass under supported 10-foot straightedge.
3. Steel gauge block 5/16-inch thick.
4. Finish Slab Elevation: Slope slabs to floor drain and gutter, and shall adequately drain regardless of tolerances.

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5. Thickness: Maximum 1/4 inch minus or 1/2 inch plus from thickness shown. Where thickness tolerance will not affect slope, drainage, or slab elevation, thickness tolerance may exceed 1/2 inch plus.

C. Exterior Slab Finish:

1. Provide broom finish unless specified otherwise.
2. Finish exposed edges with steel edging tool.
3. Mark sidewalks transversely at 5-foot intervals with jointing tool.

3.11 EXPOSED METAL OBJECTS

- A. Remove metal objects not intended to be exposed in as-built condition of structure including wire, nails, and bolts, by chipping back concrete to depth of 1 inch and then cutting or removing metal object.
- B. Repair area of chipped-out concrete as specified for defective areas.

3.12 PROTECTION AND CURING

- A. Protect and cure concrete in accordance with requirements of ACI 301, ACI 308.1, and as follows:
 1. Protect fresh concrete from direct rays of sunlight, drying winds, and wash by rain.
 2. Keep concrete slabs continuously wet for a 7-day period. Intermittent wetting is not acceptable.
 3. Use curing compound only where approved by Engineer.
 4. Cure formed surfaces with curing compound applied in accordance with manufacturer's written instructions as soon as forms are removed and finishing is completed.
 5. Remove and replace concrete damaged by freezing.
 6. Repair areas damaged by construction, using specified repair materials and approved repair methods.

3.13 NONSHRINK GROUT

- A. General: Mix, place, and cure nonshrink grout in accordance with grout manufacturer's written instructions.
- B. Grouting Machinery Foundations:
 1. Block out original concrete or finish off at distance shown below bottom of machinery base with grout. Prepare concrete surface by sandblasting,

- chipping, or by mechanical means to remove any soft material. Surface roughness in accordance with manufacturer's written instructions.
2. Clean metal surfaces of all paint, oil, grease, loose rust, and other foreign material that will be in contact with grout.
3. Set machinery in position and wedge to elevation with steel wedges, or use cast-in leveling bolts. Remove wedges after grout is set and pack void with grout.
4. Form with watertight forms at least 2 inches higher than bottom of plate.
5. Fill space between bottom of machinery base and original concrete in accordance with manufacturer's written instructions.

3.14 FIELD QUALITY ASSURANCE AND QUALITY CONTROL

A. General:

1. Contractor-Furnished Quality Control: Inspection and testing as required in Section 01450, Contractor Quality Control.
2. Provide adequate facilities for safe storage and proper curing of concrete test specimens onsite for first 24 hours and for additional time as may be required before transporting to test lab.
3. Unless otherwise specified, sample concrete for testing for making test specimens, from point of delivery.
4. When concrete is pumped, sample and test air content at point of delivery and at point of placement.
5. Evaluation will be in accordance with ACI 301 and Specifications.
6. Test specimens shall be made, cured, and tested in accordance with ASTM C31/C31M and ASTM C39/C39M.
7. Frequency of testing may be changed at discretion of Engineer.
8. Pumped Concrete: Take concrete samples for slump, ASTM C143/C143M, and test specimens, ASTM C31/C31M and ASTM C39/C39M.
9. If measured air content at delivery is greater than specified limit, check test of air content will be performed immediately on a new sample from delivery unit. If check test fails, concrete has failed to meet requirements of Contract Documents. If measured air content is less than lower specified limit, adjustments will be permitted in accordance with ASTM C94/C94M, unless otherwise specified. If check test of adjusted mixture fails, concrete has failed to meet requirements of Contract Documents. Concrete that has failed to meet requirements of Contract Documents shall be rejected.

B. Concrete Strength Test:

1. Unless otherwise specified, one specimen at age of 7 days for information, and two 6-inch diameter or when permitted three 4-inch diameter test specimens at age of 28 days for acceptance.
2. If result of 7-day concrete strength test is less than 50 percent of specified 28-day strength, extend period of moist curing by 7 additional days.
3. Provide a minimum of one spare test specimen per sample. Test spare cylinder as directed by Engineer.
4. Segregation Test Objective: Concrete shall stay together when slumped. Segregation is assumed to cause mortar to flow out of mix even though aggregate may stay piled enough to meet slump or slump flow test.
5. Test Procedure: Make slump or slump flow test and check for excessive slump or slump flow. Observe to see if mortar or moisture flows from slumped concrete.
6. Reject concrete if mortar or moisture separates and flows out of mix.

C. Cold Weather Placement Tests:

1. During cold weather concreting, cast cylinders for field curing as follows. Use method that will produce greater number of specimens:
 - a. Six extra test cylinders from last 100 cubic yards of concrete.
 - b. Minimum three specimens for each 2 hours of placing time or for each 100 cubic yards.
2. These specimens shall be in addition to those cast for lab testing.
3. Protect test cylinders from weather until they can be placed under same protection provided for concrete of structure that they represent.
4. Keep field test cylinders in same protective environment as parts of structure they represent to determine if specified strength has been obtained.
5. Test cylinders in accordance with applicable sections of ASTM C31/C31M and ASTM C39/C39M.
6. Use test results to determine specified strength gain prior to falsework removal.

D. Slab Finish Tolerances and Slope Tolerances:

1. Support 10-foot-long straightedge at each end with steel gauge blocks of thicknesses equal to specified tolerance.
2. Compliance with designated limits in four of five consecutive measurements is satisfactory, unless defective conditions are observed.

3.15 MANUFACTURER'S SERVICES

- A. Provide representative at Site for installation assistance, inspection, and certification of proper installation for concrete ingredients, mix design, mixing, and placement.
- B. Concrete Producer Representative:
 - 1. Observe how concrete mixes are performing.
 - 2. Assist with concrete mix design, performance, placement, weather problems, and problems as may occur with concrete mix throughout Project, including instructions for redosing.
 - 3. Establish control limits on concrete mix designs.
 - 4. Provide equipment for control of concrete redosing for air entrainment or high-range, water-reducing admixture, superplasticizers, at Site to maintain proper slump or slump flow, and air content when specified.
- C. Admixture Manufacturer's Representative: Available for consultations as required to ensure proper installation and performance of specified products.
- D. Bonding Agent Manufacturer's Representative: Available for consultations as required to ensure proper installation and performance of specified products.

3.16 SUPPLEMENTS

- A. Requirements of concrete mix designs following "End of Section," are a part of this Specification and supplement requirements of Part 1 through Part 3 of this section:
 - 1. Concrete Mix Design, Class 4500F2S1P1C1.

END OF SECTION

CONCRETE MIX DESIGN, CLASS 4500F2S1P1C1

- A. Mix Locations: Typical, unless otherwise specified.
- B. Exposure Categories and Classifications: F2S1P1C1.
- C. Mix Properties:
1. Limit water to cementitious materials ratio (W/Cm) in mix design to maximum value of 0.45.
 2. Minimum concrete compressive strength (f'_c) shall be 4,500 psi at 28 days.
 3. Air-entraining admixtures are prohibited in concrete mixtures and total air content shall not be greater than 3 percent, for the following:
 - a. Slabs to receive hard-troweled finish.
 - b. Slabs to receive dry shake floor hardener.
 - c. Slabs to receive topping placed monolithically as two-course floor on top of plastic concrete.
 4. Unless otherwise specified, provide air content based on nominal maximum size of aggregate as follows:

Nominal Maximum Aggregate Size in.‡	Air Content (%)*
3/8	7.5
1/2	7.0
3/4	6.0
1	6.0
1-1/2	5.5
2§	5.0
3§	4.5

‡See ASTM C33/C33M for tolerance on oversize for various nominal maximum size designations.

*Tolerance of air content is $\pm 1\frac{1}{2}$ percent.

§Air contents apply to total mixture. When testing concretes, however, aggregate particles larger than 1-1/2 inches are to be removed by sieving and air content will be measured on sieved fraction (tolerance on air content as delivered applies to this value). Air content of total mixture is computed from value measured on the sieved fraction passing the 1-1/2-inch sieve in accordance with ASTM C231/C231M.

5. Provide cementitious materials in accordance with one of the following:

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- a. ASTM C150/C150M Type II; inclusion of supplementary cementitious materials in design mix is optional.
 - b. ASTM C150/C150M types other than Type II, plus supplementary cementitious materials in accordance with one of the following:
 - 1) Tricalcium Aluminate Content of Total Cementitious Materials: Maximum 8 percent by weight.
 - 2) Provide documentation of test results in accordance with ASTM C1012/C1012M, for combinations of cementitious materials providing sulfate resistance with expansion less than 0.10 percent at 6 months.
 - 3) ASTM C595/C595M Type IP or Type IS (less than 70), tested to comply with moderate sulfate resistance option (MS).
6. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent, unless otherwise specified.
- a. Limits are stated in terms of chloride ions in percent by weight of cement.
 - b. Unless otherwise permitted, provide documentation from concrete tested in accordance with ASTM C1218/C1218M at an age between 28 days and 42 days.
- D. Refer to PART 1 through PART 3 of this section for additional requirements.

DIVISION 5

METALS

SECTION 05019
POST-INSTALLED ANCHORS

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. American Concrete Institute (ACI):
 - a. 318, Building Code Requirements for Structural Concrete.
 - b. 355.2, Qualification of Post-Installed Mechanical Anchors in Concrete.
 - c. 355.4, Qualification of Post-Installed Adhesive Anchors in Concrete.
 2. American Iron and Steel Institute (AISI): Stainless Steel Type 316.
 3. American National Standards Institute (ANSI).
 4. ASTM International (ASTM):
 - a. A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - b. A143/A143M, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
 - c. A153/A153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - d. A193/A193M, Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature or High Pressure Service and Other Special Purpose Applications.
 - e. A194/A194M, Specification for Carbon Steel, Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both.
 - f. A380/A380M, Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
 - g. A385/A385M, Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip).
 - h. A563, Standard Specification for Carbon and Alloy Steel Nuts.
 - i. A780/A780M, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
 - j. A967/A967M, Standard Specification for Chemical Passivation Treatments for Stainless Steel Parts.

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- k. E488/E488M, Standard Test Methods for Strength of Anchors in Concrete Elements.
- l. F436/F436M, Standard Specification for Hardened Steel Washers.
- m. F468, Standard Specification for Nonferrous Bolts, Hex Cap Screws, and Studs for General Use.
- n. F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
- o. F594, Standard Specification for Stainless Steel Nuts.
- p. F1554, Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
- 5. International Association of Plumbing and Mechanical Officials Uniform ES (IAPMO-UES): Evaluation Reports for Concrete and Masonry Anchors.
- 6. International Code Council Evaluation Service (ICC-ES):
 - a. Evaluation Reports for Concrete and Masonry Anchors.
 - b. AC01, Acceptance Criteria for Expansion Anchors in Masonry Elements.
 - c. AC70, Acceptance Criteria for Fasteners Power-driven into Concrete, Steel and Masonry Elements.
 - d. AC106, Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements.
 - e. AC193, Acceptance Criteria for Mechanical Anchors in Concrete Elements.
 - f. AC308, Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements. Evaluation Reports for Concrete and Masonry Anchors.
- 7. Specialty Steel Industry of North America (SSINA):
 - a. Specifications for Stainless Steel.
 - b. Design Guidelines for the Selection and Use of Stainless Steel.
 - c. Stainless Steel Fabrication.
 - d. Stainless Steel Fasteners.

1.02 DEFINITIONS

- A. Corrosive Area: Containment area or area exposed to delivery, storage, transfer, or use of chemicals.
- B. Exterior Area: Location not protected from weather by a building or other enclosed structure to include buried roof structures.

- C. Interior Dry Area: Location inside building or structure where floor is not subject to liquid spills or wash down, and where wall or roof slab is not common to a water-holding or earth-retaining structure.
- D. Interior Wet Area: Location inside building or structure where floor is sloped to floor drains or gutters and is subject to liquid spills or wash down, or where wall, floor, or roof slab is common to a water-holding or earth-retaining structure.
- E. Submerged: Location at or below top of wall of open water-holding structure, such as a basin or channel, or wall, ceiling, or floor surface inside a covered water-holding structure, or exterior below grade wall or roof surface of water-holding structure, open or covered.

1.03 SUBMITTALS

A. Action Submittals:

- 1. Shop Drawings: Specific instructions for concrete anchor installation, including drilled hole size and depth, preparation, placement, procedures, and instructions for safe handling of anchoring systems.

B. Informational Submittals:

- 1. Concrete and Masonry Anchors:
 - a. Manufacturer's product description and installation instructions.
 - b. Current ICC-ES or IAPMO-UES Report for each type of post-installed anchor to be used.
 - c. Adhesive Anchor Installer Certification.
- 2. Passivation method for stainless steel members.

1.04 QUALITY ASSURANCE

- A. Qualifications: Installers of adhesive anchors horizontally or upwardly inclined to support sustained tension loads shall be certified by an applicable certification program. Certification shall include written and performance tests in accordance with the ACI/CRSI Adhesive Installer Certification Program or equivalent.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Package stainless steel items in a manner to provide protection from carbon impregnation.

PART 2 PRODUCTS

2.01 GENERAL

- A. Unless otherwise indicated, meet the following requirements:

Item	ASTM Reference
Stainless Steel:	
Threaded Rods	F593, AISI Type 316, Condition CW
Nuts*	F594, AISI Type 316, Condition CW
*Nuts of other grades and styles having specified proof load stresses greater than specified grade and style are also suitable. Nuts must have specified proof load stresses equal to or greater than minimum tensile strength of specified threaded rod.	

- B. Bolts, Washers, and Nuts: Use stainless steel.

2.02 POST-INSTALLED CONCRETE ANCHORS

- A. General:

1. AISI Type 316 stainless.
2. Post-installed anchor systems used in concrete shall be approved by ICC Evaluation Services Report or equivalent for use in cracked concrete and for short-term and long-term loads including wind and earthquake.
3. Mechanical Anchors: Comply with the requirements of ICC-ES AC193 or ACI 355.2.
4. Adhesive Anchors: Comply with the requirements of ICC-ES AC308 or ACI 355.4.

- B. Torque-Controlled Expansion Anchors (Wedge Anchors):

1. Manufacturers and Products:
 - a. Hilti, Inc., Tulsa, OK; Kwik-Bolt –TZ (KB-TZ) Anchors (ESR-1917).
 - b. DeWalt/Powers Fasteners, Brewster, NY; Power-Stud +SD1 , +SD2, +SD4, or +SD6 Anchors (ESR-2502 and ESR-2818).
 - c. Simpson Strong-Tie Co., Inc., Pleasanton, CA; Strong-Bolt 2 Anchors (ESR-1771 and ESR-3037).

C. Self-Tapping Concrete Screw Anchors:

1. Manufacturers and Products:
 - a. DeWalt/Powers Fasteners, Brewster, NY; Wedge-Bolt+ (ESR-2526).
 - b. DeWalt/Powers Fasteners, Brewster, NY; Vertigo+ Rod Hanger Screw Anchor (ESR-2989).
 - c. DeWalt/Powers Fasteners, Brewster, NY; Snake+ Flush Mount Screw Anchor (ESR-2272).
 - d. Hilti, Inc., Tulsa, OK; HUS-EZ Screw Anchor (ESR-3027).
 - e. Simpson Strong-Tie Co., Inc., Pleasanton, CA; Titen HD Screw Anchor (ESR-2713 and IAPMO UES-493).

D. Adhesive Anchors:

1. Threaded Rod:
 - a. Diameter as shown on Drawings.
 - b. Length as required to provide minimum depth of embedment indicated and thread projection required.
 - c. Clean and free of grease, oil, or other deleterious material.
2. Adhesive:
 - a. Two-component, insensitive to moisture, designed to be used in adverse freeze/thaw environments.
 - b. Cure Temperature, Pot Life, and Workability: Compatible for intended use and anticipated environmental conditions.
3. Packaging and Storage:
 - a. Disposable, self-contained system capable of dispensing both components in proper mixing ratio and fitting into a manually or pneumatically operated caulking gun.
 - b. Store adhesive on pallets or shelving in a covered storage area.
 - c. Package Markings: Include manufacturer's name, product name, batch number, product expiration date, ANSI hazard classification, and appropriate ANSI handling precautions.
 - d. Dispose of When:
 - 1) Shelf life has expired.
 - 2) Stored other than in accordance with manufacturer's instructions.
4. Manufacturers and Products:
 - a. Hilti, Inc., Tulsa, OK; HIT Doweling Anchor System, HIT RE 500 V3 (ESR-3814).
 - b. Simpson Strong-Tie Co., Inc., Pleasanton, CA; SET-3G Epoxy Adhesive Anchors (ESR-4057).
 - c. DeWalt/Powers Fasteners, Brewster NY; Pure 110+ Epoxy adhesive anchor system (ESR-3298).

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E. Adhesive Threaded Inserts:

1. Type 316 stainless steel, internally threaded inserts.
2. Manufacturer and Product: Hilti, Inc., Tulsa, OK; HIS-RN Insert with HIT-RE 500-V3 or HIT-HY 200 adhesive.

2.03 POST-INSTALLED MASONRY ANCHORS

A. General: AISI Type 316 stainless.

B. Current ICC Evaluation Report indicating acceptance for anchors at structural applications in masonry.

C. Manufacturers and Products:

1. Hilti, Inc., Tulsa, OK; Kwik-Bolt-3 (KB-3) (ESR-1385), for grout-filled masonry, HIT-HY 200 (ESR-3963) for grout filled masonry, HIT-HY 270 (ESR 4143) for hollow CMU, or hollow brick masonry, HIT-HY 270 (ESR 4144) for unreinforced masonry.
2. Simpson Strong-Tie Co., Inc., Pleasanton, CA; Strong-Bolt 2 (IAPMO ER 240) for grout filled CMU, Titen-HD (ESR-1056) for grout filled or hollow CMU, AT-XP (IAPMO ER-281) for grout filled CMU.
3. DeWalt/Powers Fasteners, Brewster NY; Power-Stud+ SD1 (ESR-2966) for grout-filled masonry, Wedgebolt+ (ESR-1678) for grout-filled masonry.

PART 3 EXECUTION

3.01 CONCRETE AND MASONRY ANCHORS

- A. Begin installation only after concrete or masonry to receive anchors is a minimum of 21 days old or has attained design strength, whichever requires longer duration.
- B. Locate existing reinforcing with Ground Penetrating Radar or other method approved by Engineer prior to drilling. Coordinate with Engineer to adjust anchor locations where installation would result in hitting reinforcing.
- C. Install in accordance with written manufacturer's instructions.
- D. Provide minimum embedment, edge distance, and spacing as indicated on Drawings.

- E. Use only drill type and bit type and diameter recommended by anchor manufacturer. Use rotatory hammer drill unless otherwise approved by Engineer. Core drilling shall be used only where specifically approved by the Engineer.
- F. Clean hole of debris and dust per manufacturer's requirements.
- G. When unidentified embedded steel, rebar, or other obstruction is encountered in drill path, slant drill to clear obstruction. If drill must be slanted more than indicated in manufacturer's installation instructions to clear obstruction, notify Engineer for direction on how to proceed.
- H. Adhesive Anchors:
 - 1. Unless otherwise approved by Engineer and adhesive manufacturer:
 - a. Do not install adhesive anchors when temperature of concrete or masonry is below 40 degrees F or above 100 degrees F.
 - b. Do not install prior to concrete attaining an age of 21 days.
 - c. Remove any standing water from hole with oil-free compressed air. Inside surface of hole shall be dry.
 - d. Do not disturb anchor during recommended curing time.
 - e. Do not exceed maximum torque as specified in manufacturer's instructions.
 - 2. For hollow-unit masonry, install screen tube in accordance with manufacturer's instructions.

3.02 FIELD QUALITY ASSURANCE AND QUALITY CONTROL

- A. Owner-Furnished Quality Assurance, in accordance with IBC Chapter 17 requirements. Contractor responsibilities and related information are included in Division 1, General Requirements.
- B. Contractor-Furnished Quality Control: Inspection and testing as required in Division 1, General Requirements.

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3.03 FASTENER SCHEDULE

A. Unless indicated otherwise on Drawings, provide fasteners as follows:

Service Use and Location	Product	Remarks
1. Post-Installed Anchors for Metal Components to Cast-in-Place Concrete (such as, Ladders, Handrail Posts, Electrical Panels, Platforms, and Equipment)		
Interior Dry Areas, Submerged, Exterior, Interior Wet, and Corrosive Areas	Stainless steel adhesive anchors	Verify product acceptability and manufacturer's requirements if anchor installation will occur in an overhead application
2. Anchors in Grout-Filled Concrete Masonry Units		
Interior Dry Areas, Submerged, Exterior, Interior Wet, and Corrosive Areas	Stainless steel adhesive anchors	
3. Anchors in Hollow Concrete Masonry Units		
Interior Dry Areas, Exterior, Interior Wet, and Corrosive Areas	Stainless steel adhesive anchors	Adhesive anchors shall be installed with screen tubes.
4. All Others		
All service uses and locations	Stainless steel fasteners	

B. Antiseizing Lubricant: Use on all stainless steel threads.

C. Do not use adhesive anchors to support fire-resistive construction or where ambient temperature will exceed 120 degrees F.

END OF SECTION

DIVISION 11

EQUIPMENT

**SECTION 11305
SUBMERSIBLE PUMPS**

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards that may be referenced in this section:
1. American Bearing Manufacturers Association (ABMA):
 - a. 9, Load Ratings and Fatigue Life for Ball Bearings.
 - b. 11, Load Rating and Fatigue Life for Roller Bearings.
 2. American Society of Mechanical Engineers (ASME): B16.1, Gray Iron Pipe Flanges and Flanged Fittings, Class 25, 125, and 150.
 3. ASTM International (ASTM):
 - a. A48, Standard Specification for Gray Iron Castings.
 - b. A576, Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality.
 4. Hydraulic Institute Standards (HIS):
 - a. 11.6, Submersible Pump Test.
 - b. 14.6, Rotodynamic Pumps for Hydraulic Performance Acceptance Tests.
 5. National Electrical Manufacturers Association (NEMA).
 6. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code.
 - b. 497, Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas.
 7. Underwriters Laboratories Inc. (UL).

1.02 DEFINITIONS

- A. Terminology pertaining to pumping unit performance and construction shall conform to ratings and nomenclature of Hydraulic Institute Standards.

1.03 SUBMITTALS

- A. Submittals shall be provided in accordance with Section 01300, Submittals.
- B. Action Submittals:
1. Make, model, weight, and horsepower of each equipment assembly.
 2. Complete catalog information, descriptive literature, specifications, and identification of materials of construction, including cable seal details.

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3. Performance data curves showing head, capacity, horsepower demand, and pump efficiency over entire operating range of pump, from shutoff to maximum capacity. Indicate separately head, capacity, horsepower demand, overall efficiency, and minimum submergence required at guarantee point.
4. Where required for variable speed motors, provide variable speed curves for every 50 rpm over the operational range.
5. Power and control wiring diagrams, including terminals and numbers.
6. Motor data.
7. Factory-finish system.
8. L-10 bearing life calculations per ABMA.
9. If required, wiring for motor protection module.

C. Informational Submittals:

1. Special shipping, storage and protection, and handling instructions.
2. Manufacturer's printed installation instructions.
3. Factory and Field Performance Test Reports and Log
4. Suggested spare parts list to maintain equipment in service for period of 1 year and 5 years. Include list of special tools required for checking, testing, parts replacement, and maintenance with current price information.
5. List special tools, materials, and supplies furnished with equipment for use prior to and during startup and for future maintenance.
6. Operation and Maintenance Data as specified in Section 01730, Operation and Maintenance Data.
7. Manufacturer's Certificate of Proper Installation, in accordance with Section 01640, Manufacturer's Services and Section 01810, Equipment Testing and Start-Up.

1.04 EXTRA MATERIALS

- A. Furnish the spare parts shown in the vendor proposals for each pump.

PART 2 PRODUCTS

2.01 GENERAL

- A. Submersible, vertical shaft, centrifugal nonclog type, for pumping wastewater.
- B. The replacement pumps to be provided are defined in the vendor proposals shown in the supplemental information defined below. Designed for continuous operation under submerged or partially submerged conditions, and intermittent operation when totally dry without damage to pump or motor.

2.02 SUPPLEMENTS

- A. Data Sheets: 1a, 1b, and 1c.
- B. Supplement 2a, 2b, and 2c:
 - 1. 2a – Six Flags PS Pump Replacement -Xylem Proposal 2020-ATL-0307, Alternate 2, Version 8 dated 7-28--2020.
 - 2. 2b- -Plant Atkinson PS Pump Replacement – Xylem Proposal 2020-ATL 0295, Alternate 1, Version 6 dated 7-28-2020.
 - 3. 2c – Marina Trace PS Pump Replacement – Xylem Proposal 2020-ATL-0295, Alternate 1, Version 5 dated 7-28-2020.

2.03 COMPONENTS

- A. Equipment consists of pump complete with motor, power cable, protective relays, guide rail, anchoring brackets, base elbow, where required, and pump lifting cable defined in the attached proposals.
- B. Anchor Bolts: Type 316 stainless steel, sized by equipment manufacturer, and as specified in Section 05019 Post-Installed Anchors.

2.04 FACTORY FINISHING

- A. Manufacturer's standard epoxy system for continuous submergence in corrosive water.

2.05 SOURCE QUALITY CONTROL

- A. Pump Factory Testing:
 - 1. Hydrostatic test.
 - 2. Factory Performance Test by Manufacturer:
 - a. Conduct on each pump for Six Flags, Plant Atkinson and Marina Trace.
 - b. In accordance with HIS 11.6, Level A for submersible pump tests.
 - c. Include test data sheets and curve test results.
 - d. Six Flags pumps shall be tested at full speed(60 Hz) and at 40 Hz.
 - 3. Perform under actual or approved simulated operating conditions.
 - a. Throttle discharge valve to obtain pump data points on curve at 2/3, 1/3, and shutoff conditions.

FY21 MULTIPLE PUMP STATIONS PROJECTS

4. Vibration Test:
 - a. Test at specified design flow and head conditions. Vibration levels not to exceed those recommended in HIS 11.6.
 - b. If units exhibit vibration in excess of limits adjust or modify as necessary. Units that cannot be adjusted or modified to conform as specified shall be replaced.

B. Submersible Motor Functional Test: In accordance with HIS 11.6.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's printed instructions.
- B. Install and connect pump protection monitor, MAS or Mini-CAS, in accordance with the details shown in the Electrical Drawings.
 1. At the Six Flags pump station, the pump protection MAS unit shall be installed in a new enclosure provided by the pump manufacturer.
 2. At the Marina Trace pump station, the pump protection Mini-CAS shall be installed in a new enclosure mounted to the side of the existing control panel.
 3. At the Plant Atkinson pump station, the existing pump protection Mini-CAS are to be removed and new Mini-CAS installed in the existing pump control panel.
- C. For Marina Trace PS, mount the discharge elbow to the floor of the wetwell floor with stainless steel expansion type bolts. Install new guide rails and 90 degree bend for each pump.
- D. Connect piping without imposing strain to flanges.
- E. No portion of pump shall bear directly on floor of sump.

3.02 FIELD FINISHING

- A. Equipment shall be coated with the manufacturers standard coating for submerged wastewater applications.

3.03 FIELD QUALITY CONTROL

- A. Field Functional Test: Conduct on each pump.

FY21 MULTIPLE PUMP STATIONS PROJECTS

1. Alignment: Test complete assemblies for correct rotation, proper alignment and connection.
2. Operating Temperatures: For Six Flags Pumps, monitor motor winding and temperatures for abnormally high temperatures.
3. Test for continuous 48 hour period.
4. Test Report Requirements: In accordance with Hydraulic Institute Standards for submersible pump tests HIS 14.6 and 11.6.

B. Field Pump Test:

1. General:
 - a. Conduct on each pump provided.
 - b. Conduct in accordance with HIS 11.6.
 - c. Operate Six Flags Pumps using the existing 20-inch and 30-inch force mains
 - d. Test motor and cable insulation for moisture content and insulation defects.
 - e. Conduct abbreviated three-point operational field performance test.
 - f. After operational performance test, perform insulation test again.
2. Field Vibration test.
 - a. Record Vibration levels for Six Flags using pump vibration sensors.
 - b. No field vibration testing is required for Plant Atkinson and Marina Trace pumps.

3.04 MANUFACTURER'S SERVICES

- A. Manufacturer's Representative: Present at each pump station Site, for minimum person-days listed below, travel time excluded:
 1. one person-days for installation assistance and inspection and facility start-up.
 2. one person-days for functional testing and completion of Manufacturer's Certificate of Proper Installation.
 3. one person-days for post-startup training of Owner's personnel. Training shall not commence until accepted detailed lesson plan for each training activity has been reviewed by Owner.
- B. See Section 01640, Manufacturer's Services and Section 01810, Equipment Testing and Facility Startup.

FY21 MULTIPLE PUMP STATIONS PROJECTS

3.05 SUPPLEMENTS

A. The supplements listed below, following “End of Section,” are part of this Specification.

1. Data Sheets:
 - a. 11305-1a, Six Flags Pump Station.
 - b. 11305-1b, Plant Atkinson Pump Station.
 - c. 11305-1c, Marina Trace Pump Station.
2. Proposals:
 - a. 11305-2a, Six Flags Pump Station.
 - b. 11305-2b, Plant Atkinson Pump Station.
 - c. 11305-2c, Marina Trace Pump Station.

END OF SECTION

SUBMERSIBLE PUMP DATA SHEET, 11305-1 – Six Flags Pump Station

Tag Numbers: _____

Pump Name: Six Flags Pump Station Pumps Nos. 1 and 2

Manufacturer and Model Number: (1) Xylem N 3312-765

SERVICE CONDITIONS

Liquid Pumped (Material and Percent Solids): Municipal Wastewater, <1.0% solids

Pumping Temperature (Fahrenheit): Normal: 70 Max 75 Min 55

Specific Gravity at 60 Degrees F: 62.4 lbs/CF Viscosity Range: 1.0 – 1.01 cps

Vapor Pressure at 60 Degrees F: 0.36 psi pH: 6-9

Abrasive (Y/N) Y Possible Scale Buildup (Y/N): N

Total suspended solids (mg/L) <400 mg/L_____.

Minimum diameter solid pump can pass (inches) 3 -inch

Min. NPSH Available (Ft. Absolute): 35 ft

Suction Pressure (Ft): Max _____ Rated_____.

PERFORMANCE REQUIREMENTS

Capacity (US gpm): Rated: 5178 Secondary: 8041

Total Dynamic Head (Ft): Rated: 120 Secondary: 85

Maximum Shutoff Pressure (Ft): 190

Min. Rated Pump Hydraulic Efficiency at Rated Capacity (%): 74.3

Max. Pump Speed at Rated Capacity (rpm): Constant (Y/N): 1185

Adjustable (Y/N): Y

DESIGN AND MATERIALS

Pump Type: Heavy-Duty Nonclog (Y/N) Y Other: _____

Volute Material: Cast Iron ASTM A48

Pump Casing Material: Cast Iron ASTM A48

Motor Housing Material: Cast Iron ASTM A48

Wear Rings Case (Y/N): Y Material: ASTM A276, Series 400 Stainless Steel,
Minimum 350 Brinell Hardness.

FY21 MULTIPLE PUMP STATIONS PROJECTS

Wear Ring Impeller (Y/N): Y Material: ASTM A 276, Series 400 Stainless Steel,
Minimum Brinell Hardness 250

SUBMERSIBLE PUMP DATA SHEET, 11305 - 1 – Six Flags Pump Station

Tag Numbers: _____

Pump Name: Six Flags Pump Station Pumps Nos. 1 and 2

Pump Manufacturer and Model: Xylem NP 3312

Elastomers: Nitrile Rubber

Fasteners: Stainless Steel

Impeller: Type: Double-Shrouded Non-Clog (Y/N): Y

Material: Cast Iron, ASTM A48, GR 35B

Shaft Material: Carbon Steel, ASTM A576 with stainless steel sleeve or all stainless steel.

Base Elbow: Existing

Double Mechanical Seal (Y/N): Y Bearing Life (Hrs): _____

DRIVE MOTOR

Horsepower: 280 Voltage: 460 Phase: 3 Synchronous Speed (rpm): 1200

Enclosure: EXP

CLASSIFICATION: Class 1, Group D, Division 1

Adjustable Speed Drive Range: 40 Hz min to 60 Hz max, Pumps will
use existing Low-Voltage Adjustable Frequency Drive System.

Other Features: _____

Moisture Detection Switches (Y/N): Y

Thermal Protection Embedded in Windings (Y/N): Y

Vibration Sensor: Y

REMARKS: Pumps to be provided with MAS-Type Pump Protection System. MAS unit shall consist of a Pump Electronic Module(PEM) mounted inside the pump and a Base and control unit mounted inside a control enclosure provided by the pump manufacturer.

SUBMERSIBLE PUMP DATA SHEET, 11305 - 2 – Plant Atkinson Pump Station

Tag Numbers: _____

Pump Name: Plant Atkinson Pump Station Pumps Nos. 1 and 2

Manufacturer and Model Number: (1) Xylem N 3202-462

SERVICE CONDITIONS

Liquid Pumped (Material and Percent Solids): Municipal Wastewater, <1.0% solids

Pumping Temperature (Fahrenheit): Normal: 70 Max 75 Min 55

Specific Gravity at 60 Degrees F: 62.4 lbs/CF Viscosity Range: 1.0 – 1.01 cps

Vapor Pressure at 60 Degrees F: 0.36 psi pH: 6-9

Abrasive (Y/N) Y Possible Scale Buildup (Y/N): N

Total suspended solids (mg/L) <400 mg/L.

Minimum diameter solid pump can pass (inches) 3-inch

Min. NPSH Available (Ft. Absolute): 35 ft

Suction Pressure (Ft): Max _____ Rated _____.

PERFORMANCE REQUIREMENTS

Capacity (US gpm): Rated: 500 Secondary: 2000

Total Dynamic Head (Ft): Rated: 114.5 Secondary: 48

Maximum Shutoff Pressure (Ft): 144

Min. Rated Pump Hydraulic Efficiency at Rated Capacity (%): 62.5

Max. Pump Speed at Rated Capacity (rpm): 1775

Constant (Y/N): Y

Adjustable (Y/N): N

DESIGN AND MATERIALS

Pump Type: Heavy-Duty Nonclog (Y/N) Y

Volute Material: Cast Iron ASTM A48, GR 35B

Pump Casing Material: Cast Iron ASTM A48, GR 35B

Motor Housing Material: Cast Iron ASTM A48, GR 35B

FY21 MULTIPLE PUMP STATIONS PROJECTS

SUBMERSIBLE PUMP DATA SHEET, 11305 - 2 – Plant Atkinson Pump Station

Tag Numbers: _____

Pump Name: Plant Atkinson Pump Station Pumps Nos. 1 and 2

Elastomers: Nitrile Rubber

Fasteners: Stainless Steel

Impeller: Type: Double-Shrouded Non-Clog (Y/N): Y

Material: Hard Iron ASTM A532, Alloy IIIA

Insert Ring (Y/N): Y Material: ASTM A532, Alloy IIIA

Shaft Material: Carbon Steel, ASTM A576 with stainless steel sleeve or all stainless steel.

Base Elbow: Existing

Double Mechanical Seal (Y/N): Y Bearing Life (Hrs): _____

DRIVE MOTOR

Horsepower: 45 Voltage: 460 Phase: 3 Synchronous Speed (rpm): 1800

Enclosure: EXP

CLASSIFICATION: Class 1, Group D, Division 1

Other Features: _____

Moisture Detection Switches (Y/N): Y

Thermal Protection Embedded in Windings (Y/N): Y

REMARKS:

Pumps to be provided with a new Mini-CAS Type Protective Relay mounted inside the existing pump control panel. Pumps to be provided with Grip Eye Lifting System

SUBMERSIBLE PUMP DATA SHEET, 11305 - 3 – Marina Trace Pump Station

Tag Numbers: _____

Pump Name: Marina Trace Pump Station Pumps Nos. 1 and 2

Manufacturer and Model Number: (1) Xylem NP 3127-488

SERVICE CONDITIONS

Liquid Pumped (Material and Percent Solids): Municipal Wastewater, <1.0% solids

Pumping Temperature (Fahrenheit): Normal: 70 Max 75 Min 55

Specific Gravity at 60 Degrees F: 62.4 lbs/CF Viscosity Range: 1.0 – 1.01 cps

Vapor Pressure at 60 Degrees F: 0.36 psi pH: 6-9

Abrasive (Y/N) Y Possible Scale Buildup (Y/N): N

Total suspended solids (mg/L) <400 mg/L.

Minimum diameter solid pump can pass (inches) 3 -inch

Min. NPSH Available (Ft. Absolute): 10 ft

Suction Pressure (Ft): Max _____ Rated _____.

PERFORMANCE REQUIREMENTS

Capacity (US gpm): Rated: 270 Secondary: 650

Total Dynamic Head (Ft): Rated: 66.1 Secondary: 39

Maximum Shutoff Pressure (Ft): 83

Min. Rated Pump Hydraulic Efficiency at Rated Capacity (%): 60.0

Max. Pump Speed at Rated Capacity (rpm): 1745

Constant (Y/N): Y

Adjustable (Y/N): N

DESIGN AND MATERIALS

Pump Type: Heavy-Duty Nonclog (Y/N) Y

Volute Material: Cast Iron ASTM A48, GR 35B

Pump Casing Material: Cast Iron ASTM A48, GR 35B

Motor Housing Material: Cast Iron ASTM A48, GR 35B

Impeller Material: Hard Iron, ASTM A532, Alloy 532A

FY21 MULTIPLE PUMP STATIONS PROJECTS

Insert Ring: (Y/N): Y Material: Hard Iron, ASTM Alloy IIIA

SUBMERSIBLE PUMP DATA SHEET, 11305 - 3 – Marina Trace Pump Station

Tag Numbers: _____

Pump Name: Marina Trace Pump Station Pumps Nos. 1 and 2

Elastomers: Nitrile Rubber

Fasteners: Stainless Steel

Shaft Material: Carbon Steel, ASTM A576 with stainless steel sleeve or all stainless steel.

Base Elbow: New _____

Double Mechanical Seal (Y/N): Y Bearing Life (Hrs): _____

DRIVE MOTOR

Horsepower: 10 Voltage: 460 Phase: 3 Synchronous Speed (rpm): 1800

Enclosure: EXP

CLASSIFICATION: Class 1, Group D, Division 1

Other Features: _____

Moisture Detection Switches (Y/N): Y

Thermal Protection Embedded in Windings (Y/N): Y

REMARKS:

Pumps to be provided with new Mini-CAS Type Protective Relays. Pump protective relays are to be mounted inside new Mini-CAS Box.

Pumps are to be provided with new discharge elbow and guide rails.

Pumps to be provided with Grip Eye Lifting System



**Xylem Water Solutions USA, Inc.
Flygt Products**

July 28, 2020

90 Horizon Drive
Suwanee, GA 30024
Tel (770) 932-4320
Fax (770) 932-4321

Mr. Tom Wynn
Jacobs

Quote # 2020-ATL-0307 Alternate 2, Version 8
Project Name: Cobb-Six Flags
Job Name: NP3312 280HP

A Flygt Preventive Maintenance Contract is available for this order. Please contact your Xylem Service Center for more information.

Xylem Water Solutions USA, Inc. is pleased to provide a quote for the following Flygt equipment for the project referenced above.

PUMPS

Qty	Description
2	00331277500000 Flygt NT 3312, 63-670 , 470 mm Intended for dry vertical installation, T-stand and inlet elbow included Hard iron impeller and insert ring Coating: Duasolid 50, Oxyrane ester Drive Unit: 775 6 pole, 280 hp, 460 V, Approval: FM Ex Cooling jacket for direct media cooling Standard connection housing Insulated support bearing Cables Power Cable not included. Power Cable inlet dia 1x18 mm Pilot Cable not included. Pilot Cable inlet dia 1x18 mm Material Shaft: AISI 431 Stainless steel Supervision FLS, leakage detector, in junction box FLS, leakage detector, in stator housing PT-100 in one stator winding PT-100 in 2nd and 3rd stator windings PT-100 in lower bearing PT-100 in upper bearing PEM Vibration 3 AXIS Current Frequency



Qty Description

PUMPS Price USD \$ 176,096.66

CABLE

Qty	Description
	2 PUMPS X 2 CABLES PER PUMP X 100' PER CABLE = 400'
	REQUIRED CABLE LENGTH VERIFIED BY ENGINEER
400	94 19 86
	CABLE,SUBCAB 3X70+2G35/2+ S(2X0.5) 39.5MM
8	83 57 26
	GRIP,CABLE SS 37-49MM

CABLE Price USD \$ 22,290.40

MAS 801

Qty	Description
1	79681AA
	MAS 801 CABINET
1	823 07 00
	MONITOR,PUMP MAS800 CU
2	823 06 00
	MONITOR,PUMP MAS800 BU
1	822 48 00
	PANEL,OPERATOR FOP402
1	14-60 30 10
	SUPPLY,BATTERY POWER, 55W, 24V TRICKLE CHARGE,DIN RAIL KIT
2	14-60 30 26
	BATTERY, PM 12120, 12V 12AMP

MAS 801 Price USD \$ 10,996.75

SPARES

Qty	Description
1	LIST
	IMPELLER UNIT 470MM
1	617 99 02
	SEAL,MECHANICAL WCCR/WCCR
1	83 21 32
	KIT,O-RING 3312
1	83 05 86
	KIT,O-RING 7X5 C
2	84 23 25
	BEARING,BALL ANG CONT SNGL ROW 200X95X45MM, 7319 BECBP
1	83 57 59
	BEARING,ROLLER CYL SNGL ROW 170X95X32,30X30MM, NU219ECP6
1	83 34 65
	BEARING,ROLLER CYL SNGL ROW 160X75X37,28X28, NU315ECPVLO24
1	790 02 00
	RING,INSERT HC

Qty	Description
1	586 12 04 SEAL,MECHANICAL WCCR/WCCR
100	94 19 86 CABLE,SUBCAB 3X70+2G35/2+ S(2X0.5) 39.5MM
2	83 57 26 GRIP,CABLE SS 37-49MM

SPARES Price USD \$ 31,823.14

SERVICES

Qty	Description
1	00ZZZZ0 ENGINEERING-SPECIALITY
2	14-69 00 10A START UP,FLYGT,NO TAX 2-TP MODELS: 3000,7000,8000
3	14-69 95 16 TEST FAL 2.2 PLOTTED 3001-7000 FAL 15-900006
3	14-69 95 76 TEST FAL 2.8 VIBRATN 3001-7000 FAL 15-900015
1	14-69 98 98 SUBMITTALS
1	electronic_Sub Electronic Copy of Submittals in PDF (Portable Document Format) complete with Bookmarks and an Indexed Table Of Contents.
1	14-69 98 96 PARTS LISTS AND MANUALS
1	electronic_OM Electronic Copy of Operations & Maintenance Manual in PDF (Portable Document Format) with Bookmarks and Indexed Table Of Contents.

SERVICES Price USD \$ 13,652.00

Total Price \$ 254,858.95

Freight Charge \$ 10,554.00

Total Price \$ 265,412.95

Terms & Conditions

This order is subject to the Standard Terms and Conditions of Sale – Xylem Americas effective on the date the order is accepted which terms are available at <http://www.xyleminc.com/en-us/Pages/terms-conditions-of-sale.aspx> and incorporated herein by reference and made a part of the agreement between the parties.



Purchase Orders: Please make purchase orders out to: Xylem Water Solutions USA, Inc.
Freight Terms: 3 DAP - Delivered At Place 08 - Jobsite (per Incoterms 2020)
See Freight Payment (Delivery Terms) below.
Taxes: State, local and other applicable taxes are not included in this quotation.
Back Charges: Buyer shall not make purchases nor shall Buyer incur any labor that would result in a back charge to Seller without prior written consent of an authorized employee of Seller.
Shortages: Xylem will not be responsible for apparent shipment shortages or damages incurred in shipment that are not reported within two weeks from delivery to the jobsite. Damages should be noted on the receiving slip and the truck driver advised of the damages. Please contact our office as soon as possible to report damages or shortages so that replacement items can be shipped and the appropriate claims made.
Terms of Delivery: PP/Add Order Position
Validity: This Quote is valid for thirty (30) days.
Terms of Payment: 90% N60 after invoice date; 10% Upon completion of start-up, not to exceed 120 days following invoice date (whichever occurs first).
Xylem's payment shall not be dependent upon Purchaser being paid by any third party unless Owner denies payment due to reasons solely attributable to items related to the equipment being provided by FLYGT.

Schedule: Delivery lead times are XX weeks after receipt of submittal approval and order acceptance.

Submittals: 2-4 after receipt of order.

Pumps: 9-12 weeks after receipt of signed submittals and approved contract.

Controls: 6-9 weeks after receipt of signed submittals and approved contract.

Accessories: 4-6 weeks after receipt of signed submittals and approved contract

Our current delivery lead-times are forecasted estimates only due to the outbreak of the COVID-19 virus pandemic and its global effects on commerce, supply chain, and logistics. Xylem will, however, use all commercially reasonable efforts to minimize any delivery delay impacts.

Sincerely,

Chris Miller, P.E.
Sales Representative
Phone: (678)804-5723
Cell: (678)381-3878 <Best
chris.miller@xylem-inc.com





Customer Acceptance

This order is subject to the Standard Terms and Conditions of Sale – Xylem Americas effective on the date the order is accepted which terms are available at <http://www.xyleminc.com/en-us/Pages/terms-conditions-of-sale.aspx> and incorporated herein by reference and made a part of the agreement between the parties.

A signed copy of this Quote is acceptable as a binding contract.

Purchase Orders: Please make purchase orders out to: Xylem Water Solutions USA, Inc.

Quote #: 2020-ATL-0307 Alternate 2, Version 8
Customer Name: Mr. Tom Wynn
Job Name: NP3312 280HP
Total Amount: \$ 254,858.95
(excluding freight)

Signature: _____	Name: _____ (PLEASE PRINT)
Company/Utility: _____	PO: _____
Address: _____	Date: _____
_____	Phone: _____
_____	Email: _____
_____	Fax: _____



PERFORMANCE CURVE

DATE
2020-07-24

PROJECT:

ISSUE
54

PROD.

N3312/775 FM

NO. OF
BLADES..... 3

TOT.MOM.OF
INERTIA..... 4.61 KGM²
RATED
SPEED..... 1185 RPM

POLES 6 FREQ. 60 HZ
VOLTAGE..... 460 V
MOTOR SHAFT
POWER..... 280hp / 209 kW
STARTING
TORQUE..... 2470 NM
MAX
TORQUE..... 4800 NM
RATED
CURRENT..... 345 A
STARTING
CURRENT..... 2230 A

CURVE NO
63- 670

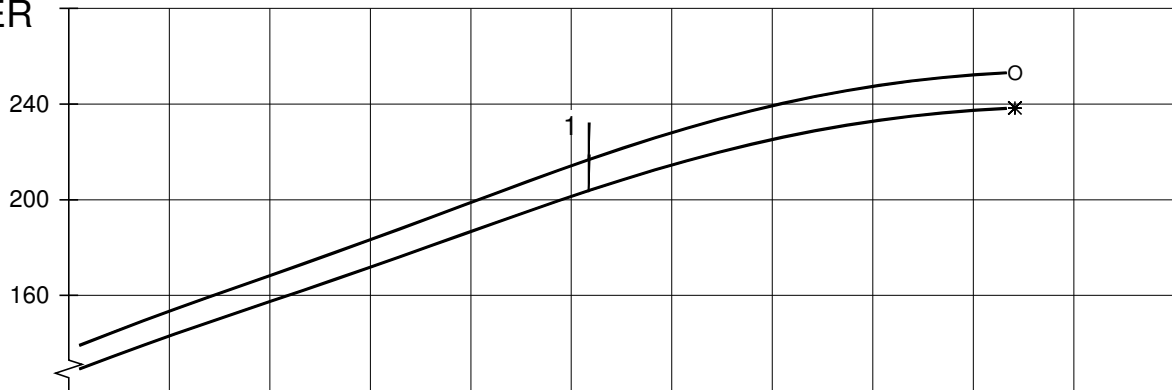
IMPELLER DIAMETER
470 mm

MOTOR TYPE
43-56-6BC /01 (13)

GEAR TYPE RATIO

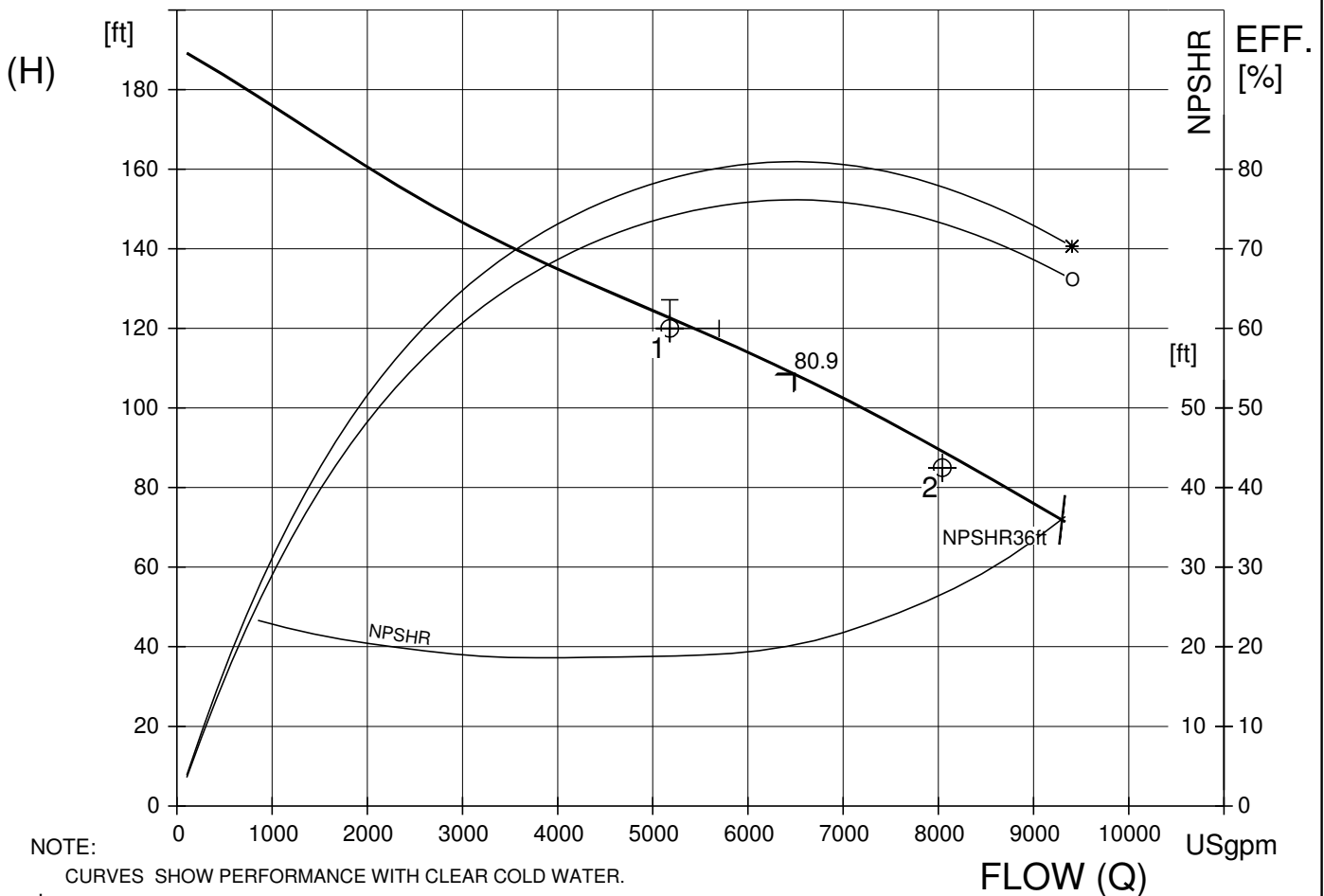
	1/1-LOAD	3/4-LOAD	1/2-LOAD
MOTOR COS PHI	0.80	0.75	0.63
MOTOR EFFICIENCY	94.0%	94.0%	93.0%
GEAR EFFICIENCY			

POWER [hp]



DUTY POINTs :	FLOW[USgpm]	HEAD[ft]	POWER [hp]	EFF. [%]	NPSHR[ft]	GUARANTEE	
1	5178	120.0	(< 225) (< 211)	(74.3) (79.0)	19.2	HI grade 1U Q&H) * -> No guarantee (ANSI/HI 11.6:2012)
2	8041	85.0					

HEAD (H)



NOTE:

CURVES SHOW PERFORMANCE WITH CLEAR COLD WATER.

* : PUMP EFFICIENCY / SHAFT POWER

O : OVERALL EFFICIENCY / INPUT POWER

NPSHR = NPSH3 + margins

unix AUTHOR: ewillats PECU rev:21.10 /CUPC



PERFORMANCE CURVE



Motor Chart

Motor Nr

43-56-6BC

Issue

13

Date

1995-11-17

0775.000

Nominal Values

Voltage	3 * 460 V	Frequency	60 Hz	Poles	6	Stator	01 D
P-Input	222 kW	P-Shaft	209 kW / 280 HP	Current	350 A	Speed	1185 RPM

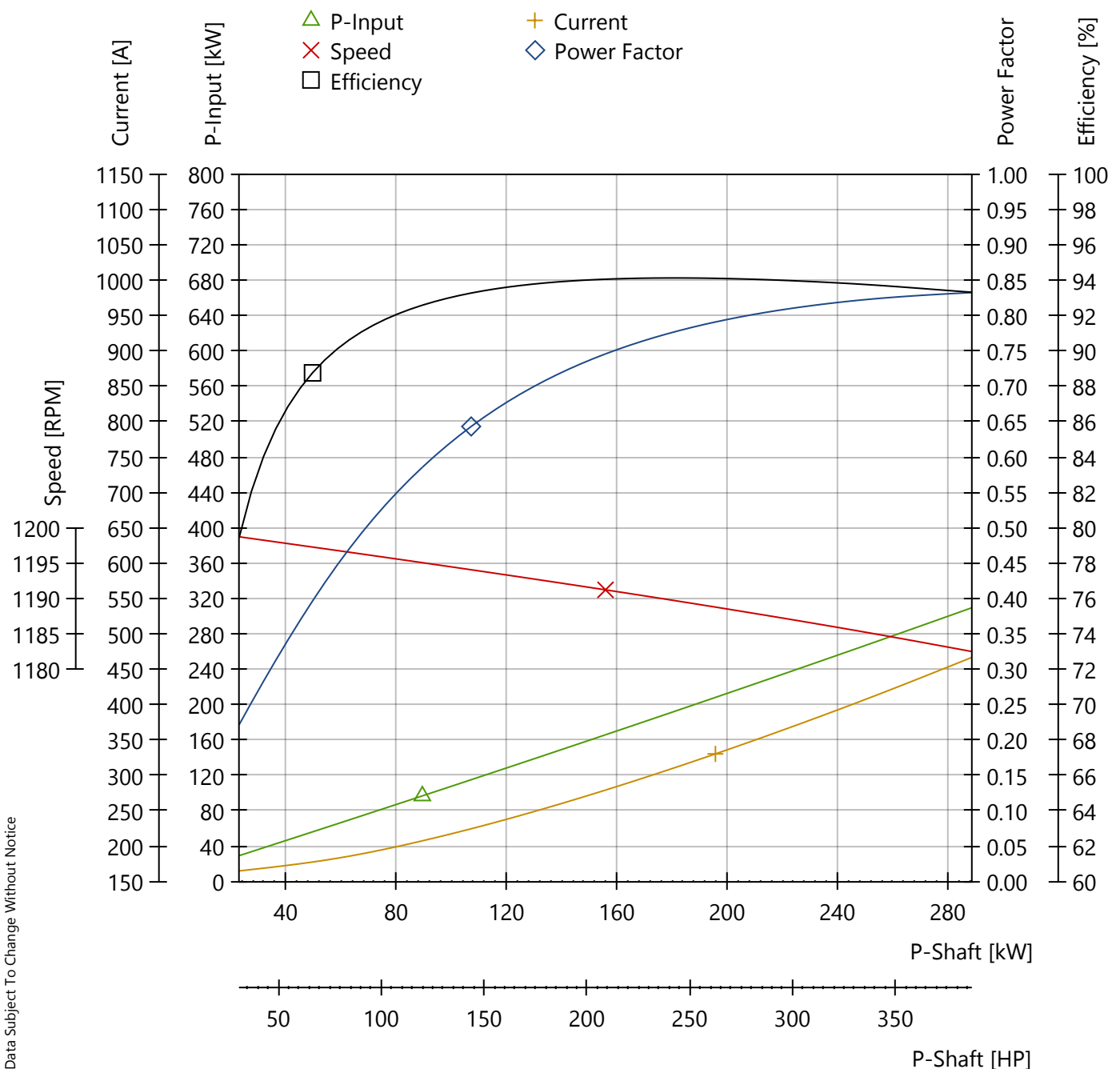
Torque (Nm / Quotient Compared To Torque At Nominal Speed)

Start 2470 / 1.5 Pull-Up 1830 / 1.1 Break-Down 4800 / 2.9

Moment Of Inertia

3.5 kgm²

Load	1/1	3/4	1/2	Breakaway Starting Current (Locked Rotor Current Acc. To NEMA)	2230 A
Power Factor	0.80	0.75	0.64	Breakaway Starting Power Factor	0.32
Efficiency %	94.0	94.1	93.2	No Load Current	161 A
Current A	350	280	222	No Load Power Factor	0.046
				Insulation	Class H





Torque-Current-Speed Chart

Motor Nr

43-56-6BC

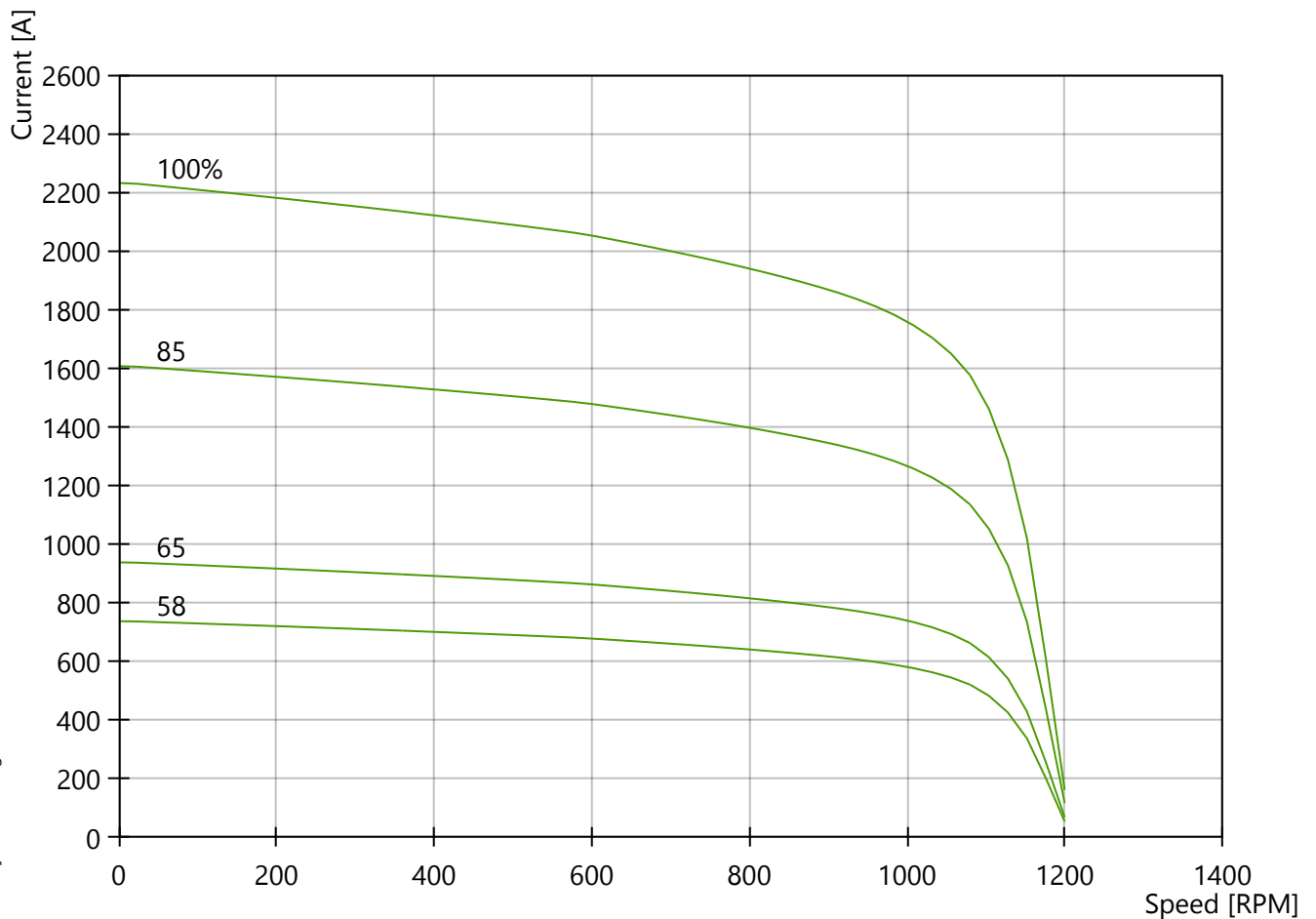
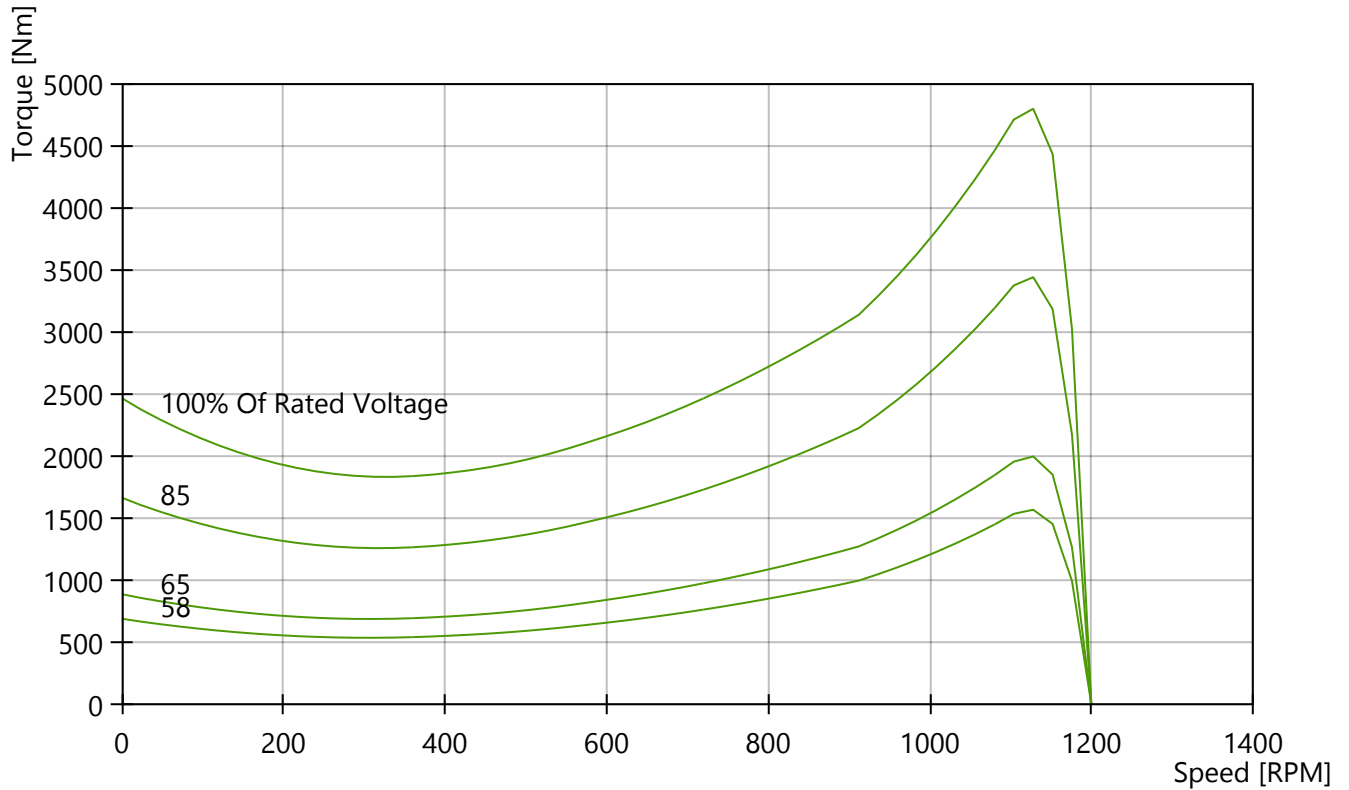
Rated Values Voltage 3 * 460 V Frequency 60 Hz Stator 01 D

Issue

13

Date

1995-11-17





Various Load Table

Motor Nr

43-56-6BC

Issue 13

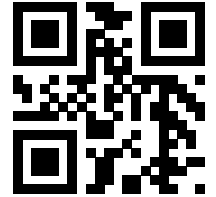
Date 1995-11-17

Frequency: 60 Hz
Number of Poles: 6
Number of Phases: 3
Rated Speed: 1185 RPM
Rated Voltage: 460 V
Rated Current: 350 A
Rated OutPower: 209 kW 280 HP
Rated InPower: 222 kW
Stator Variant: 01 D

The values are valid at 75° C average winding temperature

		125%	110%	100%	90%	75%	50%	25%	10%
Output Power	kW	261	230	209	188	157	105	52	21
Output Power	HP	350	308	280	252	210	140	70	28
Input Power	kW	279	245	222	200	167	112	59	27
Efficiency	%	93.6	93.9	94.0	94.1	94.1	93.2	89.2	77.8
Current	A	425	375	350	320	280	222	179	164
Power Factor	-	0.83	0.81	0.80	0.78	0.75	0.64	0.41	0.21
Torque	Nm	2105	1850	1680	1510	1255	835	415	165
Speed	RPM	1185	1185	1185	1190	1190	1195	1195	1200

No Load Current: 161 A
Power factor at no load: 0.046
Breakaway Starting Current: 2230 A Break. starting current/Rated current: 6.4
Breakaway Starting Power Factor: 0.32
Starting torque: 2470 Nm Starting torque/Rated torque: 1.5
Max torque: 4800 Nm Max torque/Rated torque: 2.9
Speed at max. torque: 1120 RPM
Rotor inertia: 3.5 kgm²
Iron losses: 2870 W
Friction losses: 830 W (at synchronous speed):
Pull up torque: 1830 Nm



MAS 801

Pump monitoring

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3.3.3 IP-rating.....	12
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1 System Description

1.1 System overview

MAS 801

MAS 801 is a monitoring system that is designed to protect the pump, based on measurements. The measurements are acquired from pump sensors and measurement modules. The system has these functions for different user categories:

- A graphical user interface, called the configuration and analysis tool, for the computer and the HMI
- Local and remote information of pump status, key data, and alarms
- Analysis and troubleshooting that are based on graphs, alarms, and black boxes
- Service reminders and reports
- Configuration of the system and monitoring channels
- Protocols for communication with external automation electronics, SCADA, and cloud applications

The system consists of the following components:

- A central unit
- Base units
- Pump electronic modules
- An HMI

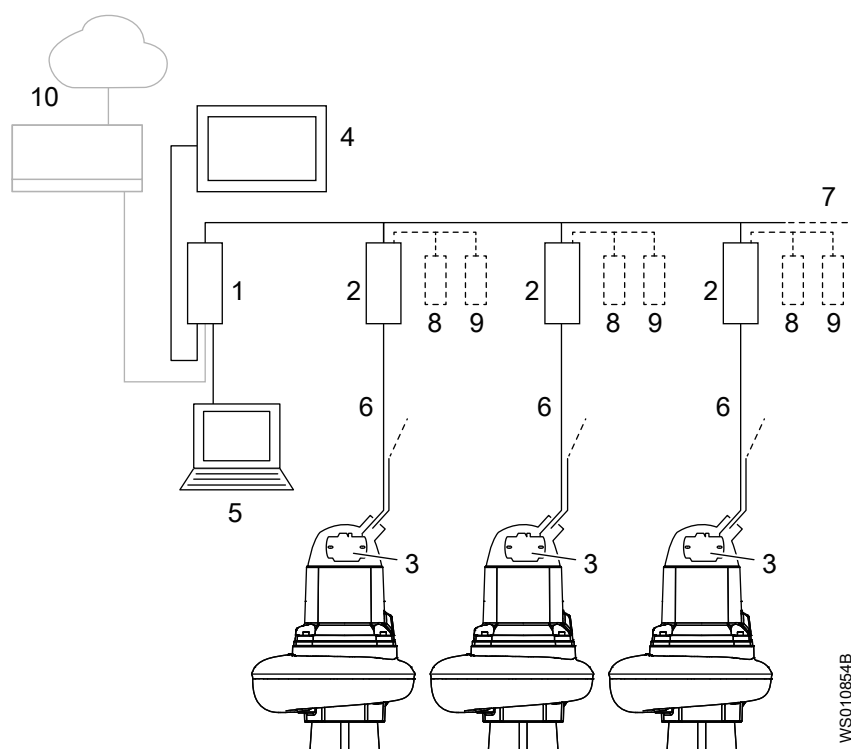


Table 1: Parts

Number	Part	Product name	Description
1	Central unit (CU)	MAS CU 801	<ul style="list-style-type: none"> The central unit communicates with all the base units in the system. It includes the configuration and analysis tool that consists of embedded webpages, used to interact with the monitoring system. It is installed in an electrical cabinet.
2	Base unit (BU)	MAS BU 811	The base unit communicates data between the pump electronic module and the central unit. If necessary, the base unit also protects the pump by stopping it. It is installed in an electrical cabinet.
3	Pump electronic module (PEM)	MAS PEM 811	<p>The pump electronic module is connected to the pump sensors. It communicates with the base unit and has these features:</p> <ul style="list-style-type: none"> Contains the default settings that are specific to the pump Stores measured data <p>It is installed in the pump junction box.</p>
4	Human-machine interface (HMI)	FOP 402	The HMI is connected to the central unit and shows the configuration and analysis tool that is used for user interaction. The HMI is installed on an electrical cabinet door.
5	Computer	-	The computer is an alternative to the HMI. It is connected to the central unit and shows the configuration and analysis tool that is used for user interaction.
6	Two-wire communication	-	The noise-tolerant bus communication, in the SUBCAB™ cable, between the pump electronic module and the base unit
7	DeviceNet	-	The communication bus that connects the central unit to the base units
8	Power analyzer, optional	PAN 312	<p>The power analyzer measures the following data:</p> <ul style="list-style-type: none"> Three-phase power Power factor System voltage Voltage imbalance Pump current Current imbalance Total energy
9	Relay module, optional	MRM 01	<p>The relay module has four relays that can be individually configured for:</p> <ul style="list-style-type: none"> A certain channel, A-alarm or B-alarm Combined B-alarm Combined A-alarm <p>A maximum of 8 relay modules can be used.</p>
10	Higher system level components	-	<ul style="list-style-type: none"> Controller SCADA system

Communication

- Measurements and pump information are transmitted through the two wires from each pump electronic module
- Data runs through the base unit and to the central unit over the DeviceNet bus. In this way, two databases of the same pump information are updated continually. This is a backup measure and provides different access possibilities.

Monitoring alternatives

These pump sensors, which are connected to the pump electronic module, are used for monitoring.

- Thermal contacts or thermistors for stator winding temperature monitoring
- Leakage sensor in the stator housing
- Leakage sensor in the junction box
- Leakage sensor in the oil inspection chamber
- One or three Pt100 sensors to measure the stator winding temperature
- Pt100 sensor to measure the main bearing temperature
- Pt100 sensor to measure the support bearing temperature
- Current transformer for pump current and speed measurement
- Vibration sensor for 3-axis vibration measurement, integrated in the pump electronic module

2 Product Description

2.1 MAS CU 801

2.1.1 Product design

The central unit is a hub for information storing, communication, and presentation. There is one central unit per system and all the base units exchange information continuously with the central unit.

The central unit has these features:

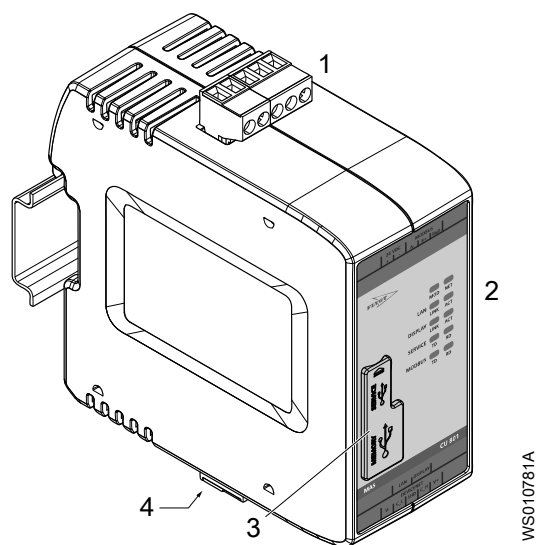
- Holds copies of each pump data
- Contains a configuration and analysis tool that is accessed by using a standard web browser

Product name	Article number	Description
MAS CU 801	823 07 00	The central unit handles and communicates with up to ten base units.

2.1.2 Approvals

- CE
- CB
- UL
- CSA

2.1.3 Parts



1. Top connections
2. Status LEDs
3. Front connections
4. Bottom connections

2.2 MAS BU 811

2.2.1 Product design

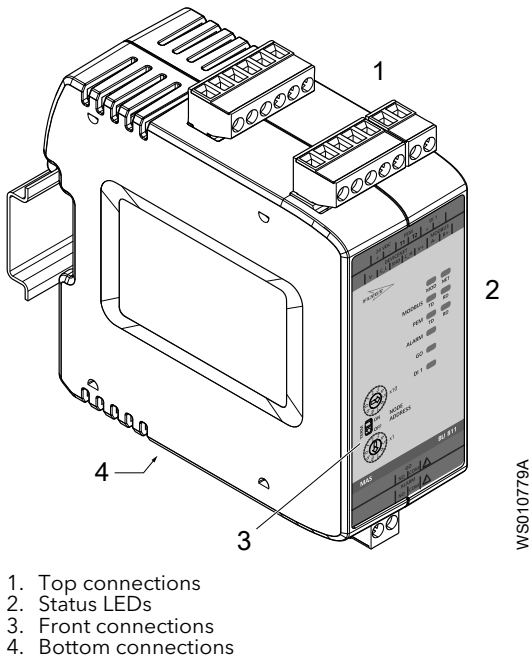
The base unit is a communication gateway between the pump electronic module and the central unit. The base unit receives status changes of monitored channels from the pump electronic module.

Product name	Article number	Description
MAS BU 811	823 06 00	The base unit communicates with the central unit and the pump electronic module.

2.2.2 Approvals

- CE
- CB
- UL
- CSA

2.2.3 Parts



2.3 FOP 402

2.3.1 Product design

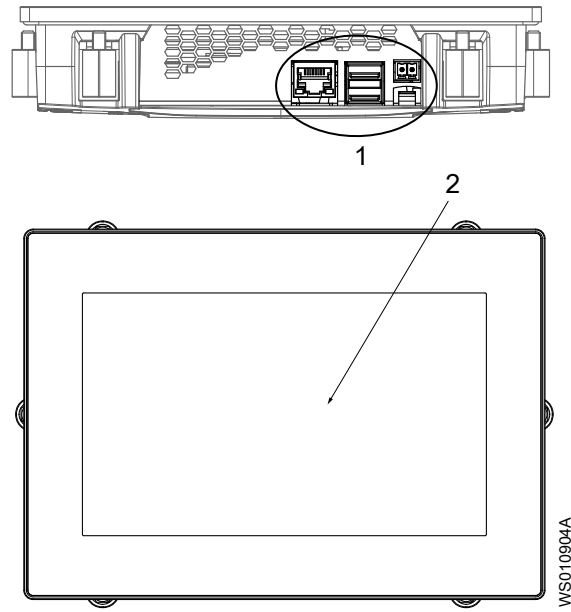
FOP 402 is a touchscreen HMI that is connected to one or more web servers. The HMI is installed on a wall or in the cabinet door.

Product name	Part number	Description
FOP 402	822 48 00	Hand-Off-Auto for one or more units.

2.3.2 Approvals

- CE
- UL

2.3.3 Parts

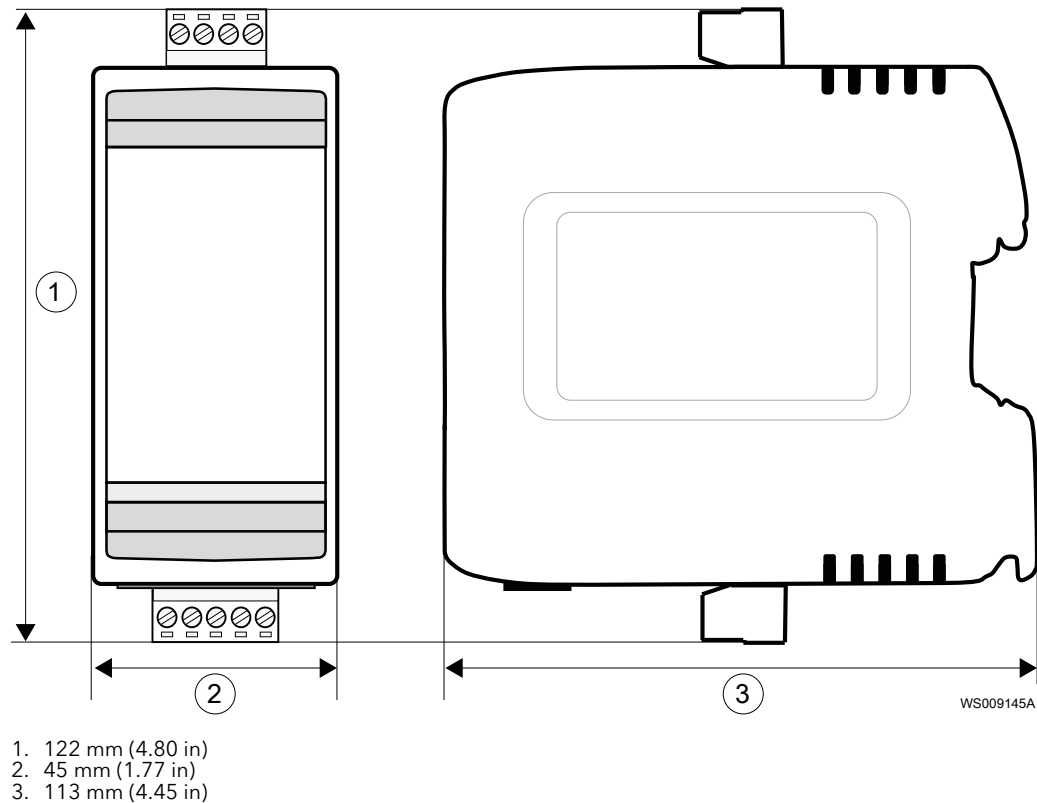


1. Terminals, see [Terminals](#) on page 13
2. Screen

3 Technical Reference

3.1 MAS CU 801

3.1.1 Dimensions



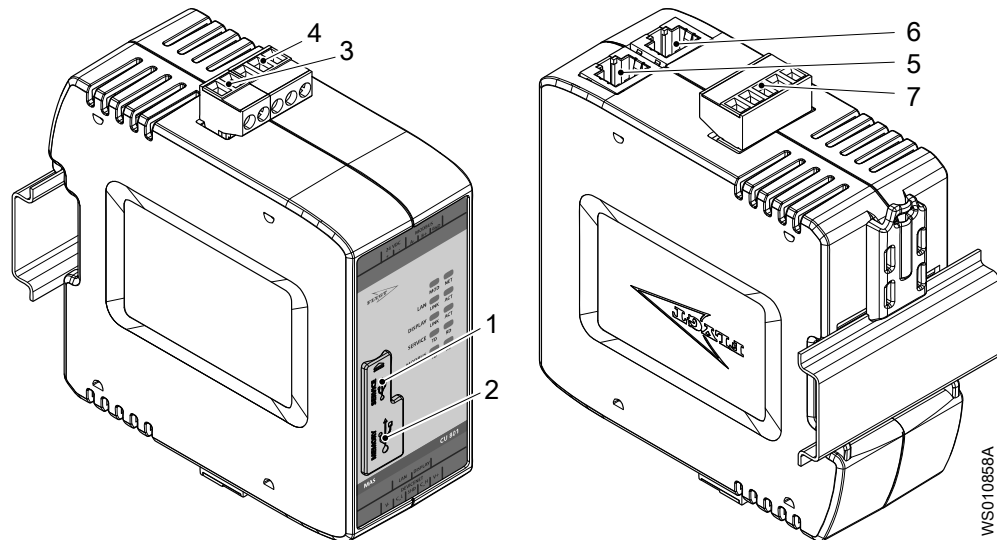
3.1.2 Environmental requirements

Parameter	Value
Operating temperature	-20°C - +65°C (-4°F - +149°F)
Storage temperature	-10°C - +75°C (+14°F - +167°F)
Working humidity	90% relative humidity, non-condensing
Maximum altitude	4000 m (13 123 ft)
IP rating	IP20

3.1.3 Electrical data

Part	Description
Power	Maximum 10 W
Voltage	<ul style="list-style-type: none">• 24 VDC -15% to +20%• Class II power supply only
GO contact interlocking function	<ul style="list-style-type: none">• 250 VAC, 8 A, resistive load• 250 VAC, 3 A, inductive load
A-alarm relay	250 VAC, 4 A, resistive load

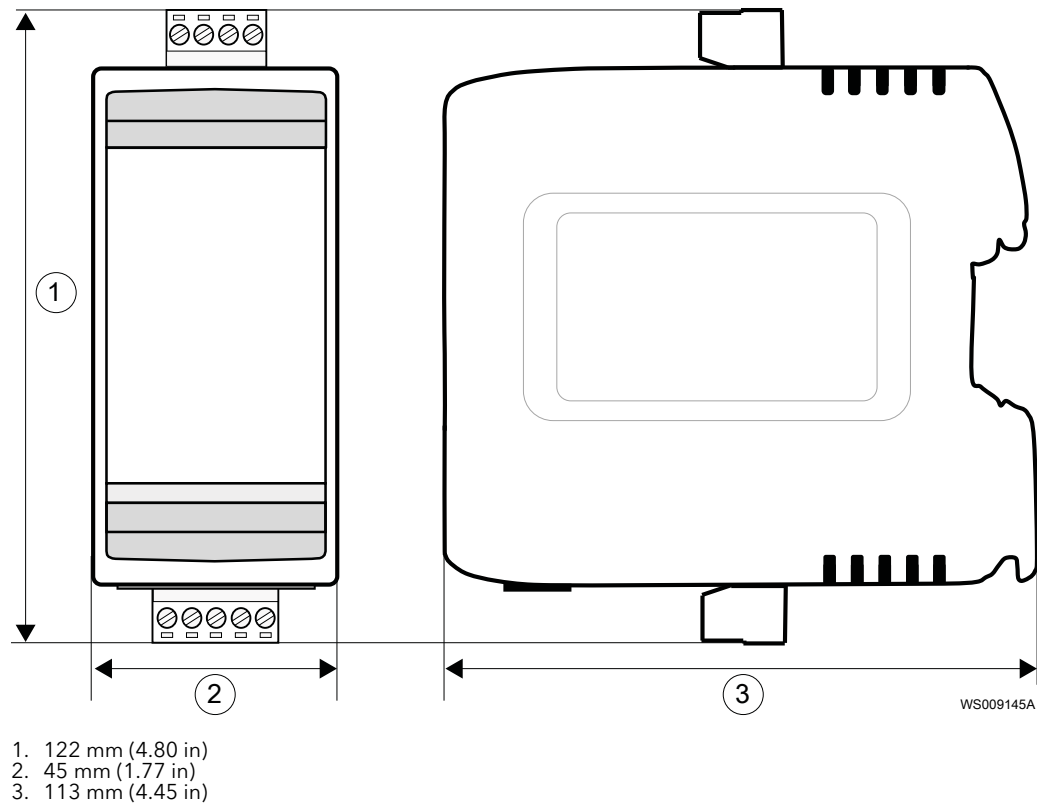
3.1.4 Terminals



Section	Terminal		Description
1	SERVICE		-
2	MEMORY		USB type A connector
3	+	24 VDC	24 VDC ±10%
	—		
4	A-	MODBUS	<ul style="list-style-type: none">• RS-485• Modbus slave
	B+		
	GND		
5	LAN		The RJ45 connection to the computer
6	DISPLAY		The RJ45 connection to the HMI
7	V-	DEVICENET	<ul style="list-style-type: none">• Communication between the central unit and the base unit• 24 VDC, shielded
	C_L		
	SHD		
	C_H		
	V+		

3.2 MAS BU 811

3.2.1 Dimensions



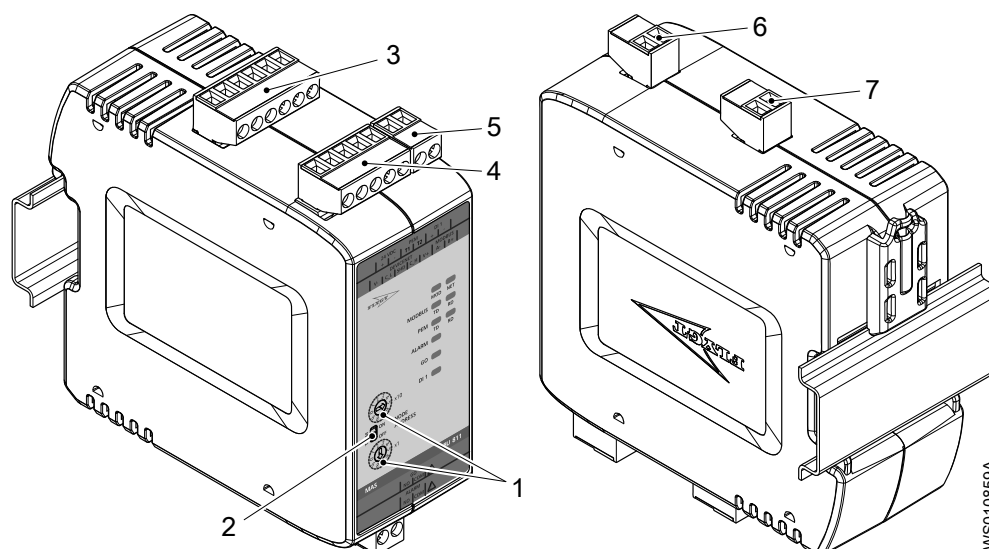
3.2.2 Environmental requirements

Parameter	Value
Operating temperature	-20°C - +65°C (-4°F - +149°F)
Storage temperature	-10°C - +75°C (+14°F - +167°F)
Working humidity	90% relative humidity, non-condensing
Maximum altitude	4000 m (13 123 ft)
IP rating	IP20

3.2.3 Electrical data

Part	Description
Power	Maximum 10 W
Voltage	<ul style="list-style-type: none">• 24 VDC -15% to +20%• Class II power supply only
GO contact interlocking function	<ul style="list-style-type: none">• 250 VAC, 8 A, resistive load• 250 VAC, 3 A, inductive load
A-alarm relay	250 VAC, 4 A, resistive load

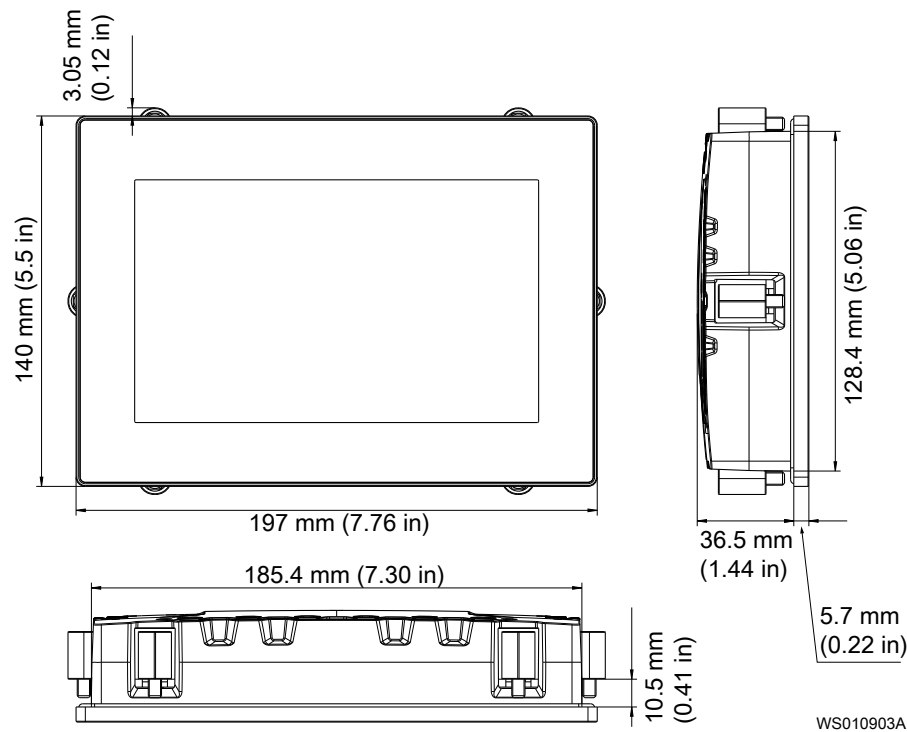
3.2.4 Terminals



Section	Terminal		Description
1	NODE ADDRESS		Settings for the NODE ADDRESS : <ul style="list-style-type: none"> Rotational switch x1 set to 1–9 depending on the number of pumps. Only set to 0 if 10 pumps are used Rotational switch x10, set to 1 only if 10 pumps are used Otherwise set to 0
2	TERM	ON/OFF	For multiple setups, terminate the last connector in the chain. Set TERM to ON .
3	+	24 VDC	24 VDC –15% to +20% The power supply must be sufficient for all pumps.
	–		
	T1	PEM	Twisted pair <ul style="list-style-type: none"> The base unit supplies the pump electronic module with power over the two signal leads. 24 VDC power supply
	T2		
	+	DI1	<ul style="list-style-type: none"> The digital input is used for a manual alarm reset or external alarm input For the Ex-proof pump application, the input is used to receive the thermal contact status
	–		
4	V–	DEVICENET	<ul style="list-style-type: none"> Communication between the central unit and the base unit 24 VDC, shielded
	C_L		
	SHD		
	C_H		
	V+		
5	A–	MODBUS	<ul style="list-style-type: none"> RS-485 Modbus master
	B+		
	GND		
6	NO	GO	The relay is opened when an A-alarm is detected and the pump is stopped. <ul style="list-style-type: none"> 250 VAC, 8 A, resistive load 250 VAC, 3 A, inductive load, contactor coil
	COM		
7	NO	ALARM	The relay is closed when an A-alarm is detected. <ul style="list-style-type: none"> 250 VAC, 4 A, resistive load
	COM		

3.3 FOP 402

3.3.1 Dimensions



3.3.2 Environmental requirements

Parameter	Value
Operating temperature	-20°C - +60°C (-4°F - +140°F)
Storage temperature	-30°C - +80°C (-22°F - +176°F)
Operating humidity	Relative humidity: 20-90 %

3.3.3 IP-rating

- IP20, back side
- IP65, front side

3.3.4 Electrical data

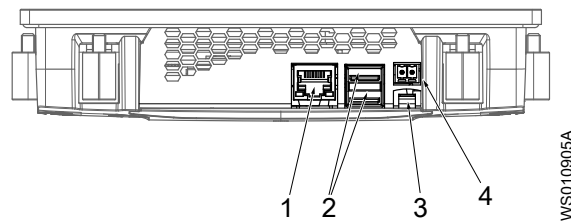
Parameter	Value
Supply voltage	24 VDC
Maximum current at nominal voltage	0.35 A at 24 VDC
Maximum power consumption	8.5 W
Voltage range	24 VDC (-15% / +20%)

3.3.5 Display data

Part	Description
Processor	ARM Cortex A9, dual core, 800 MHz
Display	7" TFT LED, resolution 800 x 480 pixels
Brightness	500 cd/m ²
Contrast ratio	600:1
Colors	16.7 M

Part	Description
Touch-panel type	Multi-touch, PCT
Memory	512 MB Flash, 1 GB RAM

3.3.6 Terminals



Number	Terminal	Description
1	Ethernet	-
2	USB	The HMI is equipped with a USB 2.0 host controller with two USB interfaces.
3	Power supply	24 VDC
4	Grounding clip	-

Xylem |'zīləm|

- 1) The tissue in plants that brings water upward from the roots;
- 2) a leading global water technology company.

We're a global team unified in a common purpose: creating advanced technology solutions to the world's water challenges. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. Our products and services move, treat, analyze, monitor and return water to the environment, in public utility, industrial, residential and commercial building services settings. Xylem also provides a leading portfolio of smart metering, network technologies and advanced analytics solutions for water, electric and gas utilities. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise with a strong focus on developing comprehensive, sustainable solutions.

For more information on how Xylem can help you, go to www.xylem.com



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Visit our Web site for the latest version of this document and more information

The original instruction is in English. All non-English instructions are translations of the original instruction.

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TO: Xylem GA ATTN: Chris Miller QUOTE NO.: 79681AA PUMP MODEL: _____
 HP: NA VOLTAGE: 120 PHASE: 1 WIRE: _____ NO PUMPS/MOTORS: 2 PUMP FLA: _____
 JOB NAME: MAS811 panel (Duplex)

ENCLOSURE APPROX.
☐ NEMA 4X 24 X 24
☐ BOX IN BOX X 8
☐ CUSTOM ENCLOSURE
☐ MCC
MATERIAL
☐ 304 SS
 ENCLOSURE BRAND--- HOFFMAN

MODIFICATIONS
☐ ALARM CAGE
☐ DEAD FRONT
☐ DOOR STOP
☐ DRAINS
☐ DRIP SHIELD
☐ INSULATION
☐ THREE POINT LATCH
☐ LEGS
☐ PARTITION
☐ SKIRTS
☐ SPECIAL POWDER COAT COLOR
☐ ST STEEL LEGEND SCREWS
☐ SUN SHIELD
☐ TEMPERATURE SENSOR
☐ WINDOW
☐ AIR CONDITIONER
☐ INTRUSION SWITCH

MOTOR STARTERS
☐ AMBIENT OVERLOADS
☐ AUX CONTACTS
☐ NEMA MOTOR STARTERS
☐ SMART RUN VFDS
☐ SOLID STATE MOTOR STARTERS
☐ SOLID STATE OVERLOADS
☐ PHASE CONVERTORS
☐ VFD
☐ VFD - LINE FUSES
☐ VFD - LINE REACTORS
☐ CONTACTOR

BREAKERS
☐ AUX CONTACTS
☐ CONTROL Q-FRAME
☐ EMERGENCY
☒ 1 EXTRA SINGLE POLE
☐ FUSIBLE DISCONNECT
☐ GEN RECEPTACLE
☐ HANDLE
☐ BREAKER INTERLOCK
☐ LIGHTING PANEL
☐ MAIN
☐ MCP
☐ MOTOR
☐ BREAKER PADLOCK ATTACHMENTS
☐ POWER TERMINALS
☐ TVSS
☐ RECEPTACLE Q-FRAME
☐ TRANSFORMER

CONTROL SYSTEM
☐ APP CONTROLLER
☐ TOUCH SCREEN
☐ MPE BS2000 BUBBLER
☐ APG CONTROLLER
☐ MPE CONTROLLER
☐ PLC
☐ MPE PROBE RELAY
☐ PROBE
☐ MILTRONICS CONTROLLER
☐ MPE INTRINSIC SAFE DUPLEXOR
☐ START/STOP PB'S ☐

☐ PRESSURE TRANSDUCER
☐ ULTRASONIC TRANSDUCER

OPTIONS
☐ ALARM HORN
☐ ALARM LIGHT
☐ ALARM SILENCE
☐ ALARM TEST
☐ ALTERNATOR
☐ AMMETER W/C'TS
☒ ABL 8 (SCHNEIDER ELECTRIC POWER SUPPLY)

☐ AWG #14 WIRING
☐ BEARING PL
☐ BREAKER TRIP PL
☐ COPPER GROUND BUS
☐ COUNTERS
☐ DC ALARM/BAT BACK UP
☐ DIALER
☐ DIM GLOW LIGHTS
☐ ELAPSED TIME METERS
☐ ETM SIMULTANEOUS
☐ FLOAT TEST SWITCH
☐ GROUND FAULT SYSTEM
☐ GRD. FAULT RECEPT.
☐ GRD. MONITOR RELAYS
☐ HEATER/THERMOSTAT
☐ INDUSTRIAL RELAYS
☐ INTRINSIC BARRIER
☐ INTRINSIC RELAYS
☐ JUNCTION BOX
☐ LEVEL LIGHTS
☐ MAS UNIT SUPPLIED BY OTHERS
☐ MODULE (1PH)
☐ MOISTURE PL
☐ NEMA 4 HOA, SPRING RET.
☐ O & M MANUAL

☐ ON/OFF SWITCH
☐ OVERLOAD PL
☐ OVERLOAD RESETS
☐ PHASE MONITOR
☐ SPEED POT
☐ POWER ON LIGHT
☐ PUMP FAIL PL
☐ PUMP CALL
☐ REMOTE ALARM TERM
☐ RESETS
☐ RUN LIGHTS
☐ SERVICE ENT. LABEL
☐ STIRRING FAN W/THERMOSTAT
☐ SUB-MEGS
☐ SURGE ARRESTOR
☐ SIGNAL SPLITTER
☐ THERMAL PL
☐ THERMAL TERMINALS
☐ TD RELAYS
☐ TIME CLOCK
☐ TIMER, REPEAT CYCLE
☐ TOGGLE HOA
☐ CONTROL TRANSFORMER
☐ TRANSFORMER 24 VAC
☐ TROUBLE LIGHT/SWITCH
☐ TVSS
☐ UL- SEE NOTE BELOW
☐ VOLT/METER
☐ MODEM

OTHER
☐ STARTUP _____ DAYS
☒ 24 x 24 304SS cabinet included
☒ ABL8 power supply included
☒ Schneider terminals as required
☒ Ground Lugs as required
☒ parts by Xylem, installed by StaCon-- MAS811 Base unit (X2), MAS PAN 312 module (X1)
☐ MAS 801 CU (X2), MAS HMI FOP402

AVAILABLE SITE CURRENT REQUESTED

Cobb-Six Flags
 MAS-801 Cabinet
 07-16-2020

PRELIMINARY
 NOT FOR
 CONSTRUCTION



**Xylem Water Solutions USA, Inc.
Flygt Products**

July 28, 2020

90 Horizon Drive
Suwanee, GA 30024
Tel (770) 932-4320
Fax (770) 932-4321

Mr. Tom Wynn
Jacobs c/o Cobb County Water System

Quote # 2020-ATL-0295 Alternate 1, Version 6
Project Name: Cobb-Plant Atkinson
Job Name: NP3202 45HP

A Flygt Preventive Maintenance Contract is available for this order. Please contact your Xylem Service Center for more information.

Xylem Water Solutions USA, Inc. is pleased to provide a quote for the following Flygt equipment for the project referenced above.

PUMP

Qty	Description
2	3202.095-0070 Flygt Model NP-3202.095 6" volute Submersible pump equipped with a 460 Volt / 3 phase / 60 Hz 45 HP 1750 RPM motor, 462 impeller, 1 x 50 Ft. length of SUBCAB 4G16+S(2x0,5) submersible cable, FLS leakage detector, volute is prepared for Flush Valve
1	556 51 01 VALVE,FLUSH

PUMP Price USD \$ 62,461.40

SPARE PUMP

Qty	Description
1	3202.095-0070 Flygt Model NP-3202.095 6" volute Submersible pump equipped with a 460 Volt / 3 phase / 60 Hz 45 HP 1750 RPM motor, 462 impeller, 1 x 50 Ft. length of SUBCAB 4G16+S(2x0,5) submersible cable, FLS leakage detector, volute is prepared for Flush Valve

SPARE PUMP Price USD \$ 29,671.80

CONTROLS

Qty	Description
2	14-40 71 29 MINI-CASII/FUS 120/24VAC,24VDC
2	14-40 70 97 SOCKET,11 PIN OCTAL DIN MOUNT

CONTROLS Price USD \$ 969.00

ACCESSORIES

Qty	Description
-----	-------------



Qty	Description
2	602 33 06 CONNECTION,DISCH 5½X6" CI

ACCESSORIES Price USD \$ 2,308.60

SPARE PARTS

Qty	Description
1	762 69 51 IMPELLER,N HT CODE 462 HC
1	657 17 03 KIT,REPAIR BASIC 3202.180
1	720 16 00 SLEEVE UNIT
1	83 04 60 SCREW,ALLEN M16 X 120 SS
1	82 38 01 WASHER,SS 17MM ID 30MM OD

SPARE PARTS Price USD \$ 8,721.00

SERVICES

Qty	Description
1	00ZZZZ0 ENGINEERING-SPECIALITY
2	14-69 00 10A START UP,FLYGT,NO TAX 2-TP MODELS: 3000,7000,8000
3	14-69 95 16 TEST FAL 2.2 PLOTTED 3001-7000 FAL 15-900006
1	14-69 98 98 SUBMITTALS
1	electronic_Sub Electronic Copy of Submittals in PDF (Portable Document Format) complete with Bookmarks and an Indexed Table Of Contents.
1	14-69 98 96 PARTS LISTS AND MANUALS
1	electronic_OM Electronic Copy of Operations & Maintenance Manual in PDF (Portable Document Format) with Bookmarks and Indexed Table Of Contents.

SERVICES Price USD \$ 12,059.00

Total Price \$ 116,190.80

Freight Charge \$ 4,758.00



Qty Description

Total Price \$ 120,948.80

Terms & Conditions

This order is subject to the Standard Terms and Conditions of Sale – Xylem Americas effective on the date the order is accepted which terms are available at <http://www.xyleminc.com/en-us/Pages/terms-conditions-of-sale.aspx> and incorporated herein by reference and made a part of the agreement between the parties.

Purchase Orders: Please make purchase orders out to: Xylem Water Solutions USA, Inc.

Freight Terms: 3 DAP - Delivered At Place 08 - Jobsite (per Incoterms 2020)

See Freight Payment (Delivery Terms) below.

Taxes: State, local and other applicable taxes are not included in this quotation.

Back Charges: Buyer shall not make purchases nor shall Buyer incur any labor that would result in a back charge to Seller without prior written consent of an authorized employee of Seller.

Shortages: Xylem will not be responsible for apparent shipment shortages or damages incurred in shipment that are not reported within two weeks from delivery to the jobsite. Damages should be noted on the receiving slip and the truck driver advised of the damages. Please contact our office as soon as possible to report damages or shortages so that replacement items can be shipped and the appropriate claims made.

Terms of Payment: 90% Net 30 days following shipment date; 10% Upon completion of start-up, not to exceed 90 days following shipment date (whichever occurs first).
Xylem's payment shall not be dependent upon Purchaser being paid by any third party unless Owner denies payment due to reasons solely attributable to items related to the equipment being provided by FLYGT.

Validity: This Quote will expire in ninety (30) days unless extended in writing by Xylem Water Solutions USA, Inc..

Schedule: Delivery lead times are XX weeks after receipt of submittal approval and order acceptance.

Submittals: 2-4 after receipt of order.

Pumps: 9-12 weeks after receipt of signed submittals and approved contract.

Controls: 6-9 weeks after receipt of signed submittals and approved contract.

Accessories: 4-6 weeks after receipt of signed submittals and approved contract

Terms of Delivery: Full Freight Allowed

Our current delivery lead-times are forecasted estimates only due to the outbreak of the COVID-19 virus pandemic and its global effects on commerce, supply chain, and logistics. Xylem will, however, use all commercially reasonable efforts to minimize any delivery delay impacts.



Sincerely,

Chris Miller, P.E.
Sales Representative
Phone: (678)804-5723
Cell: (678)381-3878 <Best
chris.miller@xyleminc.com





Customer Acceptance

This order is subject to the Standard Terms and Conditions of Sale – Xylem Americas effective on the date the order is accepted which terms are available at <http://www.xyleminc.com/en-us/Pages/terms-conditions-of-sale.aspx> and incorporated herein by reference and made a part of the agreement between the parties.

A signed copy of this Quote is acceptable as a binding contract.

Purchase Orders: Please make purchase orders out to: Xylem Water Solutions USA, Inc.

Quote #: 2020-ATL-0295 Alternate 1, Version 6
Customer Name: Mr. Tom Wynn
Job Name: NP3202 45HP
Total Amount: \$ 116,190.80
(excluding freight)

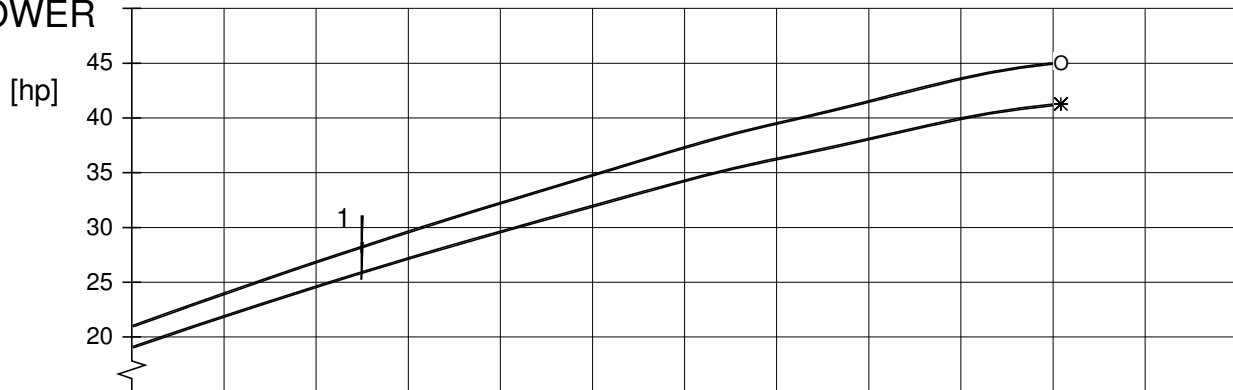
Signature: _____	Name: _____ (PLEASE PRINT)
Company/Utility: _____	PO: _____
Address: _____	Date: _____
_____	Phone: _____
_____	Email: _____
_____	Fax: _____



PERFORMANCE CURVE

DATE 2020-07-24	PROJECT:				ISSUE 7	PROD. NP 3202.095	FM HT
NO. OF BLADES.....	2	TOT.MOM.OF INERTIA.....	0.303	KGM ²	POLES 4	FREQ. 60	HZ
		RATED SPEED.....	1775	RPM	VOLTAGE.....	460	V
					MOTOR SHAFT POWER.....	45hp / 34	kW
					STARTING TORQUE.....	260	NM
					MAX TORQUE.....	545	NM
					RATED CURRENT.....	52	A
					STARTING CURRENT.....	365	A
MOTOR COS PHI	1/1-LOAD 0.89	3/4-LOAD 0.85	1/2-LOAD 0.77				MOTOR TYPE 30-19-4AA /01 (10)
MOTOR EFFICIENCY	91.0%	91.5%	91.0%				GEAR TYPE
GEAR EFFICIENCY							RATIO

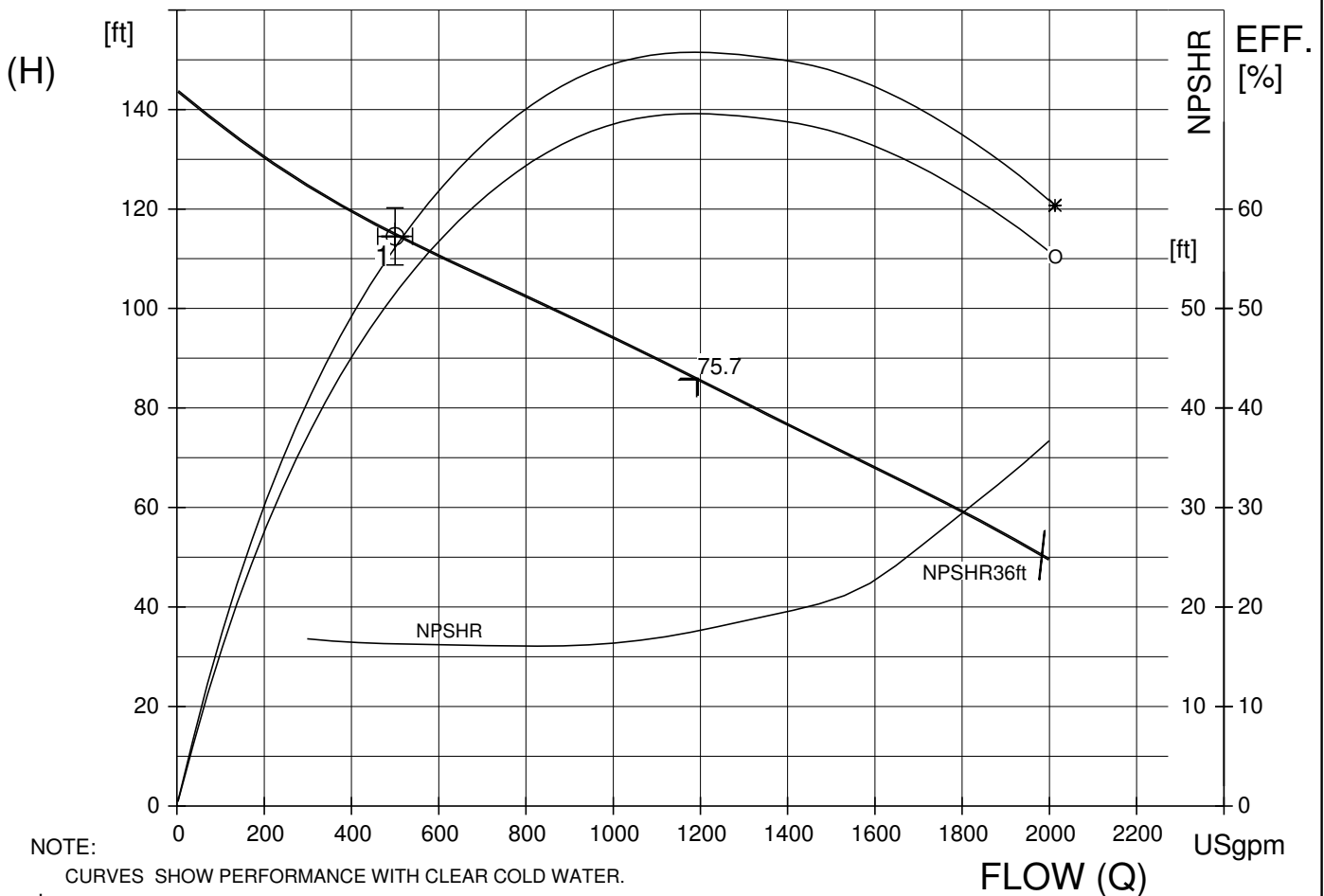
POWER



DUTY POINTS : FLOW[USgpm] HEAD[ft] POWER [hp] EFF. [%] NPSHR[ft] GUARANTEE) * -> No guarantee

HEAD

500 114.5 (<29.4) (<27.0) * (51.5) (56.1) * 16.8 HI grade 2B Q&H (ANSI/HI 11.6:2012)



NOTE:

CURVES SHOW PERFORMANCE WITH CLEAR COLD WATER.

* : PUMP EFFICIENCY / SHAFT POWER

O : OVERALL EFFICIENCY / INPUT POWER

NPSHR = NPSH3 + margins



PERFORMANCE CURVE



Motor Chart

Motor Nr

21-12-4AL

Issue

13

Date

2018-09-26

3127.070

Nominal Values

Voltage	3 * 460 V	Frequency	60 Hz	Poles	4	Stator	12 YSER
P-Input	8.7 kW	P-Shaft	7.5 kW / 10 HP	Current	13 A	Speed	1745 RPM

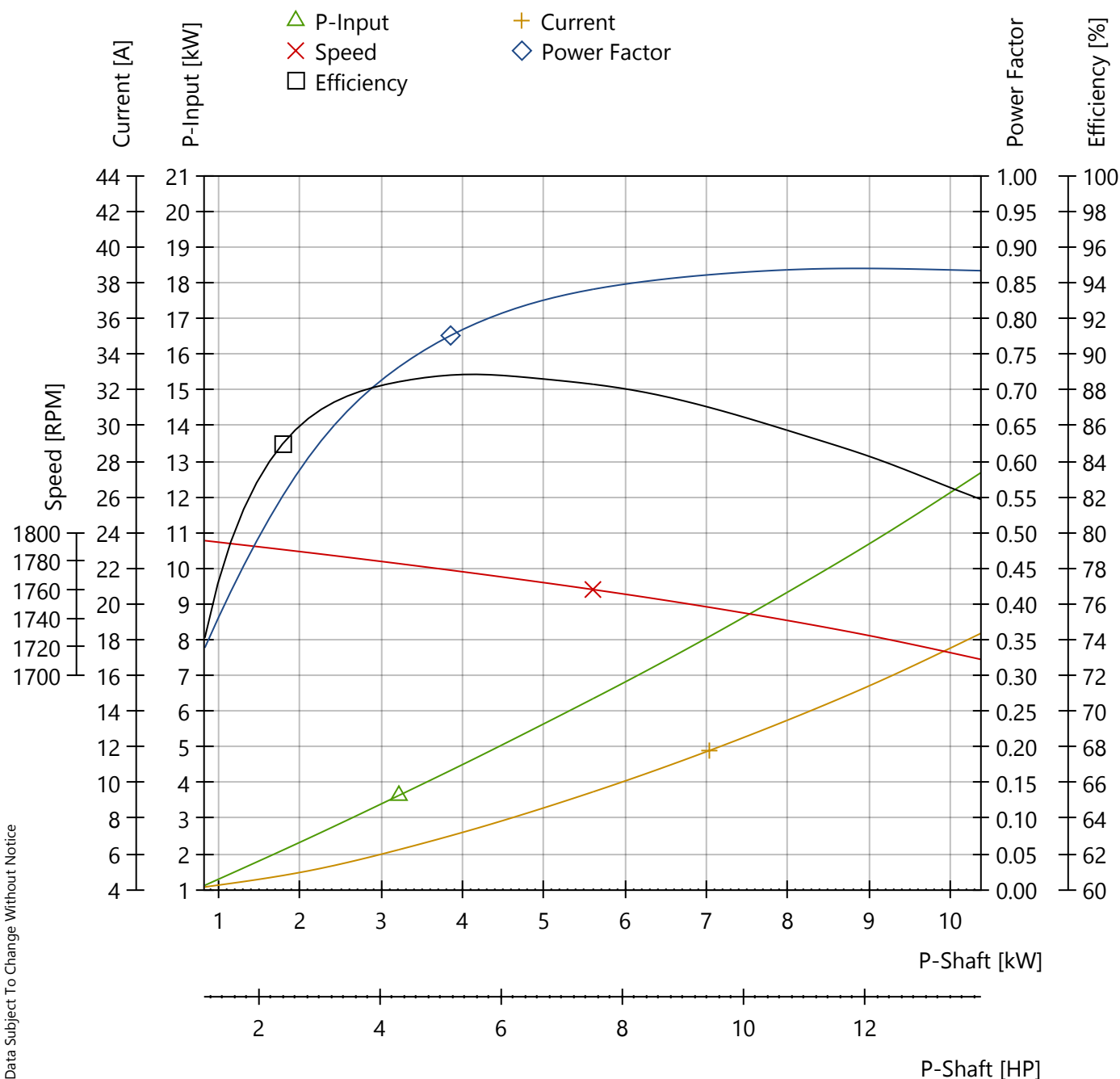
Torque (Nm / Quotient Compared To Torque At Nominal Speed)

Start 54 / 1.3 Pull-Up 39 / 0.9 Break-Down 95 / 2.3

Moment Of Inertia

0.030 kgm²

Load	1/1	3/4	1/2	Breakaway Starting Current (Locked Rotor Current Acc. To NEMA)	70 A
Power Factor	0.86	0.84	0.77	Breakaway Starting Power Factor	0.53
Efficiency %	86.4	88.3	88.8	No Load Current	3.9 A
Current A	13	9.5	6.9	No Load Power Factor	0.090
				Insulation	Class H



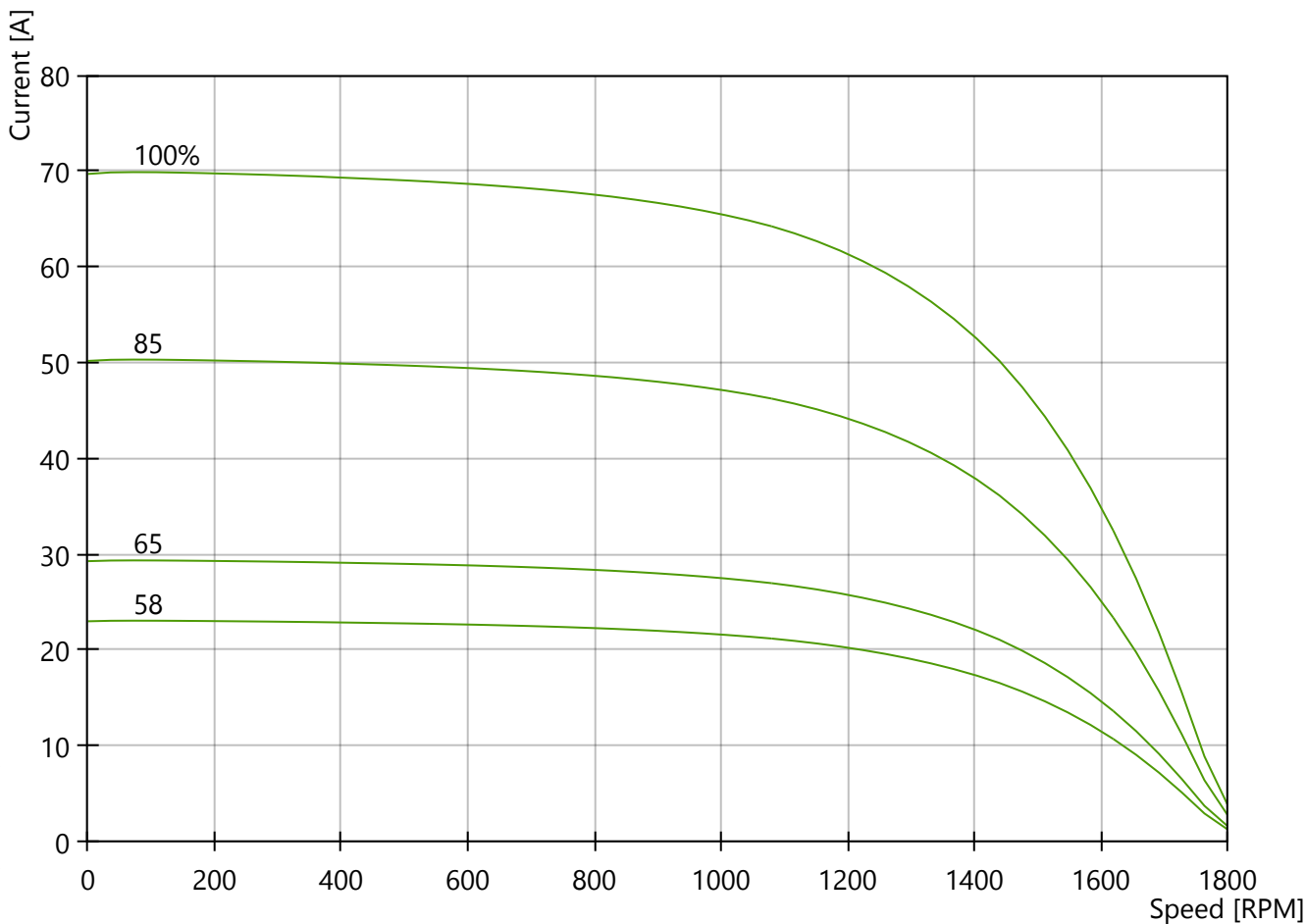
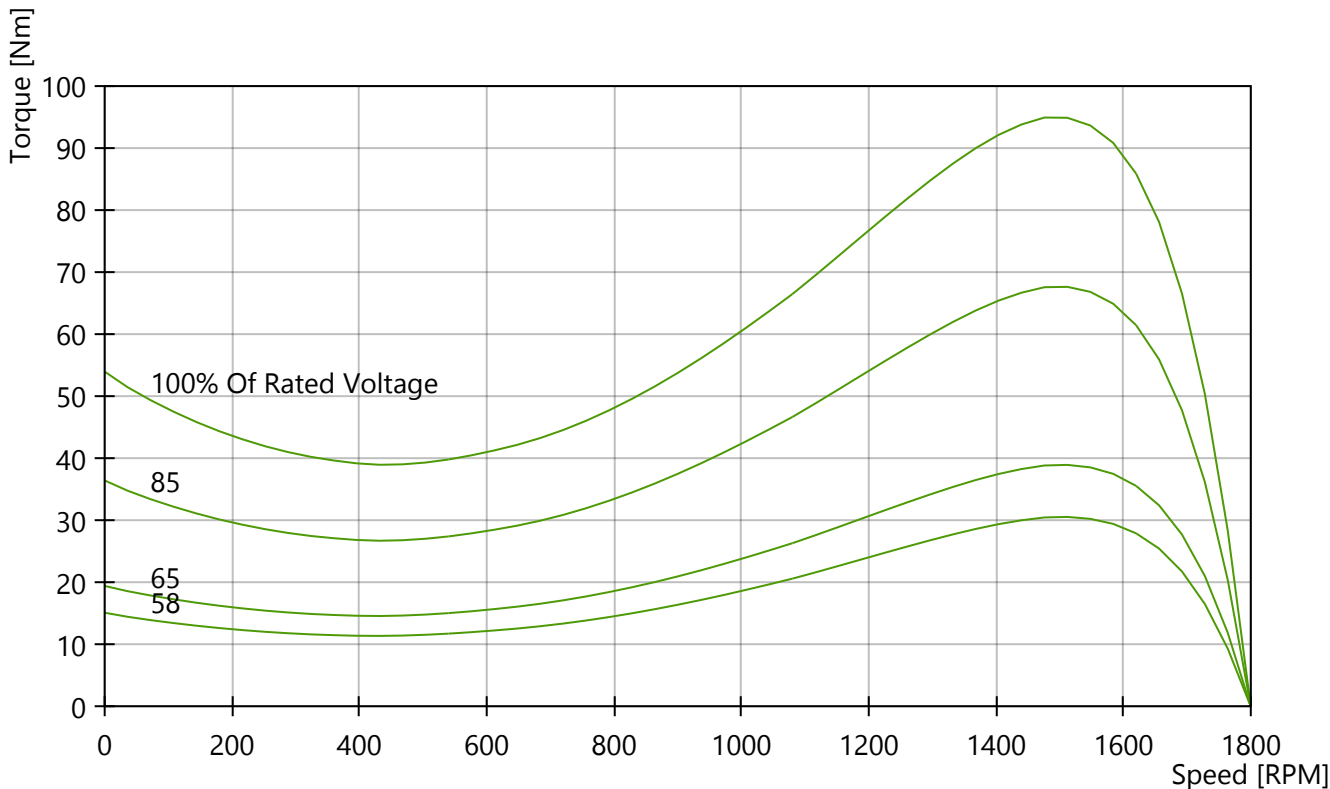


Torque-Current-Speed Chart

Motor Nr
21-12-4AL

Rated Values Voltage 3 * 460 V Frequency 60 Hz Stator 12 YSER

Issue 13
Date 2018-09-26





Various Load Table

Motor Nr

21-12-4AL

Issue 13

Date 2018-09-26

Frequency: 60 Hz
Number of Poles: 4
Number of Phases: 3
Rated Speed: 1745 RPM
Rated Voltage: 460 V
Rated Current: 13 A
Rated OutPower: 7.5 kW 10 HP
Rated InPower: 8.7 kW
Stator Variant: 12 YSER

The values are valid at 75° C average winding temperature

		125%	110%	100%	90%	75%	50%	25%	10%
Output Power	kW	9.4	8.3	7.5	6.8	5.6	3.8	1.9	0.75
Output Power	HP	12.5	11	10	9	7.5	5	2.5	1
Input Power	kW	11.2	9.7	8.7	7.7	6.4	4.2	2.2	1
Efficiency	%	83.7	85.4	86.4	87.4	88.3	88.8	85.4	72.2
Current	A	16	14	13	11	9.5	6.9	4.9	4.1
Power Factor	-	0.87	0.87	0.86	0.86	0.84	0.77	0.57	0.32
Torque	Nm	52	45	41	37	31	20	10	4
Speed	RPM	1725	1735	1745	1750	1760	1775	1785	1795

No Load Current: 3.9 A
Power factor at no load: 0.090
Breakaway Starting Current: 70 A
Breakaway Starting Power Factor: 0.53
Starting torque: 54 Nm
Max torque: 95 Nm
Speed at max. torque: 1485 RPM
Rotor inertia: 0.030 kgm²
Iron losses: 80 W
Friction losses: 56 W
Pull up torque: 39 Nm

Break. starting current/Rated current: 5.6
Starting torque/Rated torque: 1.3
Max torque/Rated torque: 2.3
(at synchronous speed):

MiniCAS

Description:

The Flygt MiniCAS modules are relays especially designed to simultaneously supervise pump motor thermal switches and Flygt pump leakage detectors FLS (Stator housing) and/or CLS (Water-in-oil) installed in each small to medium Flygt pump (Models 3085 through 3300) or mixer (Series 4600).

The MiniCAS is using only two wires for two or more sensors connected in series and actually includes two current sensitive mini-relays. The principle of operation is: a 12 VDC voltage is sent to the pump sensors and the current through the input circuit is fed through the current mini-relays. One mini-relay is an overcurrent relay, the other is an undercurrent relay.

- If a normally closed thermal switch, installed into the stator winding, opens due to overheating, or one of the connecting leads is broken, the undercurrent relay will de-energize, changing its contacts status. The MiniCAS will shut down the pump.

- If the Flygt leakage sensor (FLS or CLS) is activated, the current through the sensor will increase and the overcurrent relay will be energized, changing the status of its contacts. The MiniCAS will send a "Leakage" signal or shut down the pump, depending on the MiniCAS external connections.

Flygt MiniCAS relays are available in two interchangeable variants:

- **CURRENT PRODUCT** - MiniCAS II/FUS produced in the U.S. with a "Manual/Auto Reset" selector switch, which allows the pump to restart in "Auto Reset" position after the stator cools down and the thermal switches re-close. (See Technical Data next page).

14-40 71 29 (MiniCAS II/FUS - 120VAC / 24 VAC / 24 VDC)
14-40 70 97 (Socket, 11-pin) – optional

- **LEGACY PRODUCT** - MiniCAS II produced in Sweden with external manual reset after an overtemperature tripping.

83 58 57 (MiniCAS II - 24VAC)
40-50 10 98 (MiniCAS II - 120VAC)
14-40 70 97 (Socket, 11-pin) – optional

MiniCAS II/FUS-120 Technical Data (US version)

Operation Principle:	Current sensing
Environment:	-20 to 65°C (-4 to 149°F)
Supply Voltage:	120 VAC 50-60 Hz $\pm 10\%$, 24 VAC $\pm 10\%$, 24 VDC $\pm 10\%$
Relay Contact Rating:	10 Amps @ 120 VAC
Voltage to Sensor:	12 VDC $\pm 10\%$
Values of Operation:	3.0 mA < I < 22 mA = OK conditions. I \leq 3.0 mA = High temp. $\pm 5\%$ (or interrupt). I \geq 22.0 mA = Leakage $\pm 5\%$ (or short circuit). (I = current measured by the MiniCAS II/FUS). Green LED On = Supply Voltage present. Green LED Off = No Supply Voltage present.

Leakage

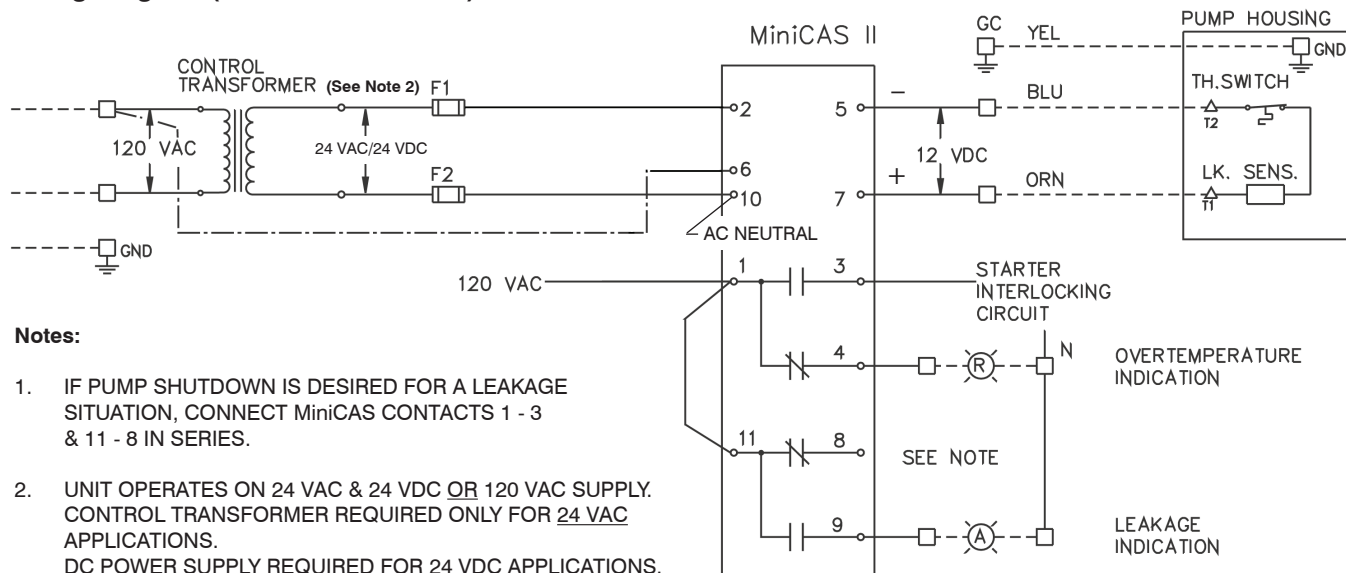
Contact:	Form "C" 10 A @ 120 VAC (N.C. contact for interlocking)
Reset:	Automatic (N.O. contact for alarm)
LED Indicators:	Red LED On = Leakage indicated Red LED Off = No leakage indicated

Temperature

Contact:	Form "C" 10 A @ 120 VAC (N.C. contact for interlocking, N.O. contact for alarm)
Reset:	Manual - by interrupting the supply for 1 sec. or by setting the toggle switch in the "Manual" mode. Automatic - by setting the toggle switch in the "Auto Reset" mode.
LED Indicators:	Red LED On = Over-temperature indicated. Red LED Off = No Over-temperature indicated
Physical Size:	Width: 2.125" Height: 4.250" Depth: 3.470" (+ socket depth)
Part Number:	14-40 71 29 (MiniCAS II/FUS -120) 14-40 70 97 (Socket, 11-pin) - optional
Approvals:	UL - File E101681

Wiring Diagram MiniCAS II/FUS-120 (US version)

Wiring Diagram (MiniCAS II/FUS-120)



Mode of Operation

In normal conditions, when the MiniCAS - 120 is powered, the green LED is 'ON' and the relay contact status is as follows:

- Overtemperature relay contacts: 1-3 closed, 1-4 open;
- Leakage relay contacts: 11-8 closed, 11-9 open.

If an overtemperature condition occurs, the overtemperature Red LED will turn on, the unit will turn the pump off and lock it out.

Relay contact status:

- Overtemperature relay contacts: 1-3 open, 1-4 closed;
- Leakage relay contacts: 11-8 closed, 11-9 open.

The power to the pump can be restored after the stator temperature has decreased to a point of safe operation and the thermal switches are closed. When the overtemperature condition resets, the overtemperature Red LED will turn off. The MiniCAS-120 can be reset either manually or automatically.

Note:

When selecting the "Automatic Reset" mode, the control panel should include a latching type circuit for over-temperature alarm display. This circuit will retain the information that an overtemperature situation has occurred and the operator should check the possible cause for motor overtemperature.

If a leakage is detected, after a 5 sec. delay, an alarm will be activated or the pump will be shut down and the leakage Red LED will turn on. Relay contact status:

- Overtemperature relay contacts: 1-3 closed, 1-4 open;
- Leakage relay contacts: 11-8 open, 11-9 closed.

Once the leakage condition is removed, power is restored to the pump and the Leakage Red LED will turn off automatically, leakage relay contacts will be reset.

MiniCAS II Technical Data (Swedish version)

Operation Principle:	Current sensing
Environment:	0-50°C (32-123°F) max 90% RH
Supply Voltages:	20-30 VAC 50-60 Hz, or 120VAC 50-60 Hz
Relay Contact Rating:	8 Amps @ 250 VAC
Voltage to Sensor:	12 VDC \pm 5%
Values of Operation:	3 mA < I < 22 mA = OK conditions. I < 3 mA = High temp. (or broken wire). I > 22 mA = Leakage (or short circuit). (I = DC current measured by the MiniCAS II).
LED Indicators:	Yellow LED: for Supply Voltage presence indication. Red LED: for Overtemperature indication. Red LED: for Leakage indication.
Reset:	Manual - for Overtemperature by interrupting power supply or pushing external push-button (NO), connected between terminals 6 and 2 (not supplied with the unit). Automatic - for Leakage
Physical Size:	Width: 33mm (1.33") Height: 79mm (3.11") Depth: 75mm (2.95")
Part Number:	83 58 57 (MiniCAS II - 24VAC) 40-50 10 98 (MiniCAS II - 120VAC) 14-40 70 97 (Socket, 11 pin) – optional

MiniCAS Specifications

Furnish and install one Flygt MiniCAS (Mini Control and Status) module to monitor the temperature and leakage detectors installed in each Flygt pump or mixer. The MiniCAS shall be capable of monitoring the thermal switches embedded in the stator end coils, the Flygt FLS (float switch type) water-in-stator-housing sensor, and the Flygt CLS (capacitive type) water-in-oil sensor. The MiniCAS shall monitor both the series connected thermal switches and leakage sensor(s) by outputting 12 VDC on a single two wire circuit. When both CLS and FLS leakage sensors are specified they shall be connected in parallel with each other and then in series with the thermal switches.

The MiniCAS circuitry shall operate on the current sensing principle whereby a change in temperature or leakage condition shall change the resistance of the associated sensor and thus alter the current in the sensing circuit. The MiniCAS shall contain two sets of form C dry contacts, one for overtemperature and one for leakage. The dry

contacts shall change status upon occurrence of an over temperature or leakage condition so as to indicate that condition to other control components in the pump control panel. In the case of an overtemperature, and in keeping with Flygt's warranty policy, the overtemperature dry contacts shall be used to trip the pump off line. The MiniCAS shall be designed to be plugged into a standard 11-pin circular socket. Detailed technical data and wiring connections shall be found in the MiniCAS Manual.



**Xylem Water Solutions USA, Inc.
Flygt Products**

July 28, 2020

90 Horizon Drive
Suwanee, GA 30024
Tel (770) 932-4320
Fax (770) 932-4321

Mr. Tom Wynn
Jacobs c/o Cobb County Water System

Quote # 2020-ATL-0294 Alternate 1, Version 5
Project Name: Cobb-Marina Trace
Job Name: NP3127-488 10HP

A Flygt Preventive Maintenance Contract is available for this order. Please contact your Xylem Service Center for more information.

Xylem Water Solutions USA, Inc. is pleased to provide a quote for the following Flygt equipment for the project referenced above.

PUMP

Qty	Description
2	3127.070-0057 Flygt Model NP-3127.070 4" volute Submersible pump equipped with a 460 Volt / 3 phase / 60 Hz 10 HP 1750 RPM motor, 488 impeller, 1 x 50 Ft. length of SUBCAB 4G6+2x1,5 submersible cable, FLS leakage detector, volute is prepared for Flush Valve
2	00ZZZZ0 IMPELLER TRIM
1	556 51 02 VALVE,FLUSH 4901

PUMP Price USD \$ 25,576.20

SPARE PUMP

Qty	Description
1	3127.070-0057 Flygt Model NP-3127.070 4" volute Submersible pump equipped with a 460 Volt / 3 phase / 60 Hz 10 HP 1750 RPM motor, 488 impeller, 1 x 50 Ft. length of SUBCAB 4G6+2x1,5 submersible cable, FLS leakage detector, volute is prepared for Flush Valve
1	00ZZZZ0 IMPELLER TRIM

SPARE PUMP Price USD \$ 11,576.00

CONTROLS

Qty	Description
2	14-40 71 29 MINI-CASII/FUS 120/24VAC,24VDC
2	14-40 70 97 SOCKET,11 PIN OCTAL DIN MOUNT



Qty Description

CONTROLS Price USD \$ 969.00

ACCESSORIES

Qty Description
2 540 13 05
CONNECTION,DISCH 4X4" CI

ACCESSORIES Price USD \$ 1,555.50

SPARE PARTS

Qty Description
1 798 58 43
IMPELLER UNIT,N HT CODE 488 HC
1 00ZZZZ0
IMPELLER TRIM
1 693 19 00
KIT,REPAIR BASIC
1 798 81 00
SLEEVE UNIT
1 83 02 67
SCREW,ALLEN M12 X 70 SS

SPARE PARTS Price USD \$ 4,872.25

SERVICES

Qty Description
1 00ZZZZ0
ENGINEERING-SPECIALITY
2 14-69 00 09A
START UP,FLYGT,NO TAX 1-TP MODELS: 3000,7000,8000
3 14-69 95 16
TEST FAL 2.2 PLOTTED 3001-7000 FAL 15-900006
1 14-69 98 98
SUBMITTALS
1 electronic_Sub
Electronic Copy of Submittals in PDF (Portable Document Format) complete with
Bookmarks and an Indexed Table Of Contents.
1 14-69 98 96
PARTS LISTS AND MANUALS
1 electronic_OM
Electronic Copy of Operations & Maintenance Manual in PDF (Portable Document
Format) with Bookmarks and Indexed Table Of Contents.

SERVICES Price USD \$ 8,285.00

Qty Description

Total Price \$ 52,833.95

Freight Charge \$ 2,109.00

Total Price \$ 54,942.95

Terms & Conditions

This order is subject to the Standard Terms and Conditions of Sale – Xylem Americas effective on the date the order is accepted which terms are available at <http://www.xyleminc.com/en-us/Pages/terms-conditions-of-sale.aspx> and incorporated herein by reference and made a part of the agreement between the parties.

Purchase Orders: Please make purchase orders out to: Xylem Water Solutions USA, Inc.

Freight Terms: 3 DAP - Delivered At Place 08 - Jobsite (per IncoTerms 2020)
See Freight Payment (Delivery Terms) below.

Taxes: State, local and other applicable taxes are not included in this quotation.

Back Charges: Buyer shall not make purchases nor shall Buyer incur any labor that would result in a back charge to Seller without prior written consent of an authorized employee of Seller.

Shortages: Xylem will not be responsible for apparent shipment shortages or damages incurred in shipment that are not reported within two weeks from delivery to the jobsite. Damages should be noted on the receiving slip and the truck driver advised of the damages. Please contact our office as soon as possible to report damages or shortages so that replacement items can be shipped and the appropriate claims made.

Terms of Delivery: PP/Add Order Position

Validity: This Quote is valid for thirty (30) days.

Terms of Payment: 90% N60 after invoice date; 10% Upon completion of start-up, not to exceed 120 days following invoice date (whichever occurs first).

Xylem's payment shall not be dependent upon Purchaser being paid by any third party unless Owner denies payment due to reasons solely attributable to items related to the equipment being provided by FLYGT.

Schedule: Delivery lead times are XX weeks after receipt of submittal approval and order acceptance.

Submittals: 2-4 after receipt of order.

Pumps: 9-12 weeks after receipt of signed submittals and approved contract.

Controls: 6-9 weeks after receipt of signed submittals and approved contract.

Accessories: 4-6 weeks after receipt of signed submittals and approved contract

Our current delivery lead-times are forecasted estimates only due to the outbreak of the COVID-19 virus pandemic and its global effects on commerce, supply chain, and logistics. Xylem will, however, use all commercially reasonable efforts to minimize any delivery delay impacts.



Sincerely,

Chris Miller, P.E.
Sales Representative
Phone: (678)804-5723
Cell: (678)381-3878 <Best
chris.miller@xyleminc.com





Customer Acceptance

This order is subject to the Standard Terms and Conditions of Sale – Xylem Americas effective on the date the order is accepted which terms are available at <http://www.xyleminc.com/en-us/Pages/terms-conditions-of-sale.aspx> and incorporated herein by reference and made a part of the agreement between the parties.

A signed copy of this Quote is acceptable as a binding contract.

Purchase Orders: Please make purchase orders out to: Xylem Water Solutions USA, Inc.

Quote #: 2020-ATL-0294 Alternate 1, Version 5
Customer Name: Mr. Tom Wynn
Job Name: NP3127-488 10HP
Total Amount: \$ 52,833.95
(excluding freight)

Signature: _____	Name: _____ (PLEASE PRINT)
Company/Utility: _____	PO: _____
Address: _____	Date: _____
_____	Phone: _____
_____	Email: _____
_____	Fax: _____



PERFORMANCE CURVE

DATE
2020-07-24

PROJECT:
Performance from Many

ISSUE
27

PROD.
NP 3127.070 HT

NO. OF
BLADES..... **2**

TOT.MOM.OF
INERTIA..... **0.057 KGM²**
RATED
SPEED..... **1750 RPM**

POLES **4** FREQ. **60 HZ**
VOLTAGE..... **460 V**
MOTOR SHAFT
POWER..... **10hp / 7.5 kW**
STARTING
TORQUE..... **65 NM**
MAX
TORQUE..... **110 NM**
RATED
CURRENT..... **13 A**
STARTING
CURRENT..... **83 A**

CURVE NO
63- 498-00 -37 02

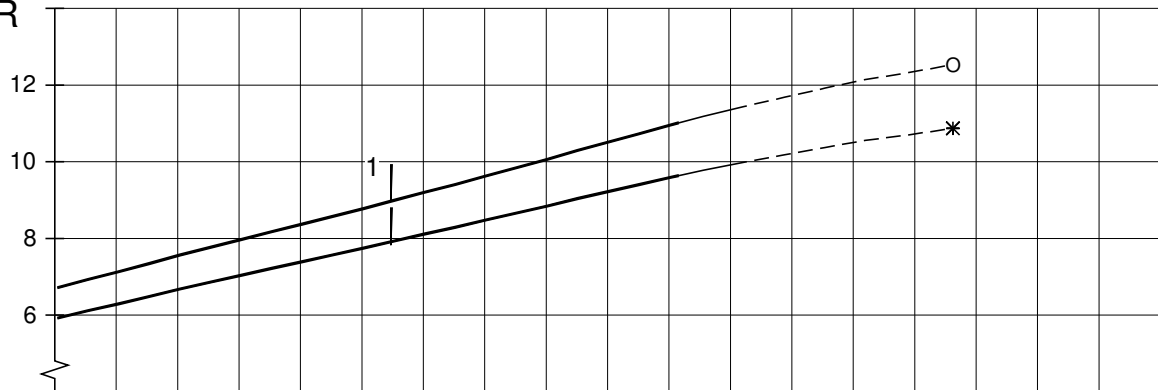
IMPELLER DIAMETER
220 mm

MOTOR TYPE
21-12-4AL /38 (17)

GEAR TYPE RATIO

	1/1-LOAD	3/4-LOAD	1/2-LOAD
MOTOR COS PHI	0.82	0.77	0.67
MOTOR EFFICIENCY	87.3%	88.3%	87.7%
GEAR EFFICIENCY			

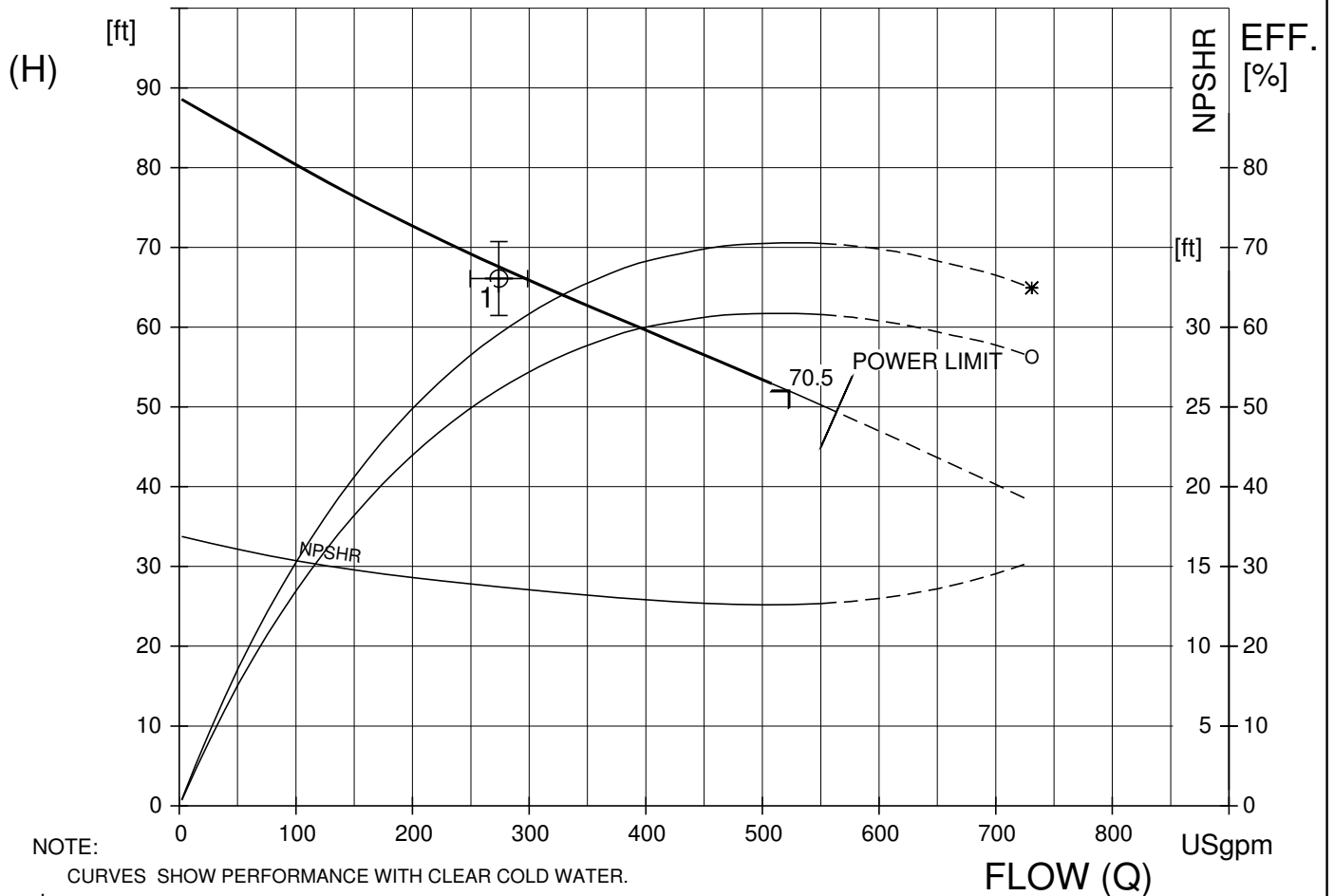
POWER [hp]



DUTY POINTs : FLOW[USgpm] HEAD[ft] POWER [hp] EFF. [%] NPSHR[ft] GUARANTEE) * -> No guarantee

274.0 66.1 (<9.44) (<8.31) (52.6) (59.6) 14.3 HI grade 3B Q&H (ANSI/HI 11.6:2012)

HEAD



NOTE:

CURVES SHOW PERFORMANCE WITH CLEAR COLD WATER.

* : PUMP EFFICIENCY / SHAFT POWER

O : OVERALL EFFICIENCY / INPUT POWER

NPSHR = NPSH3 + margins

unix AUTHOR: ewillats PECU rev:21.10 /CUPC org:BUILD/PROD



PERFORMANCE CURVE



Motor Chart

Motor Nr

21-12-4AL

Issue

13

Date

2018-09-26

3127.070

Nominal Values

Voltage	3 * 460 V	Frequency	60 Hz	Poles	4	Stator	12 YSER
P-Input	8.7 kW	P-Shaft	7.5 kW / 10 HP	Current	13 A	Speed	1745 RPM

Torque (Nm / Quotient Compared To Torque At Nominal Speed)

Start 54 / 1.3

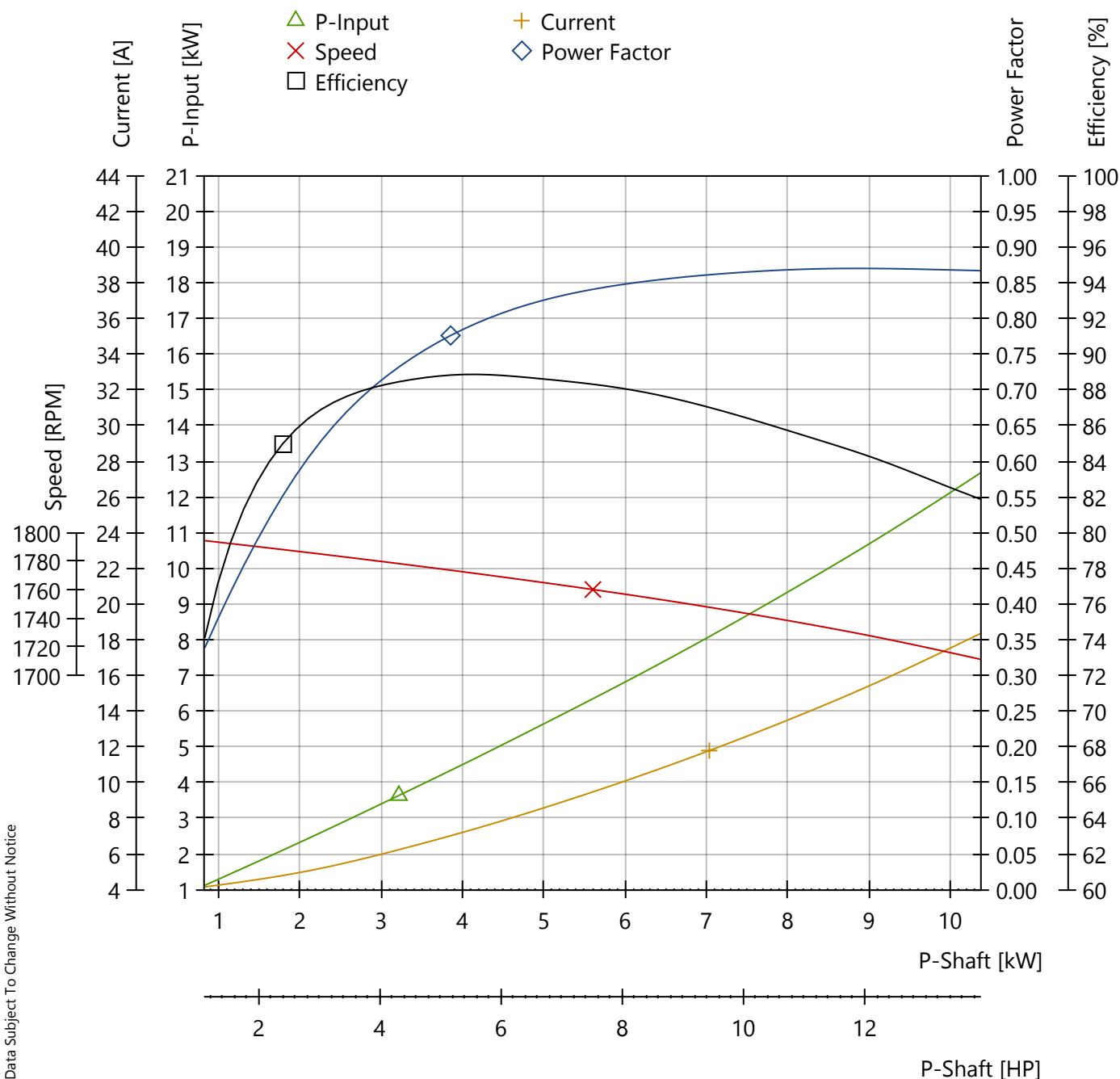
Pull-Up 39 / 0.9

Break-Down 95 / 2.3

Moment Of Inertia

0.030 kgm²

Load	1/1	3/4	1/2	Breakaway Starting Current (Locked Rotor Current Acc. To NEMA)	70 A
Power Factor	0.86	0.84	0.77	Breakaway Starting Power Factor	0.53
Efficiency %	86.4	88.3	88.8	No Load Current	3.9 A
Current A	13	9.5	6.9	No Load Power Factor	0.090
				Insulation	Class H



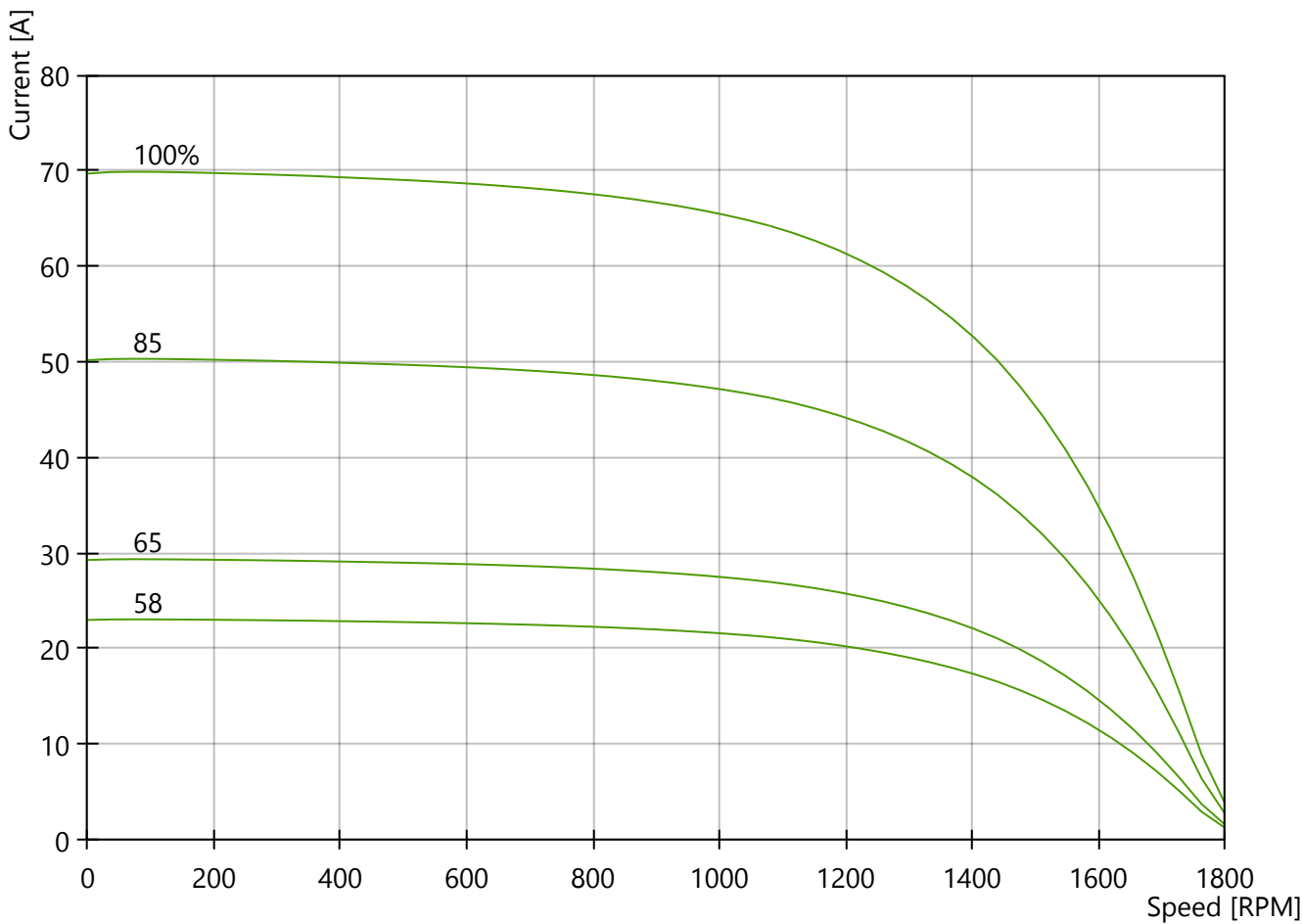
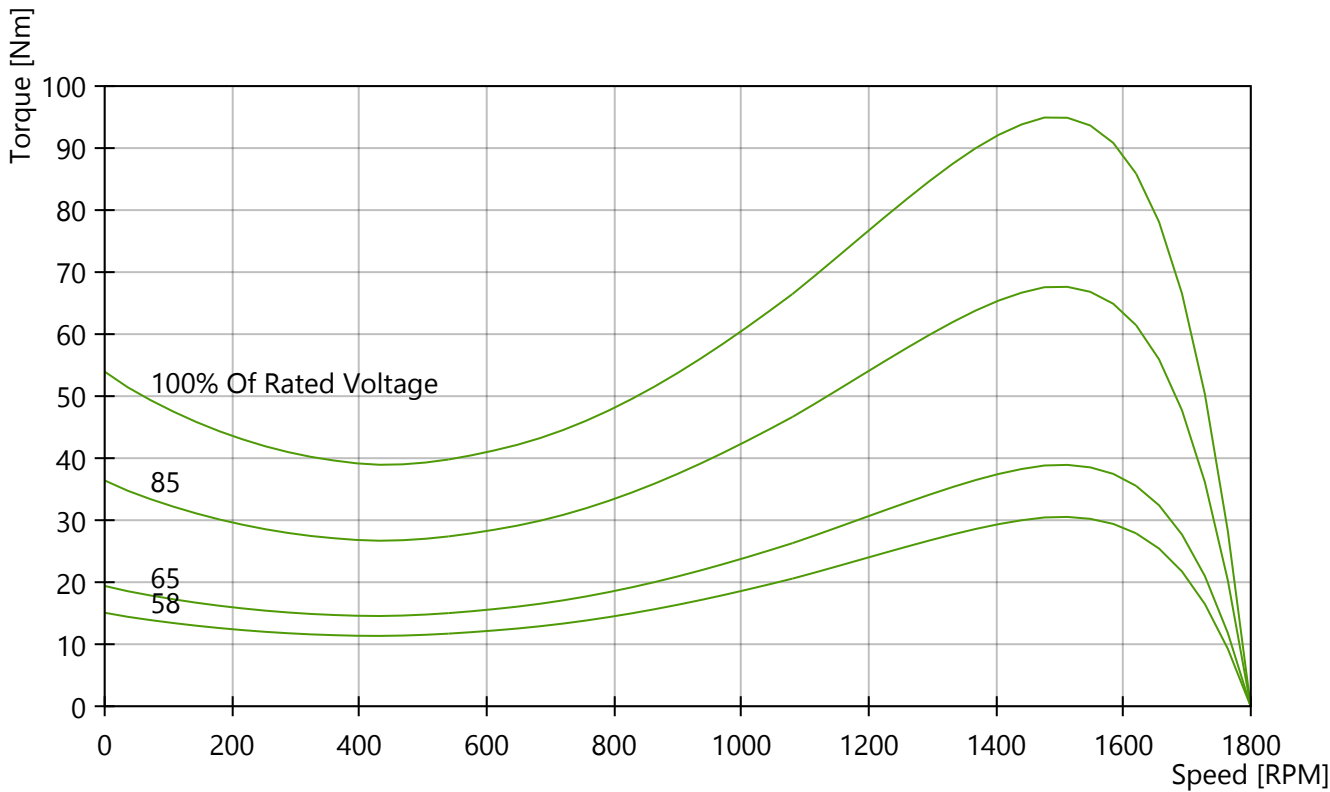


Torque-Current-Speed Chart

Motor Nr
21-12-4AL

Rated Values Voltage 3 * 460 V Frequency 60 Hz Stator 12 YSER

Issue 13
Date 2018-09-26





Various Load Table

Motor Nr

21-12-4AL

Issue 13

Date 2018-09-26

Frequency: 60 Hz
Number of Poles: 4
Number of Phases: 3
Rated Speed: 1745 RPM
Rated Voltage: 460 V
Rated Current: 13 A
Rated OutPower: 7.5 kW 10 HP
Rated InPower: 8.7 kW
Stator Variant: 12 YSER

The values are valid at 75° C average winding temperature

		125%	110%	100%	90%	75%	50%	25%	10%
Output Power	kW	9.4	8.3	7.5	6.8	5.6	3.8	1.9	0.75
Output Power	HP	12.5	11	10	9	7.5	5	2.5	1
Input Power	kW	11.2	9.7	8.7	7.7	6.4	4.2	2.2	1
Efficiency	%	83.7	85.4	86.4	87.4	88.3	88.8	85.4	72.2
Current	A	16	14	13	11	9.5	6.9	4.9	4.1
Power Factor	-	0.87	0.87	0.86	0.86	0.84	0.77	0.57	0.32
Torque	Nm	52	45	41	37	31	20	10	4
Speed	RPM	1725	1735	1745	1750	1760	1775	1785	1795

No Load Current: 3.9 A
Power factor at no load: 0.090
Breakaway Starting Current: 70 A
Breakaway Starting Power Factor: 0.53
Starting torque: 54 Nm
Max torque: 95 Nm
Speed at max. torque: 1485 RPM
Rotor inertia: 0.030 kgm²
Iron losses: 80 W
Friction losses: 56 W
Pull up torque: 39 Nm

Break. starting current/Rated current: 5.6
Starting torque/Rated torque: 1.3
Max torque/Rated torque: 2.3
(at synchronous speed):

MiniCAS

Description:

The Flygt MiniCAS modules are relays especially designed to simultaneously supervise pump motor thermal switches and Flygt pump leakage detectors FLS (Stator housing) and/or CLS (Water-in-oil) installed in each small to medium Flygt pump (Models 3085 through 3300) or mixer (Series 4600).

The MiniCAS is using only two wires for two or more sensors connected in series and actually includes two current sensitive mini-relays. The principle of operation is: a 12 VDC voltage is sent to the pump sensors and the current through the input circuit is fed through the current mini-relays. One mini-relay is an overcurrent relay, the other is an undercurrent relay.

- If a normally closed thermal switch, installed into the stator winding, opens due to overheating, or one of the connecting leads is broken, the undercurrent relay will de-energize, changing its contacts status. The MiniCAS will shut down the pump.

- If the Flygt leakage sensor (FLS or CLS) is activated, the current through the sensor will increase and the overcurrent relay will be energized, changing the status of its contacts. The MiniCAS will send a "Leakage" signal or shut down the pump, depending on the MiniCAS external connections.

Flygt MiniCAS relays are available in two interchangeable variants:

- **CURRENT PRODUCT** - MiniCAS II/FUS produced in the U.S. with a "Manual/Auto Reset" selector switch, which allows the pump to restart in "Auto Reset" position after the stator cools down and the thermal switches re-close. (See Technical Data next page).

14-40 71 29 (MiniCAS II/FUS - 120VAC / 24 VAC / 24 VDC)
14-40 70 97 (Socket, 11-pin) – optional

- **LEGACY PRODUCT** - MiniCAS II produced in Sweden with external manual reset after an overtemperature tripping.

83 58 57 (MiniCAS II - 24VAC)
40-50 10 98 (MiniCAS II - 120VAC)
14-40 70 97 (Socket, 11-pin) – optional

MiniCAS II/FUS-120 Technical Data (US version)

Operation Principle:	Current sensing
Environment:	-20 to 65°C (-4 to 149°F)
Supply Voltage:	120 VAC 50-60 Hz $\pm 10\%$, 24 VAC $\pm 10\%$, 24 VDC $\pm 10\%$
Relay Contact Rating:	10 Amps @ 120 VAC
Voltage to Sensor:	12 VDC $\pm 10\%$
Values of Operation:	3.0 mA < I < 22 mA = OK conditions. I \leq 3.0 mA = High temp. $\pm 5\%$ (or interrupt). I \geq 22.0 mA = Leakage $\pm 5\%$ (or short circuit). (I = current measured by the MiniCAS II/FUS). Green LED On = Supply Voltage present. Green LED Off = No Supply Voltage present.

Leakage

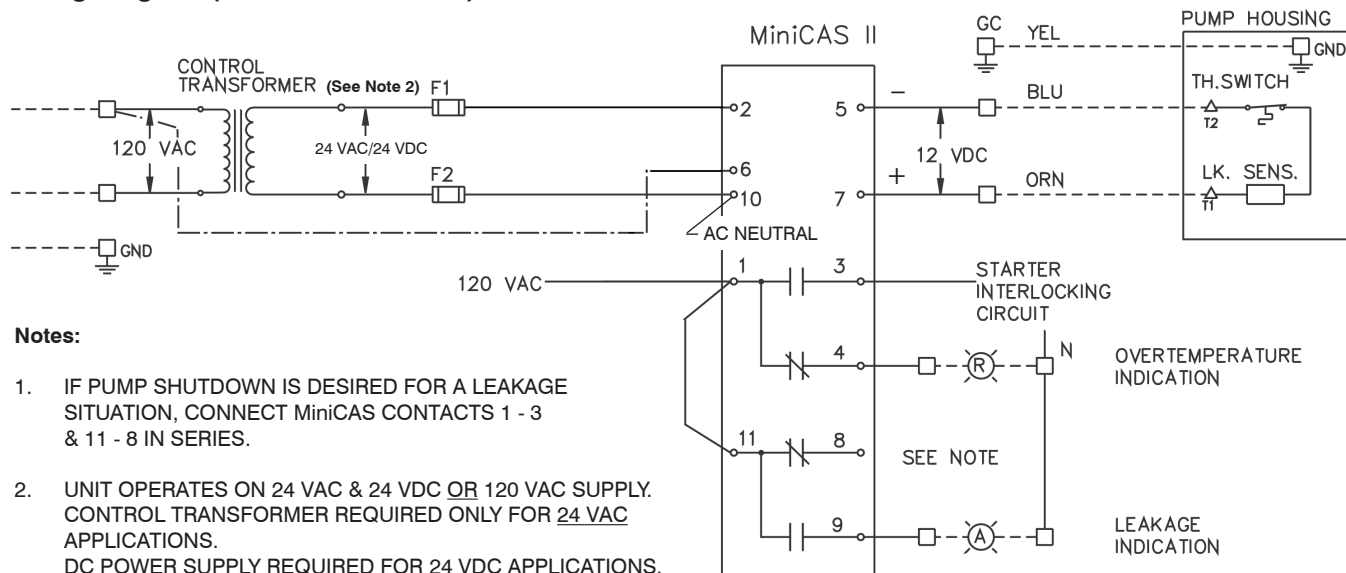
Contact:	Form "C" 10 A @ 120 VAC (N.C. contact for interlocking)
Reset:	Automatic (N.O. contact for alarm)
LED Indicators:	Red LED On = Leakage indicated Red LED Off = No leakage indicated

Temperature

Contact:	Form "C" 10 A @ 120 VAC (N.C. contact for interlocking, N.O. contact for alarm)
Reset:	Manual - by interrupting the supply for 1 sec. or by setting the toggle switch in the "Manual" mode. Automatic - by setting the toggle switch in the "Auto Reset" mode.
LED Indicators:	Red LED On = Over-temperature indicated. Red LED Off = No Over-temperature indicated
Physical Size:	Width: 2.125" Height: 4.250" Depth: 3.470" (+ socket depth)
Part Number:	14-40 71 29 (MiniCAS II/FUS -120) 14-40 70 97 (Socket, 11-pin) - optional
Approvals:	UL - File E101681

Wiring Diagram MiniCAS II/FUS-120 (US version)

Wiring Diagram (MiniCAS II/FUS-120)



Mode of Operation

In normal conditions, when the MiniCAS - 120 is powered, the green LED is 'ON' and the relay contact status is as follows:

- Overtemperature relay contacts: 1-3 closed, 1-4 open;
- Leakage relay contacts: 11-8 closed, 11-9 open.

If an overtemperature condition occurs, the overtemperature Red LED will turn on, the unit will turn the pump off and lock it out.

Relay contact status:

- Overtemperature relay contacts: 1-3 open, 1-4 closed;
- Leakage relay contacts: 11-8 closed, 11-9 open.

The power to the pump can be restored after the stator temperature has decreased to a point of safe operation and the thermal switches are closed. When the overtemperature condition resets, the overtemperature Red LED will turn off. The MiniCAS-120 can be reset either manually or automatically.

Note:

When selecting the "Automatic Reset" mode, the control panel should include a latching type circuit for over-temperature alarm display. This circuit will retain the information that an overtemperature situation has occurred and the operator should check the possible cause for motor overtemperature.

If a leakage is detected, after a 5 sec. delay, an alarm will be activated or the pump will be shut down and the leakage Red LED will turn on. Relay contact status:

- Overtemperature relay contacts: 1-3 closed, 1-4 open;
- Leakage relay contacts: 11-8 open, 11-9 closed.

Once the leakage condition is removed, power is restored to the pump and the Leakage Red LED will turn off automatically, leakage relay contacts will be reset.

MiniCAS II Technical Data (Swedish version)

Operation Principle:	Current sensing
Environment:	0-50°C (32-123°F) max 90% RH
Supply Voltages:	20-30 VAC 50-60 Hz, or 120VAC 50-60 Hz
Relay Contact Rating:	8 Amps @ 250 VAC
Voltage to Sensor:	12 VDC \pm 5%
Values of Operation:	3 mA < I < 22 mA = OK conditions. I < 3 mA = High temp. (or broken wire). I > 22 mA = Leakage (or short circuit). (I = DC current measured by the MiniCAS II).
LED Indicators:	Yellow LED: for Supply Voltage presence indication. Red LED: for Overtemperature indication. Red LED: for Leakage indication.
Reset:	Manual - for Overtemperature by interrupting power supply or pushing external push-button (NO), connected between terminals 6 and 2 (not supplied with the unit). Automatic - for Leakage
Physical Size:	Width: 33mm (1.33") Height: 79mm (3.11") Depth: 75mm (2.95")
Part Number:	83 58 57 (MiniCAS II - 24VAC) 40-50 10 98 (MiniCAS II - 120VAC) 14-40 70 97 (Socket, 11 pin) – optional

MiniCAS Specifications

Furnish and install one Flygt MiniCAS (Mini Control and Status) module to monitor the temperature and leakage detectors installed in each Flygt pump or mixer. The MiniCAS shall be capable of monitoring the thermal switches embedded in the stator end coils, the Flygt FLS (float switch type) water-in-stator-housing sensor, and the Flygt CLS (capacitive type) water-in-oil sensor. The MiniCAS shall monitor both the series connected thermal switches and leakage sensor(s) by outputting 12 VDC on a single two wire circuit. When both CLS and FLS leakage sensors are specified they shall be connected in parallel with each other and then in series with the thermal switches.

The MiniCAS circuitry shall operate on the current sensing principle whereby a change in temperature or leakage condition shall change the resistance of the associated sensor and thus alter the current in the sensing circuit. The MiniCAS shall contain two sets of form C dry contacts, one for overtemperature and one for leakage. The dry

contacts shall change status upon occurrence of an over temperature or leakage condition so as to indicate that condition to other control components in the pump control panel. In the case of an overtemperature, and in keeping with Flygt's warranty policy, the overtemperature dry contacts shall be used to trip the pump off line. The MiniCAS shall be designed to be plugged into a standard 11-pin circular socket. Detailed technical data and wiring connections shall be found in the MiniCAS Manual.

DIVISION 13

SPECIALTY FACILITY COMPONENTS

**SECTION 13121
PREFABRICATED BUILDINGS**

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Society of Civil Engineers (ASCE): 7, Minimum Design Loads for Buildings and Other Structures.
2. International Building Code (IBC) 2018.
3. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE): 90.1, Energy Efficient Design of New Buildings except Low-Rise Residential Buildings.
4. ASTM International (ASTM):
 - a. C920, Standard Specification for Elastomeric Joint Sealants.
 - b. E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
5. National Fire Protection Association (NFPA):
 - a. 10, Standard for Portable Fire Extinguishers.
 - b. 13, Standard for the Installation of Sprinkler Systems.
 - c. 70, National Electrical Code.
 - d. 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems.
 - e. 101, Life Safety Code.

1.02 SYSTEM DESCRIPTION

- A. Design, furnish, and install complete modular FRP building package using manufacturer's standard components.
- B. Building Schedule:

Location	Nominal Exterior Dimensions	Clear Interior Dimensions		Clear Ceiling Height, ft-in	
	Width, ft-in	Length, ft-in	Width, ft-in	Length, ft-in	ft-in
Plant Atkinson Road PS	8'-0"	10'-0"	7'-8"	9'-8"	7'-8"
Marina Trace PS	5'-9"	8'-2"	5'-5"	7'-9"	7'-8"

1. Roof Slope: 1 inch(es) vertical to 12 inches horizontal.
2. Include: Doors, louvers, insulation, and roof accessories.

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- C. Structure: Fabricated fiberglass environmental enclosure designed to be moved and installed as a modular unit.
- D. Design: Design to enclose electrical switchgear, HVAC unit and other equipment.
- E. Control indoor air quality and provide electrical illumination and power.

1.03 SUBMITTALS

- A. Submittals shall be provided in accordance with Section 01300, Submittals.
- B. Action Submittals:
 - 1. Shop Drawings:
 - a. Manufacturer's Literature and Technical Data: Drawings and Specifications for proposed building system.
 - b. Manufacturer's Standard Details: Clearly mark those portions that apply to specific Project and those parts that do not apply.
 - c. Anchorage and bracing drawings and/or catalog information, as required by Section 01611, Anchorage and Bracing.
 - 2. Samples: Colors of siding and interiors available.
- C. Informational Submittals:
 - 1. Drawings stamped by Manufacturer's engineer, licensed in the Project state, and prepared specifically for this Project.
 - 2. Materials and Details: Show materials, details of components (including doors and other accessories), finishes, fastenings, methods of joining, sealants, anchor bolt, shear angle, and baseplate details including sizes and dimensions, size and location of structural members and bracing, wall structural members, bracing, openings, and structural wind columns as required.
 - 3. Anchorage and bracing calculations as required by Section 01611, Anchorage and Bracing. Submit with Action Submittal for the same item.
 - 4. Experience records of manufacturer and installer.
 - 5. Description and details of electrical continuity and grounding methods.

1.04 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer:
 - a. Manufacturer shall provide professional engineering services in the state where the buildings are to be erected certifying the design will meet the design conditions specified in this Section.
 - b. At least 5 years' experience in work of type required in this section.
 - c. Production capacity to provide work required for this Project within the time constraints of the Project as determined by the Contractor.
2. Erector/Installer provided by Contractor: Not less than 5 years' experience in erection of prefabricated structures similar to this Project, documented with references and contact information.

B. Regulatory Requirements: Design building system to meet requirements of the following building codes:

1. International Building Code, 2018 Edition, with 2020 Georgia Amendments.
2. International Mechanical Code 2012 Edition.
3. International Energy Conservation Code 2012 Edition.
4. International Fire Code 2012 Edition.
5. National Electrical Code, State of Georgia.
6. State of Georgia Amendments.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver building components in undamaged condition to Site when ready for installation.
- B. Protect products from damage and deterioration.
- C. Handle products in accordance with manufacturers' instructions.

1.06 WARRANTY

- A. Provide manufacturer's standard 12-month warranty, with Owner named as beneficiary, in writing. Warranty shall provide for correction, or at the option of the Owner, removal and replacement of Work specified in this Specification section found defective during the warranty period after the date of Substantial Completion. Duties and obligations for correction or removal and replacement of defective Work as specified in the General Conditions.

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PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Materials, equipment, and accessories specified in this section shall be products of: Kenco Plastics Company.

2.02 SUPPLEMENTS

- A. Supplement 1, Price Quotations from Kenco Plastics Company, Dated 7-7-2020.
- B. Supplement 2, Anchorage Details, Kenco Plastics Company.

2.03 SYSTEM PERFORMANCE

- A. Design Criteria shall comply with the requirements in Section 01600, Common Product Requirements.
- B. Structural Loading: Design structure in accordance with the Design Criteria listed on the General Structural Notes Drawing. Environmental Design Conditions:
 - 1. Design Temperature: Minus 10 to 100 degrees F.
 - 2. Building is to be located in Atlanta, Georgia and designed for daily UV exposure at that location.

2.04 GENERAL REQUIREMENTS

- A. This Specification covers the minimum design features and material properties.
- B. The Modular building is a weather tight, corrosion resistant shelter and has maximum amount of corrosion resistant materials. At minimum, it includes the roof and wall panels with a door.
- C. Any modular building that is to be shipped unassembled shall be fully factory assembled and available for the buyer's inspection. When disassembled it shall be match marked for ease of reassembly.
- D. When assembled the only exposed metal shall be the lifting eyes and stainless steel hardware.
- E. The building shall be designed to be slab mounted with stainless steel flanges provided with holes for 1/2-inch diameter concrete anchor bolts.
- F. The building panels shall have a R Value of 1.5.

2.05 COMPONENTS

- A. Substructure: Existing Cast-in-place concrete foundation. Contractor shall field verify existing condition, equipment locations, conduit locations, and existing obstructions prior to fabrication of structure. Concrete anchorage locations shall be designed for field verified conditions.
- B. Shell:
 - 1. Provide weathertight structure that has straight, plumb walls with square corners.
 - 2. Roof design shall be peaked. The roof shall make a smooth and seamless transition to the inside walls.
 - 3. The outside surface (roof, walls, and door) shall be smooth finished gel-coat spray into a mold to create the weather and corrosion proof exterior surfaces.
 - 4. Insulation shall be bonded to the inside of the shell. Standard insulation thickness shall be one inch.
 - 5. The inside surfaces shall be coated with chopped fiberglass and resin. Surface shall be rolled and smoothed.
 - 6. Allowable Average Heat Loss: Minimum R value of wall panels shall be 1.5.
 - 7. Provide louvers or ventilators to ventilate attic space per building code requirements if applicable.
 - 8. Slope direct stormwater and drain to building perimeter without ponding.
 - 9. The wall panels shall have wood or metal embedded as needed to mount items such as electrical boxes. All wood or metal shall be seamlessly coated with the fiberglass layup.
 - 10. Flame Spread: ASTM E84 rating of 25 or less.
- C. Doors:
 - 1. Door design is the same as the panel specifications in this technical specification. Standard door is 3 feet wide by 6 feet 4 inch high. The door shall be attached into a molded, flush fitting frame; attached with a one piece stainless steel piano hinge. Door gasket shall be neoprene. Safety stop chain shall be included. Lockset shall be stainless steel cylindrical with key lock.
 - 2. Threshold shall be stainless steel with neoprene gasket.

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- D. Heating, Ventilating, and Air Conditioning: Provide heating and ventilating, and air conditioning system to maintain inside temperature between 50 degrees F and 100 degrees F .
1. Two(2) Unit Heaters shall be a QMARK SED1512, 1,500 Watt, wall mounted, thermostatically controlled, 120V unit heater hardwired to the building load center. QMARK Cover for wall heater with built-in double pole thermostat 40 degrees to 135 degrees F Range.
 2. Air Conditioner shall be a 6,000 BTU, 120V, wall mounted AC unit equal to a Frigidaire Mini Air Conditioner. The unit shall be capable of maintaining 70-75 degrees F with an outside temperature of 100 degrees F.
 3. The building shall have a thermostatically controlled, wall mounted exhaust vent fan, 120V, 1/30 HP, 1550 RPM.
- E. Fire Protection: Carbon dioxide fire extinguishers in accordance with NFPA 10.
- F. Electrical Systems:
1. Input Power: 480V/3 phase. Output Power Single-phase, 120/208 volts.
 2. The following items shall be provided by the manufacturer to be powered from a load center provided by others;
 - a. Internal Lighting.
 - b. Two(2) 1,500W, 120V unit heaters.
 - c. One 6,000 BTU, 120V air conditioner.
 - d. Two 20A/120V duplex receptables.
 - e. 1/30 hp exhaust fan.
 - f. One 20A/1P (single Pole) 120V breaker for RTU panel.
 - g. One 20A/1P (single Pole) 120V breaker for external Site lighting.
 - h. One 20A/1P (single Pole) 120V breaker for Generator Heater.
 - i. One 20A/1P (single Pole) 120V breaker for Generator Battery Charger.
 - j. One Spare.

2.06 MATERIALS

- A. Kal-Lite .090-thick panels:
1. Weight .700 pounds per square foot.
 2. Tensile strength, ASTM D638:
 - a. Machine direction 12288 psi.
 - b. Transverse 8679 psi.
 3. Tensile modulus ASTM D638:
 - a. Machine direction 803,000 psi.
 - b. Transverse 651,106 psi.

4. Elongation ASTM D638:
 - a. Machine direction 1.88 percent.
 - b. Transverse 1.87 percent.
5. Flexural strength, ASTM D790:
 - a. Machine direction 25602 psi.
 - b. Transverse 15712 psi.
6. Flexural modulus, ASTM D790:
 - a. Machine direction 735,000 psi.
 - b. Transverse 432,000 psi.
7. Compressive strength, ASTM D695:
 - a. Machine direction 18043 psi.
 - b. Transverse 13042 psi.
8. Compressive modulus, ASTM D695:
 - a. Machine direction 783,000 psi.
 - b. Transverse 508,000 psi.
9. Coefficient of linear thermal expansion, ASTM D696, -30c to +30c:
 - a. Machine direction 3.46×10^{-5} /in/in/c .
 - b. Transverse, 4.44×10^{-5} /in/in/c.
10. 24 hour water absorption, ASTM D570 7.10.1. Weight 0.27 percent increase.
11. Izod impact, ASTM D256 7.11.1. 10.32 Ft-lbs/inch notch.

B. Kenco fiberglass reinforced panels:

1. Color pigments and ultraviolet stabilizers: dispersed throughout the material thickness.
2. Glass content 33.5 percent.
3. Panel thickness .083 to .155 inch.
4. Tensile strength, ASTM D-638:
 - a. Dry 14,800 psi.
 - b. Wet 14,600 psi.
5. Flexural strength, ASTM D790 8.5.1:
 - a. Dry 39,300 psi.
 - b. Wet 26,300.
6. 24 hour water absorption, ASTM D570:
 - a. Weight 0.295 percent increase.
7. Izod impact, ASTM D256 8.7.1. 13.3 Ft-lbs/inch notch.
8. Barcol Hardness D2583 8.8.1. 44B.

C. Technical properties for PVC capping:

1. These PVC specifications are measured at 72F, Impact properties samples were extruded at 375F.
2. Specific gravity, ASTM D792 10.2.1. 1.38.
3. Hardness, Shore D, ASTM D2240 10.3.1. 78.

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4. Tensile Strength, ASTM D638 10.4.1. 6,450 psi yield.
5. Tensile modulus, ASTM D638 10.5.1. 390,000 psi.
6. Flexural strength, ASTM D-90 10.6.1. 11,700 psi yield.
7. Flexural modulus, ASTM D790 10.7.1. 400,000 psi.
8. Heat deflection, ASTM D648 10.8.1. 162 degrees F at 264 psi.
9. Coefficient of linear expansion, ASTM D696 10.9.1. 0.00003 inches per inch per degree F.
10. Impact, Notched Izod, ASTM D256 10.10.1. 16.0 foot pounds /inch.
11. Impact, Dart Drop, Procedure A, ASTM D4226 10.11.1. 1.4 inch pound/mil.
12. Impact, Dart Drop, Procedure B, ASTM D4226 10.12.1. 3.5 inch pound/mil maximum.

D. Urethane foam:

1. Urethane foam thickness shall be 1.5 inches.
2. Urethane density shall be 2 pounds per cubic feet.
3. K factor shall be .14 Btu inch per hour square feet * degree F.
4. Bulk foam tanks shall be maintained at 75 degrees F before mixing and padded with nitrogen.

E. Sealant: Single part silicone meeting ASTM C920, Type S, Grade NS, Class 25. Provided by Installing Contractor.

F. Louvers: Fixed:

1. Fixed, factory finish to match wall panels.
2. Free Airflow: Minimum 50 percent.
3. Weather Projection: 60 percent or more.
4. Insect Screen: Manufacturer's standard 14-mesh by 18-mesh.

G. Colors: As selected by Owner from manufacturer's standard color selection.

H. Specialties:

1. Illumination Level: At 36 inches above floor, 50 foot candles minimum from LED luminaires, plus task lights.
2. Two PASS & SEYMOUR duplex receptacles, 20A, 125V wall mount receptacles w/ cover.
3. Two PASS & SEYMOUR toggle switch, 20A.
4. Ground bar kit.
5. The heaters, lights, fan and duplex receptacles shall be hard wired to the electrical mini power center.

I. Anchor Bolts:

1. Anchor bolts shall be Type 316 stainless steel in accordance with specification Section 05019, Post-Installed Anchors.
2. Anchorage details are provide in Section 13121, Supplement 2. Anchor plates and anchor bolts are to be provided and installed by Contractor.

2.07 SOURCE QUALITY CONTROL

- A. Inspections: Before shipment, manufacturer shall inspect for complete, functional assembly.
- B. Tests: Perform manufacturers' standard tests and adjustments on mechanical and electrical equipment and other moving and operating components.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine Site and access to determine adverse effects on the proposed building.
- B. Investigate existing foundation pad conditions and any adverse effects on proposed building.

3.02 PREPARATION

- A. Verify Site conditions and make necessary field measurements.
- B. Perform Site modifications to suit installation of prefabricated building.

3.03 ERECTION

- A. Remove existing FRP enclosures.
- B. Provide temporary bracing and support of existing electrical equipment during demolition of existing building and installation of new building as needed to keep the existing pump station equipment in service.
- C. Erect building components on existing foundation pad and around the existing electrical equipment in accordance with manufacturer's instructions. Securely anchor to concrete foundation pad in accordance with signed and sealed concrete anchorage design.
- D. Contractor is to remove electrical equipment and install new electrical equipment as described on the Electrical Drawings.

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- E. Provide temporary bracing for erection and wind loads during installation. Maintain temporary bracing to hold structure plumb and in alignment until completion of permanent, stable structure.
- F. Install materials following manufacturers' instructions and recommendations.
- G. Special care is to be taken in sealing of any joints between panels, doors and other built in items to prevent moisture and insect/animal ingress into the structure.
- H. Anchor bolts shall be installed in accordance with Specification Section 05019, Post-Installed Anchors.

3.04 FIELD FINISHING

- A. If required, building shall be painted in accordance with the manufacturers requirements once installation is complete.
- B. Do not paint existing or new electrical equipment.

3.05 HEATING AND VENTILATING

- A. Install equipment and components following manufacturer's instructions and recommendations.
- B. Meet requirements of NFPA 90A and NFPA 90B.
- C. Adjust for proper operation and temperature control.

3.06 ELECTRICAL SYSTEMS

- A. In accordance with requirements of NFPA 70.
- B. Install products in accordance with manufacturers' instructions and recommendations and in accordance with the details on the Electrical Drawings and Specifications.
- C. Provide grounding for building.

3.07 FIELD QUALITY CONTROL

- A. Functional Tests: Conduct on moving and operating components.
- B. Electrical Continuity: Test continuity of completed structure and installed equipment to ground.

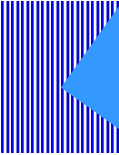
3.08 CLEANING

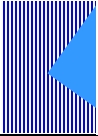
- A. Thoroughly clean interior and exterior of building and leave weathertight and ready for use.

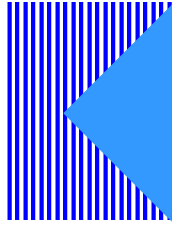
3.09 SUPPLEMENTS

- A. The supplements listed below, following “End of Section,” are part of this Specification.
 - 1. Supplement 1, Price Quotations from Kenco Plastics Company, Dated 8-17-2020.
 - 2. Supplement 2, Anchorage Details, Kenco Plastics Company.

END OF SECTION

 Kenco Plastics Company 1420 Higgs Road Lewisburg, TN 37091 931-359-6211 931-359-8664 fax		<h1>QUOTATION</h1>	
TO: Tom Wynn Jacobs Inc. RE: COBB COUNTY GA TOM.WYNN@JACOBS.COM 678-427-8149 MARINA TRACE BUILDING		DATE: 8/17/2020 QUOTATION NO. 2714C EFFECTIVE FOR 30 DAYS FOB LEWISBURG TN	
QTY		Net Unit Price	Total Net Price
1	6'0" X 8'0" X 8'0" Modular Ken Shelter building in white to include the following components:	\$ 13,605.40	\$13,605.40
1	3'0" X 6'3" Door with SS piano hinge, stop and drip cap		
1	P17-119 Junction box, weather proof, 4" round gray		
2	P18-021A QMARK SED1512 Wall heater 1500W		
2	P18-021C QMARK Cover for wall heater with built-in double pole thermostat 45° to 135°F Range		
1	P18-012 Exhaust fan,1HLA1, 10" 1/30 HP, 1550RPM		
1	P18-017-1 Exhaust Fan Shutter,10"D, Beige Fiberglass Frame, Gravity operated,single panel		
2	P17-031-2 PASS & SEYMOUR toggle switch, 20A		
2	P17-144-1 PASS & SEYMOUR 20A 125A feed thru GFCI receptacle, gray		
2	P17-047 LEVITON 4976 - GY - duplex receptacle cover		
1	P17-126 Cantex duplex toggle switch cover, waterproof, FS PVC		
1	P12-051-1 Entrance Key-In Lever Lock,"VENUS",s.s. ANSI-strike, 2 3/4" (K-D)		
1	P21-010 Light Fixture,vapor tight, CM		
1	P21-010L LED lightbulb		
1	P34-015 Threshold, stainless steel, 37" long, 1.3750" high		
1	P19-044 Wall A/C 470D48 6000 Btu, 12.1 CEER		
1	PE Stamp if required--includes calcs for both buildings.		\$2,500.00
NOTES: Estimated lead time is 4-6 weeks after final signed approval received. Kenco does not supply anchor bolts for buildings All conduit is Schedule 40 PVC conduit unless noted otherwise. PE Stamp is additional fee quoted upon request and is subject to change according to the job requirements. Changes to components or additional calculations will require additional fees. Freight estimate can be provided upon request and is subject to change based on delivery requirements. Changes to included components will require a re-quote.			
Terms: NET 30 DAYS FROM SHIPDATE, SUBJECT TO CREDIT APPROVAL. PRIOR TO CREDIT APPROVAL, ORDERS CONSIDERED CASH IN ADVANCE.			
		Rene Cook 800-251-8990 931-359-8664	

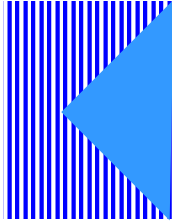
 Kenco Plastics Company 1420 Higgs Road Lewisburg, TN 37091 931-359-6211 931-359-8664 fax		<h1>QUOTATION</h1>	
TO: Tom Wynn Jacobs Inc. RE: COBB COUNTY GA TOM.WYNN@JACOBS.COM 678-427-8149 PLANT ATKINSON BUILDING		DATE: 8/17/2020 QUOTATION NO. 2714C EFFECTIVE FOR 30 DAYS FOB LEWISBURG TN	
QTY		Net Unit Price	Total Net Price
1	8'0" x 10'0" x 8'0" Modular Ken Shelter building in white to include the following components:	\$ 16,677.40	\$16,677.40
1	3'0" X 6'3" Door with SS piano hinge, stop and drip cap		
1	P17-119 Junction box, weather proof, 4" round gray		
2	P18-021A QMARK SED1512 Wall heater 1500W		
2	P18-021C QMARK Cover for wall heater with built-in double pole thermostat 45° to 135°F Range		
1	P18-012 Exhaust fan,1HLA1, 10" 1/30 HP, 1550RPM		
1	P18-017-1 Exhaust Fan Shutter,10"D, Beige Fiberglass Frame, Gravity operated,single panel		
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NOTES: Estimated lead time is 4-6 weeks after final signed approval received. Kenco does not supply anchor bolts for buildings All conduit is Schedule 40 PVC conduit unless noted otherwise. PE Stamp is additional fee quoted upon request and is subject to change according to the job requirements. Changes to components or additional calculations will require additional fees. Freight estimate available upon request and is subject to change based on delivery requirements. Changes to included components will require a re-quote.			
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Form No. FS-013.1		Rene Cook 800-251-8990 931-359-8664	



Kenco Plastics Company
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Lewisburg, TN 37091
931-359-6211 931-359-8664 fax

SPECIFICATIONS FOR MODULAR CORROSION RESISTANT PRE-FAB BUILDING





Kenco Plastics Company
1420 Higgs Road
Lewisburg, TN 37091
931-359-6211 931-359-8664 fax

INDEX

- 1. Overall building specifications**
- 2. Panel technical details**
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- 8. Properties for Kal-Lite**
- 9. Properties for Kenco Fiberglass panels**
- 10. Properties for PVC capping**
- 11. Properties for Urethane Foam**
- 12. Qualified Suppliers**
- 13. Options**
- 14. Manufacturer warranty**

1. Overall building specifications

- 1.1. This specification covers the minimum design features and material properties.
- 1.2. The Kenco Modular building is a weather tight, corrosion resistant shelter and has maximum amount of corrosion resistant materials. At minimum, it includes the roof and wall panels with a door. Many options can be specified to be included in the construction.
- 1.3. Any modular building that is to be shipped unassembled shall be fully factory assembled and available for the buyer's inspection. When disassembled it shall be match marked for ease of reassembly.
- 1.4. When assembled the only exposed metal shall be the lifting eyes and stainless steel hardware.
- 1.5. Finished assembled modular buildings shall be rated to withstand 125 miles per hour wind load and 30 pounds per square foot snow load.
- 1.6. The building is designed to slab mounted, stainless steel flanges are provided with holes for ½" fasteners, the number of flanges will be sufficient for the 125 pounds per square foot wind load.
- 1.7. If over 10 feet in length or width, a central beam shall be included for roof support. The beam shall be fabricated with 3" hot rolled steel wide flange with ¼" welded end caps, and structural wood/polyester foam, and encapsulated with the polyester fiberglass as described below. The beam shall be through bolted to reinforced locations in the side walls with stainless steel hardware.

2. Panel technical details

- 2.1. Panels will have a full perimeter of structural wood, have polyester and/or fiberglass reinforced factory spray up sheets on both sides.
- 2.2. All edges will have PVC capping.

2.3. The fully fastened and glued panel shall be placed in a hydraulic operated heated foam fixture, held under pressure and temperature while the urethane foam is injected into the cavities. Pressure shall be maintained through the curing cycle.

2.4. Final construction shall have R value 1.5 (English units).

3. Roof technical details

3.1. Roof design shall be either sloped or peaked, level flat roof is not allowed. All edges of the roof shall extend 2" minimum past the side walls.

3.2. The roof panel shall be a sandwich design with no wood or metal exposed.

4. Wall technical details

4.1. The wall panels shall be sandwich design with no wood or metal exposed except for the stainless steel door hardware.

5. Beam technical details

5.1. The beam shall be fabricated with 3" hot rolled steel wide flange with 1/4" welded end caps, and structural wood/polyester foam, and encapsulated with the polyester fiberglass as described below.

5.2. Attachment: The beam shall be through bolted to reinforced locations in the side walls with stainless steel hardware.

6. Door technical details

6.1. Door design is the same as the panel specifications in this technical specification. Standard door is 3 feet wide by 6 feet 4 inch high. The door shall be attached into a molded, flush fitting frame; attached with a one piece stainless steel piano hinge. Door gasket shall be neoprene. Safety stop chain shall be included. Lockset shall be stainless steel cylindrical with key lock.

6.2. Threshold shall be stainless steel with neoprene gasket.

7. Material specifications

7.1. Specifications for the materials are listed below in this overall technical specification.

8. Technical properties for Kal-Lite .090 thick panels

8.1. Weight .700 pounds per square foot

8.2. Tensile strength, ASTM D-638

8.2.1. Machine direction 12288 psi

8.2.2. Transverse 8679 psi

8.3. Tensile modulus ASTM D-638

8.3.1. Machine direction 803,000 psi

8.3.2. Transverse 651,106 psi

8.4. Elongation ASTM D-638

8.4.1. Machine direction 1.88%

8.4.2. Transverse 1.87%

8.5. Flexural strength, ASTM D-790

8.5.1. Machine direction 25602 psi

8.5.2. Transverse 15712 psi

8.6. Flexural modulus, ASTM D-790

8.6.1. Machine direction 735,000 psi

8.6.2. Transverse 432,000 psi

8.7. Compressive strength, ASTM D-695

8.7.1. Machine direction 18043 psi

8.7.2. Transverse 13042 psi

8.8. Compressive modulus, ASTM D-695

8.8.1. Machine direction 783,000 psi

8.8.2. Transverse 508,000psi

8.9. Coefficient of linear thermal expansion, ASTM D-696, -30c to +30c

8.9.1. Machine direction 3.46×10^{-5} /in/in/c

8.9.2. Transverse, 4.44×10^{-5} /in/in/c

- 8.10. 24 hour water absorption, ASTM D-570
- 8.10.1. Weight 0.27% increase

- 8.11. Izod impact, ASTM D-256
- 8.11.1. 10.32 Ft-lbs/inch notch

9. Technical properties for Kenco fiberglass reinforced panels

- 9.1. Color pigments and ultraviolet stabilizers: dispersed throughout the material thickness
- 9.2. Glass content 33.5%
- 9.3. Panel thickness .083 to .155"
- 9.4. Tensile strength, ASTM D-638
 - 9.4.1. Dry 14,800 psi
 - 9.4.2. Wet 14,600 psi
- 9.5. Flexural strength, ASTM D-790
 - 9.5.1. Dry 39,300 psi
 - 9.5.2. Wet 26,300
- 9.6. 24 hour water absorption, ASTM D-570
 - 9.6.1. Weight 0.295% increase
- 9.7. Izod impact, ASTM D-256
 - 9.7.1. 13.3 Ft-lbs/inch notch
- 9.8. Barcol Hardness D2583
 - 9.8.1. 44B

10. 7.3 Technical properties for PVC capping

- 10.1. These PVC specifications are measured at 72F, Impact properties samples were extruded at 375F.
- 10.2. Specific gravity, ASTM D-792
 - 10.2.1. 1.38

- 10.3. Hardness, Shore D, ASTM D-2240
 - 10.3.1. 78
- 10.4. Tensile Strength, ASTM D-638
 - 10.4.1. 6,450 psi yield
- 10.5. Tensile modulus, ASTM D-638
 - 10.5.1. 390,000 psi
- 10.6. Flexural strength, ASTM D-790
 - 10.6.1. 11,700 psi yield
- 10.7. Flexural modulus, ASTM D-790
 - 10.7.1. 400,000 psi
- 10.8. Heat deflection, ASTM D-648
 - 10.8.1. 162 degrees F @ 264 psi
- 10.9. Coefficient of linear expansion, ASTM D-696
 - 10.9.1. 0.00003 inches per inch per degree F
- 10.10. Impact, Notched Izod, ASTM D-256
 - 10.10.1. 16.0 foot pounds /inch
- 10.11. Impact, Dart Drop, Procedure A, ASTM D-4226
 - 10.11.1. 1.4 inch pound/mil
- 10.12. Impact, Dart Drop, Procedure B, ASTM D-4226
 - 10.12.1. 3.5 inch pound/mil maximum

11. Technical properties for Urethane foam

- 11.1. Urethane foam thickness shall be 1.5 inches
- 11.2. Urethane density shall be 2 pounds per cubic feet
- 11.3. K factor shall be .14 Btu inch per hour square feet * degree F.
 - 11.3.1. Bulk foam tanks shall be maintained at 75 degrees F before mixing and padded with nitrogen.

12. Qualified suppliers

Building will be manufactured from the above materials and specifications by Kenco Plastics, Lewisburg, Tennessee.

13. Options

13.1. Door exit panic hardware

Panic hardware available and will be installed in the door per manufacturer's instructions.

13.2. Window in the door

Window shall be 12 by 18 inches weather-tight safety glass and be factory installed in the door.

13.3. Engineering Calculations

Professional engineering letter certifying design capability calculations to the purchaser's requirements shall be submitted after order is placed.

13.4. Standard Electrical package

The following items shall be included with this package and shall be installed in the building in the factory before shipping.

1	P18-050-3	NEMA 3R Load Center 125 AMP, 8 space 120/240
1	P18-090A	Ground bar kit
6	P18-052-2	C-H BREAKER 120/240 20A single pole
1	P18-021A	QMARK SED1512 Wall heater 1500W
1	P18-021C	QMARK Cover for wall heater
1	P21-010	LUMAPRO #3RB17 fixture, incandescent, vapor-tite, CM, 12V 200W
1	P18-012	Dayton 1HLA1 Exhaust fan,shutter mounted, 10" 1550 RPM, 1/30 hp
1	P18-017-1	DAYTON Exhaust shutter, fiberglass, single panel, 10"
2	P17-031-2	PASS & SEYMOUR #CS20AC1-L toggle switch, 20A
2	P17-031-1	PASS & SEYMOUR #CR201 - duplex receptacle, 20A,
2	P17-047	LEVITON 4976 - GY - duplex receptacle cover
1	P17-126	Cantex duplex toggle switch cover, waterproof, FS PVC
1	P21-010L	Lamp 19A21/LED/40K/120-277
1	P12-051-1	Entrance Key-In Lever Lock, "VENUS", s.s. ANSI-strike, 2 3/4" (K-D)



Window Room Air Conditioners FRIGIDAIRE FRIEDRICH

ENERGY STAR qualified where noted. All have AHAM Certified performance. UL and C-UL Listed.

Frigidaire—Models with electric heat and heat pump condition air year-round. All feature 24-hr. timer, low-voltage startup, energy saver function, and convenient and attractive central control panel. Each includes window-mounting kit with expandable side or top panels. Nos. 470D49 to 470D55 have remote built-in thermostat to maintain temperature at location of remote. Smart Room Air Conditioner with Wi-Fi Control No. 470D69 allows you to easily control the AC unit using your smart device.

- 8-way air flow, except Nos. 470D47, 470D54, 45RK41, and 22XR23 have 4-way
- Electronic control with remote
- Antibacterial filter; check filter indicator

Friedrich® Chill—Air conditioners provide energy-efficient operation in a sleek white design and feature stale air exhaust, auto restart, and Money Saver® setting which operates fan only when cooling. No. 494L23 features built-in Wi-Fi control from your smartphone and smart home/voice command device compatibility (Amazon Alexa.)

- Removable, slide-out chassis for ease of installation, maintenance, or off-season storage
- Ultra quiet operation
- 4-way air flow with oscillating Auto Air Sweep
- Electronic control with remote
- 24-hr. timer
- EntryGard™ anti-intrusion protection
- Left/right reversible power cord

No.
48LU59



No.
470D47

BtuH Cooling	CEER Rating	Voltage - Air Conditioners & Heat Pumps	NEMA Plug Config. - Air Conditioners & Heat Pumps	Fan Speeds Cooling	Fan Speeds Heating	H	W	D	Max. Wall Thickness	Chassis Type	Brand	Mfr. Model	Item No.
Cool Only													
5000	12.1	115VAC	LCDI, 5-15P	2	—	12 3/4"	15 23/32"	15 23/32"	—	Fixed	Frigidaire	FFRE0533U1	470D47 *
5000	11.0	115VAC	5-15P	3	—	15 1/2"	24 1/2"	13 3/16"	36"	Fixed	Friedrich	CGF05A10	494L23 *
6000	12.1	115VAC	5-15P	3	—	13 3/8"	18 3/8"	20 1/4"	7 1/2"	Slide Out	Friedrich	CP06G10	48LU59 *
6000	12.1	115VAC	LCDI, 5-15P	3	—	12 3/4"	18 1/2"	15 23/32"	—	Fixed	Frigidaire	FFRE0633U1	470D48 *
8000	12.0	115VAC	LCDI, 5-15P	3	—	13 3/4"	18 1/2"	16"	—	Fixed	Frigidaire	FFRC084WA1	470D69 *
8000	12.0	115VAC	5-15P	3	—	13 3/8"	18 3/8"	20 1/4"	7 1/2"	Slide Out	Friedrich	CP08G10	48LU60 *
8000	12.0	115VAC	LCDI, 5-15P	3	—	12 3/4"	18 1/2"	15 23/32"	—	Fixed	Frigidaire	FFRE083ZA1	470D49 *
10,000	12.0	115VAC	5-15P	3	—	15"	23 3/4"	22 1/4"	8"	Slide Out	Friedrich	CP10G10	48LU61 *
10,000	12.0	115VAC	LCDI, 5-15P	3	—	15 3/4"	21 1/2"	21 1/4"	—	Fixed	Frigidaire	FFRE103ZA1	470D50 *
12,000	12.0	115VAC	5-15P	3	—	15"	23 3/4"	22 1/4"	8"	Slide Out	Friedrich	CP12G10	48LU62 *
12,100	12.0	115VAC	LCDI, 5-15P	3	—	15 3/4"	21 1/2"	21 1/4"	—	Fixed	Frigidaire	FFRE123ZA1	470D51 *
15,000	11.8	115VAC	LCDI, 5-15P	3	—	17 3/8"	23 3/4"	27 1/2"	9 1/2"	Slide Out	Frigidaire	FFRE153ZA1	470D52 *
15,500	11.8	115VAC	5-15P	3	—	16 1/4"	25 1/2"	30 3/4"	9"	Slide Out	Friedrich	CP15G10	48LU63 *
18,600/19,000	11.8/11.8	208/230VAC	6-15P	3	—	16 1/4"	25 1/2"	30 3/4"	9"	Slide Out	Friedrich	CP18G30	48LU64 *
18,000/17,600	11.8	208/230VAC	LCDI, 6-15P	3	—	17 3/8"	23 3/4"	27 1/2"	9 1/2"	Slide Out	Frigidaire	FFRE1833U2	470D53 *
22,000/21,600	10.3	208/230VAC	LCDI, 6-15P	3	—	18 3/4"	26 1/2"	26 3/4"	8 1/4"	Slide Out	Frigidaire	FFRE2233U2	470D54 *
23,500/24,000	10.3/10.3	208/230VAC	6-20P	3	—	16 3/4"	25 1/2"	30 3/4"	9"	Slide Out	Friedrich	CP24G30	48LU65 *
25,000/24,600	10.3	208/230VAC	LCDI, 6-20P	3	—	18 3/4"	26 1/2"	26 3/4"	8 1/4"	Slide Out	Frigidaire	FFRE2533U2	470D55 *
28,300/28,000	9.0	208/230VAC	LCDI, 6-30P	3	—	18 3/4"	26 1/2"	26 3/4"	8 1/4"	Slide Out	Frigidaire	FFRA2822U2	470D68 *
Slider/Casement													
8000	11.2	115VAC	5-15P	3	—	20 1/4"	14 1/2"	25 1/2"	8 1/2"	Fixed	Frigidaire	FFRS0822S1	45RK41
10,000	10.4	115VAC	LCDI, 5-15P	3	—	20 1/4"	14 1/2"	23 1/2"	8 1/2"	Fixed	Frigidaire	FFRS1022R1	22XR23
Cool/Heat (Electric)													
7500	11.0	115VAC	5-15P	3	2	13 3/4"	18 3/8"	20 1/4"	8"	Slide Out	Friedrich	EP08G11	31TN92
11,500/12,000	11.2/11.2	208/230VAC	6-20P	3	2	15"	23 3/4"	22 1/4"	8"	Slide Out	Friedrich	EP12G33	31TN93
17,500/18,000	11.1/11.1	208/230VAC	6-20P	3	2	16 3/4"	25 1/2"	30 3/4"	9"	Slide Out	Friedrich	EP18G33	31TN94
18,200/18,500	10.7	208/230VAC	LCDI, 6-30P	3	3	17 3/4"	23 3/4"	25 3/4"	8"	Slide Out	Frigidaire	FFRH1822R2	22XR20
22,500/23,000	9.8/9.8	208/230VAC	6-20P	3	2	16 3/4"	25 1/2"	30 3/4"	9"	Slide Out	Friedrich	EP24G33	31TN95
24,700/25,000	9.4	208/230VAC	LCDI, 6-30P	3	3	18 3/4"	26 1/2"	26 1/2"	10"	Slide Out	Frigidaire	FFRH2522R2	22XR21
Cool/Heat (Heat Pump)													
8000	9.8	115VAC	LCDI, 5-15P	3	1	15 3/4"	22 3/4"	23 3/4"	6 1/2"	Slide Out	Frigidaire	FFRH0822R1	22XR18

* ENERGY STAR qualified.

Air Conditioner Accessories

Window A/C Supports—Install from inside into walls from 4" to 11" thick, without external fasteners. Will not mar building facade. Built-in level. Include hardware.



Through-the-Wall A/C Cover—Eliminates drafts from outside cold air and reduces energy costs.



Support
No. 4MH73



Cover
No. 5E169

Description	H	W	D	Brand	Mfr. Model	Item No.
Window Air Conditioner Supports						
For Use With Window Air Conditioners Up to 80 lb.	1 3/4"	4 3/4"	14 1/2"	A/C Safe	AC-080	4MH72
For Use With Window Air Conditioners Up to 160 lb.	1 3/4"	4 3/4"	—	A/C Safe	AC-160	4MH73
Through-the-Wall Air Conditioner Cover						
Interior Universal Air Conditioner Cover for Units up to 19H x 27 3/4 x 6"D	21"	30"	6"	Chill Stop R	1212-06	5E169

Hazardgard® Hazardous Location Room Air Conditioners FRIEDRICH

■ Hot gas bypass for cooling operation at low ambient temps., down to 45°F (7°C) without freezing. Specifically designed to cool control rooms, laboratories, living quarters, storage areas, and other enclosures located in hazardous locations; where specific volatile flammable liquids or gases are handled or used within enclosed containers or systems. Commercial grade, enclosed permanent split capacitor fan motor meets T4 temp. classification with hermetically sealed overload

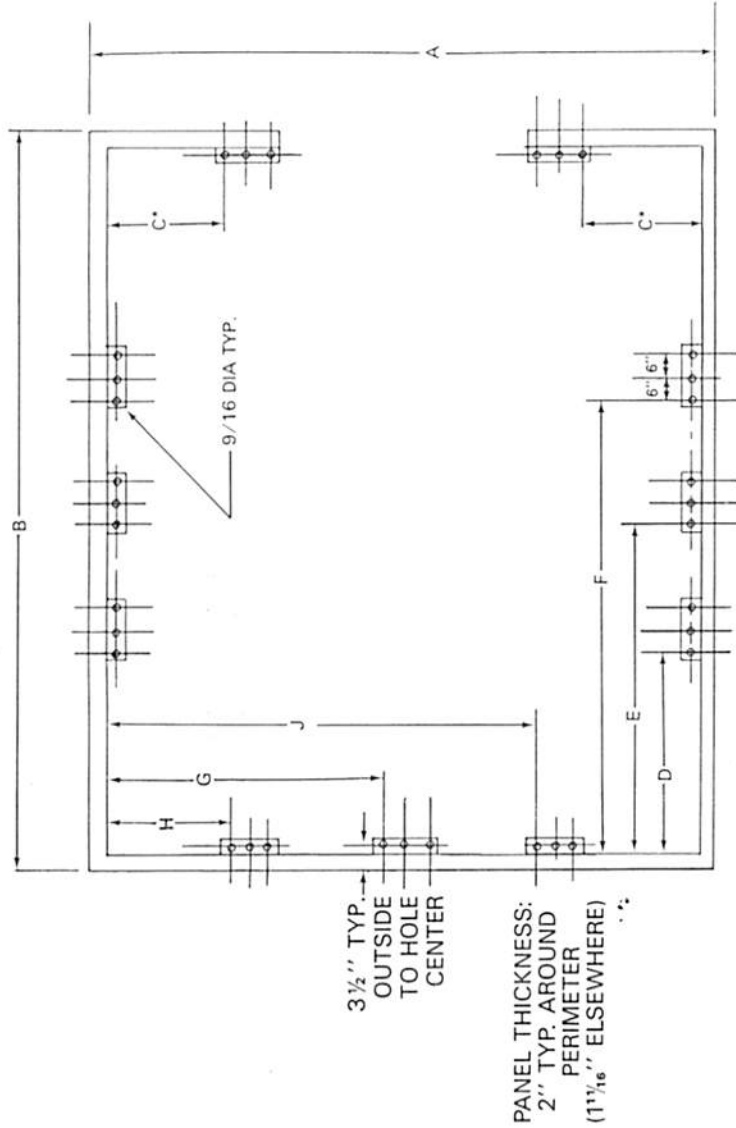
for arc-free operation. 15A circuit with time-delay fuse. Coated coils resist corrosion. Solid-state control relays. Environmentally sealed On/Off switch, gold plated contacts in thermostat, and powder-coated 22-ga. G60 steel cabinet resist corrosion. Meet ANSI/UL 484 Room A/C, SASO 2681, UL Listed for use in Class I, Div. 2, Groups A, B, C and D, ISA 12.12.101, and NFPA 70.



BtuH	EER	Voltage	Fan Speeds Cooling	H	W	D	Max. Wall Thickness	Mfr. Model	Item No.
14,000/14,500	9.7/9.7	208/230	1	15 1/4"	25 1/4"	27 3/4"	6"	SH15M30	22D138
19,000/19,000	9.6/9.7	208/230	1	17 1/4"	25 1/4"	27 3/4"	6"	SH20M30	35MW48


SIZE AxB	C*	D	E	F	G	H	J
6x4	1 1/2"	—	16"	—	28"	—	—
6x6	1 1/2"	—	28"	—	28"	—	—
6x8	1 1/2"	—	40"	—	28"	—	—
6x10	1 1/2"	32"	—	72"	28"	—	—
6x12	1 1/2"	40"	—	88"	28"	—	—
6x14	1 1/2"	48"	—	104"	28"	—	—
8x4	13"	—	16"	—	40"	—	—
8x6	13"	—	28"	—	40"	—	—
8x8	13"	—	40"	—	40"	—	—
8x10	13"	32"	—	72"	40"	—	—
8x12	13"	40"	—	88"	40"	—	—
8x14	13"	48"	—	104"	40"	—	—
10x4	25"	—	16"	—	—	32"	72"
10x6	25"	—	28"	—	—	32"	72"
10x8	25"	—	40"	—	—	32"	72"
10x10	25"	32"	—	72"	—	32"	72"
10x12	25"	40"	—	88"	—	32"	72"
10x14	25"	48"	—	104"	—	32"	72"
12x4	37"	—	16"	—	—	40"	88"
12x6	37"	—	28"	—	—	40"	88"
12x8	37"	—	40"	—	—	40"	88"
12x10	37"	32"	—	72"	—	40"	88"
12x12	37"	40"	—	88"	—	40"	88"
12x14	37"	48"	—	104"	—	40"	88"
14x4	49"	—	16"	—	—	48"	104"
14x6	49"	—	28"	—	—	48"	104"
14x8	49"	—	40"	—	—	48"	104"
14x10	49"	32"	—	72"	—	48"	104"
14x12	49"	40"	—	88"	—	48"	104"
14x14	49"	48"	—	104"	—	48"	104"

* ASSUMES STANDARD 3'0" WIDE DOOR IS
CENTERED IN FRONT PANEL.



THE HOLES ARE ON 6 IN. CENTERS.
PREPUNCHED FOR 1/2 IN. DIAMETER
BOLTS. THE ANGLES ARE ATTACHED TO
THE BUILDING WITH THREE 5/16" X
1 1/2" LAG SCREWS. SEE DRAWING NO.
KX-0003-B1 FOR SPECIFICATIONS ON ANGLES.
KENCO DOES NOT RECOMMEND
PREDRILLING HOLES IN FOUNDATION.

NOT TO SCALE.

 KENCO	PLASTICS COMPANY, INC. NECEDAH, WISCONSIN 54646	TITLE TYPICAL TIE DOWN DETAIL
	DRAWING NO. KS-0007 B1	1/31/90

DIVISION 16

ELECTRICAL

SECTION 16010
BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.01 RELATED SECTIONS

- A. Requirements specified within this section apply to Division 16, Electrical. Work specified herein shall be performed as if specified in the individual sections.

1.02 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
 - 1. National Electrical Contractors Association (NECA): National Electrical Installation Standards.
 - 2. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1,000 Volts Maximum).
 - b. Z535.4, Product Safety Signs and Labels.
 - 3. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).
 - 4. Underwriters Laboratories, Inc. (UL).

1.03 SUBMITTALS

- A. Action Submittals:
 - 1. Provide manufacturers' data for the following:
 - a. Electrical service components.
 - b. Nameplates, signs, and labels.

1.04 QUALITY ASSURANCE

- A. Provide the Work in accordance with NFPA 70. Where required by Authority Having Jurisdiction (AHJ), material and equipment shall be labeled or listed by a nationally recognized testing laboratory or other organization acceptable to the AHJ, in order to provide a basis for approval under the NEC.
- B. Materials and equipment manufactured within the scope of standards published by UL shall conform to those standards and shall have an applied UL listing mark or label.

FY21 MULTIPLE PUMP STATIONS PROJECTS

- C. Provide materials and equipment acceptable to AHJ for Class, Division, and Group of hazardous area indicated.

1.05 ENVIRONMENTAL CONDITIONS

- A. The following areas are classified hazardous Class I, Division 1, Group D, because of the potential for occurrence of hazardous concentrations of combustible gases, and for exposure to corrosive environment. Use materials and methods required for such areas.

- 1. Inside wet well containing wastewater at:
 - a. Allatoona Beach Pump Station.
 - b. West Hampton #1 Pump Station.
 - c. West Hampton #2 Pump Station.
 - d. Plant Atkinson Pump Station.
 - e. Wood Valley Pump Station.
 - f. Marina Trace Pump Station.
 - g. Six Flags Pump Station.
- 2. Three foot envelope around vent at wet well inside:
 - a. Allatoona Beach Pump Station.
 - b. West Hampton #1 Pump Station.
 - c. West Hampton #2 Pump Station.
 - d. Plant Atkinson Pump Station.
 - e. Wood Valley Pump Station.
 - f. Marina Trace Pump Station.
 - g. Six Flags Pump Station.

- B. The following areas are classified hazardous, Class I, Division 2, Group D, because of the potential for accumulation of hazardous concentrations of combustible gases, and for exposure to corrosive environment. Use materials and methods required for such areas.

- 1. Enclosed, below grade valve and metering vaults with closed piping systems containing wastewater.
- 2. Envelope 18 inches above and 3 foot from wet well hatch opening inside:
 - a. Allatoona Beach Pump Station.
 - b. West Hampton #1 Pump Station.
 - c. West Hampton #2 Pump Station.
 - d. Plant Atkinson Pump Station.
 - e. Wood Valley Pump Station.
 - f. Marina Trace Pump Station.
 - g. Six Flags Pump Station.

- C. The following areas are classified nonhazardous and wet. Use materials and methods required for such areas.
 - 1. Outdoor abovegrade areas not covered above.
 - 2. Below grade vaults.
 - 3. Six Flags Pump Station: Pump TJB Room.
 - 4. Six Flags Pump Station: Pump Room.
- D. The following areas are classified as indoor and dry:
 - 1. Plant Atkinson Pump Station: Electrical Equipment Building.
 - 2. Allatoona Beach Pump Station: Electrical Equipment Building.
 - 3. Wood Valley Pump Station: Electrical Equipment Building.
 - 4. Marina Trace Pump Station: Electrical Equipment Building.
 - 5. Six Flags PS: Upper Level Electrical Room.
- E. The following areas are not classified. Use dust-tight and oil-tight NEMA 12 materials and methods.
 - 1. Areas not covered above.

PART 2 PRODUCTS

2.01 GENERAL

- A. Where two or more units of the same class of material or equipment are required, provide products of a single manufacturer. Component parts of materials or equipment need not be products of the same manufacturer.
- B. Material and equipment installed in heated and ventilated areas shall be capable of continuous operation at their specified ratings within an ambient temperature range of 40 degrees F to 104 degrees F.
- C. Materials and equipment installed outdoors shall be capable of continuous operation at their specified rating within the ambient temperature range.

2.02 EQUIPMENT FINISH

- A. Manufacturer's standard finish color, except where specific color is indicated. If manufacturer has no standard color, finish equipment in accordance with light gray color finish as approved by Engineer.

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2.03 NAMEPLATES

- A. Material: Laminated plastic.
- B. Attachment Screws: Stainless steel.
- C. Color: White, engraved to a black core.
- D. Letter Height:
 - 1. Pushbuttons/Selector Switches: 1/8-inch.
 - 2. Other Electrical Equipment: 1/4-inch.

2.04 SIGNS AND LABELS

- A. Sign size, lettering, and color shall be in accordance with NEMA Z535.4.

PART 3 EXECUTION

3.01 GENERAL

- A. Electrical Drawings show general locations of equipment, devices, and raceway, unless specifically dimensioned. Contractor shall be responsible for actual location of equipment and devices and for proper routing and support of raceways, subject to approval of Engineer.
- B. Check approximate locations of light fixtures, switches, electrical outlets, equipment, and other electrical system components shown on Drawings for conflicts with openings, structural members, and components of other systems and equipment having fixed locations. In the event of conflicts, notify Engineer in writing.
- C. Install work in accordance with NECA Standard of Installation, unless otherwise specified.
- D. Keep openings in boxes and equipment closed during construction.
- E. Lay out work carefully in advance. Do not cut or notch any structural member or building surface without specific approval of Engineer. Carefully perform cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings, paving, or other surfaces required for the installation, support, or anchorage of conduit, raceways, or other electrical materials and equipment. Following such work, restore surfaces to original condition.

3.02 ANCHORING, BRACING, AND MOUNTING

- A. Equipment anchoring and mounting shall be in accordance with manufacturer's requirements for Project.

3.03 COMBINING CIRCUITS INTO COMMON RACEWAY

- A. Homerun circuits shown on Drawings indicate functional wiring requirements for power and control circuits. Circuits may be combined into common raceways in accordance with the following requirements:
 - 1. Analog control circuits from devices in same general area to same destination.
 - a. No power or ac discrete control circuits shall be combined in same conduit with analog circuits.
 - b. No Class 2 or Class 3 circuits including, but not limited to, HVAC control circuits, fire alarm circuits, paging system circuits shall be combined with power or Class 1 circuits.
 - c. Analog circuits shall be continuous from source to destination. Do not add TJB, splice, or combine into a multi-pair cable without authorization of Engineer.
 - d. Raceways shall be sized per General Circuit and Raceway Schedule and do not exceed 40 percent fill.
 - e. Changes shall be documented on record drawings.
 - 2. Discrete control circuits from devices in the same general area to the same destination.
 - a. No power or analog control circuits shall be combined in same conduit with discrete circuits.
 - b. No Class 2 or Class 3 circuits including, but not limited to, HVAC control circuits, fire alarm circuits, and paging system circuits shall be combined with power or Class 1 circuits.
 - c. Raceways shall be sized per the General Circuit and Raceway Schedule and do not exceed 40 percent.
 - d. Changes shall be documented on record drawings.
 - 3. Power circuits from loads in same general area to same source location (such as: panelboard, switchboard, low voltage motor control center).
 - a. Lighting Circuits: Combine no more than three circuits to a single raceway. Contractor shall be responsible for increasing conduit and conductor size if derating is required by NEC.
 - b. Receptacle Circuits, 120 Volt Only: Combine no more than three circuits to a single raceway. Provide a separate neutral conductor for each circuit. Contractor shall be responsible for increasing conduit and conductor size if derating is required by NEC.

FY21 MULTIPLE PUMP STATIONS PROJECTS

- c. All Other Power Circuits: Do not combine power circuits without authorization of Engineer.

3.04 NAMEPLATES, SIGNS, AND LABELS

A. Arc Flash Protection Warning Signs:

1. Field mark motor control centers, panelboards, and all new variable frequency drives to warn qualified persons of potential arc-flash hazards. Locate marking so to be clearly visible to persons before working on energized equipment.
2. Use arc flash hazard boundary, energy level, PPE level and description, shock hazard, bolted fault current, and equipment name from study required in Section 16015, Electrical Systems Analysis as basis for warning signs.

B. Available Fault Current Signs:

1. Install label on service equipment to indicate the maximum available fault current at the equipment. Labels shall be of sufficient durability for the environment in which the equipment is installed. Labels shall include the following information:
 - a. Equipment name or identification.
 - b. Available fault current at the equipment.
 - c. Date the fault current calculations were performed.
2. Use bolted fault current and equipment name from study required in Section 16015, Electrical Systems Analysis as basis for the label.
3. Where existing electrical systems are modified, completely remove existing fault current labels if present, and install new labels in accordance with the above requirements.

C. Multiple Power Supply Sign: Install permanent plaque or directory at each service disconnect location denoting other services, feeders, and branch circuits supplying the building, and the area served by each.

D. Equipment Nameplates:

1. Provide a nameplate to label electrical equipment including switchgear, switchboards, motor control centers, panelboards, motor starters, variable frequency drives, transformers, terminal junction boxes, disconnect switches, switches and control stations.
2. Switchgear, motor control center, variable frequency drives, transformer, and terminal junction box nameplates shall include equipment designation.

3. Disconnect switch, starter, and control station nameplates shall include name and number of equipment powered or controlled by that device.
4. Switchboard and panelboard nameplates shall include equipment designation, service voltage, and phases.

3.05 LOAD BALANCE

- A. Drawings and Specifications indicate circuiting to electrical loads and distribution equipment.
- B. Balance electrical load between phases as nearly as possible on switchboards, panelboards, motor control centers, and other equipment where balancing is required.
- C. When loads must be reconnected to different circuits to balance phase loads, maintain accurate record of changes made, and provide circuit directory that lists final circuit arrangement.

3.06 CLEANING AND TOUCHUP PAINTING

- A. Cleaning: Throughout the Work, clean interior and exterior of devices and equipment by removing debris and vacuuming.
- B. Touchup Paint:
 1. Touchup scratches, scrapes and chips on exterior and interior surfaces of devices and equipment with finish matching type, color, and consistency and type of surface of original finish.
 2. If extensive damage is done to equipment paint surfaces, refinish entire equipment in a manner that provides a finish equal to or better than factory finish, that meets requirements of Specification, and is acceptable to Engineer.

3.07 PROTECTION FOLLOWING INSTALLATION

- A. Protect materials and equipment from corrosion, physical damage, and effects of moisture on insulation and contact surfaces.
- B. When equipment intended for indoor installation is installed at Contractor's convenience in areas where subject to dampness, moisture, dirt or other adverse atmosphere until completion of construction, ensure adequate protection from these atmospheres is provided and acceptable to Engineer.

END OF SECTION

**SECTION 16015
ELECTRICAL SYSTEMS ANALYSIS**

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. American National Standards Institute (ANSI).
 2. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - a. C57.12.00, Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers.
 - b. 242, Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems.
 - c. 399, Recommended Practice for Industrial and Commercial Power System Analysis.
 - d. 1584, Guide for Performing Arc Flash Hazard Calculations.
 3. National Electrical Manufacturers Association (NEMA): Z535.4, Product Safety Signs and Labels.
 4. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code (NEC).
 - b. 70E, Standard for Electrical Safety in the Workplace.
 5. Occupational Safety and Health Standards (OSHA): 29 CFR, Part 1910 Subpart S, Electrical.

1.02 SUBMITTALS

- A. Action Submittals:
1. Short circuit study.
 2. Protective Device Coordination Study: Submit within 60 days after approval of short circuit study.
 3. Arc Flash Study: Submit initial study with protective Device Coordination Study. Submit final study prior to equipment energization.
 4. Arc flash warning labels; submit sample with initial study.
 5. Electronic files on thumb drive of final studies including all engineering software input files, output reports, and libraries.

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1.03 QUALITY ASSURANCE

- A. Short circuit, protective device coordination, and arc flash studies shall be prepared by a professional electrical engineer registered in the State of Georgia.
- B. There are eight different pump stations that are associated with this project. As such, the Contractor shall perform the specified studies for all the electrical equipment associated with each of the eight pump stations that are included as part of this Project.

1.04 SEQUENCING AND SCHEDULING

- A. Initial complete short circuit study shall be submitted, reviewed, and approved before Engineer will review Shop Drawings for any new electrical equipment.
- B. Initial complete protective device coordination and arc flash studies shall be submitted within 60 days after approval of initial short circuit study.
- C. Initial complete arc flash study shall be submitted and accepted prior to energization of the electrical equipment.
- D. Revised short circuit, protective device coordination, and arc flash studies, and arc flash labels shall be submitted 30 days before energizing any new electrical equipment. The final study must be reviewed and approved before any new electrical equipment will be permitted to be energized.
- E. Final short circuit, protective device coordination, and arc flash studies shall be completed prior to Project Substantial Completion. Final version of study shall include as-installed equipment, materials, and parameter data or settings entered into equipment based on study.
- F. Submit final arc flash labels described herein and in compliance with NEMA Z535.4 prior to Project Substantial Completion.

1.05 GENERAL STUDY REQUIREMENTS

- A. Equipment and component titles used in the studies shall be identical to equipment and component titles shown on Drawings.
- B. Perform studies using one of the following electrical engineering software packages:
 - 1. SKM Power Tools for Windows.
 - 2. ETAP.

3. Paladin.
 4. Easy Power.
- C. Perform complete fault calculations for each existing and ultimate source combination.
1. Source combination may include present and future power company supply circuits, large motors, or generators.
- D. Utilize proposed and existing load data for study obtained from Contract Documents, provided by Engineer, and obtained from extensive field investigation of system configuration, wiring information, and equipment. The Owner will make all existing documentation on the existing facilities available to the Contractor for his use in the development of the specified studies. However, all the information required to perform the specified studies is not expected to be contained within the existing documentation that will be made available to the Contractor. Therefore, the Contractor will be required to perform extensive field investigations to obtain any information that is not included in the existing documentation available for any of the eight pump stations associated with this Project. This Work shall include, but shall not be limited to, coordinating with the local utility to obtain the ratings of the existing utility transformers as well as the impedance associated with the existing utility transformer and to determine all cable sizes and lengths wherever any existing cables are shown to be utilized. All labor, materials, equipment, and incidental items required to obtain any information necessary to perform the specified studies shall be provided by the Contractor as part of his Bid.
- E. Existing System and Equipment:
1. Extent of existing system to be included in study shall include all existing electrical equipment as well as all new electrical equipment. Include fault contribution of existing motors and equipment in study.
 2. Include impedance elements that affect new system and equipment.
 3. Include protective devices in series with new equipment.
- F. Device coordination time-current curves for low voltage distribution system; include individual protective device time-current characteristics.

1.06 SHORT CIRCUIT STUDY

A. General:

1. Prepare in accordance with IEEE 399.
2. Use cable impedances based on copper conductors, except where aluminum conductors are specified or shown.
3. Use bus impedances based on copper bus bars, except where aluminum bus bars are specified or shown.
4. Use cable and bus resistances calculated at 25 degrees C.
5. Use medium-voltage cable reactances based on use of typical dimensions of shielded cables with 133 percent insulation levels.
6. Use 600-volt cable reactances based on use of typical dimensions of XHHW conductors.
7. Use transformer impedances 92.5 percent of “nominal” impedance based on tolerances specified in IEEE C57.12.00.

B. Provide:

1. Calculation methods and assumptions.
2. Typical calculation.
3. Tabulations of calculated quantities.
4. Results, conclusions, and recommendations.
5. Selected base per unit quantities.
6. One-line diagrams.
7. Source impedance data, including electric utility system and motor fault contribution characteristics.
8. Impedance diagrams.
9. Zero-sequence impedance diagrams.

C. Calculate short circuit interrupting and momentary (when applicable) duties for an assumed three-phase bolted fault at each:

1. Electric utility’s supply termination point.
2. Main Automatic Transfer Switch.
3. Low-voltage switchboards or panelboards.
4. Low-voltage motor control centers.
5. Standalone circuit breakers.
6. Standby generators.
7. Branch circuit panelboards.
8. Variable frequency drive (VFD).
9. Future load contributions as shown on one-line diagram.

- D. Provide bolted line-to-ground fault current study for areas as defined for three-phase bolted fault short circuit study.
- E. Provide bolted line-to-line fault current study for areas as defined for three-phase bolted fault short circuit study.
- F. Verify:
 - 1. Equipment and protective devices are applied within their ratings.
 - 2. Adequacy of automatic transfer switch, and motor control center bus bars to withstand short circuit stresses.
 - 3. Cable and busway sizes for ability to withstand short circuit heating, in addition to normal load currents.
- G. Tabulations:
 - 1. General Data:
 - a. Short circuit reactances of rotating machines.
 - b. Cable and conduit material data.
 - c. Bus data.
 - d. Transformer data.
 - e. Circuit resistance and reactance values.
 - 2. Short Circuit Data (for each source combination):
 - a. Fault impedances.
 - b. X to R ratios.
 - c. Asymmetry factors.
 - d. Motor contributions.
 - e. Short circuit kVA.
 - f. Symmetrical and asymmetrical fault currents.
 - 3. Equipment Evaluation:
 - a. Equipment bus bracing, equipment short circuit rating, transformer, cable, busway.
 - b. Maximum fault current available.
- H. Written Summary:
 - 1. Scope of studies performed.
 - 2. Explanation of bus and branch numbering system.
 - 3. Prevailing conditions.
 - 4. Selected equipment deficiencies.
 - 5. Results of short circuit study.
 - 6. Comments or suggestions.

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- I. Suggest changes and additions to equipment rating and/or characteristics.
- J. Notify Engineer in writing of existing circuit protective devices improperly rated for new fault conditions.
- K. Revise data for “as-installed” condition.

1.07 PROTECTIVE DEVICE COORDINATION STUDY

A. General:

- 1. Prepare in accordance with IEEE 242.
- 2. Proposed protective device coordination time-current curves for distribution system, graphically displayed on conventional log-log curve sheets.
 - a. Provide separate curve sheets for phase and ground fault coordination for each scenario.
 - b. Each curve sheet to have title and one-line diagram that applies to specific portion of system associated with time-current curves on that sheet. Limit number of devices shown to four to six.
 - c. Identify device associated with each curve by manufacturer type, function, and, if applicable, recommended tap, time delay, instantaneous and other settings recommended.
 - d. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which device is exposed.
 - e. Apply motor protection methods that comply with NFPA 70.

B. Plot Characteristics on Curve Sheets:

- 1. Electric utility’s relays.
- 2. Electric utility’s fuses including manufacturer’s minimum melt, total clearing, tolerance, and damage bands.
- 3. Low-voltage fuses including manufacturer’s minimum melt, total clearing, tolerance, and damage bands.
- 4. Low-voltage equipment circuit breaker trip devices, including manufacturers tolerance bands.
- 5. Pertinent transformer full-load currents at 100 percent.
- 6. Transformer magnetizing inrush currents.
- 7. Transformer damage curves; appropriate for system operation and location.
- 8. ANSI transformer withstand parameters.
- 9. Significant symmetrical and asymmetrical fault currents.

10. Motor overload relay settings.
 11. Ground fault protective device settings.
 12. Other system load protective devices for largest branch circuit and feeder circuit breaker in each motor control center.
- C. Primary Protective Device Settings for Delta-Wye Connected Transformer:
1. Secondary Line-to-Ground Fault Protection: Primary protective device operating band within transformer's characteristics curve, including a point equal to 58 percent of IEEE C57.12.00 withstand point.
 2. Secondary Line-to-Line Faults: 16 percent current margin between primary protective device and associated secondary device characteristic curves.
- D. Tabulate Recommended Protective Device Settings:
1. Relays:
 - a. Current tap.
 - b. Time dial.
 - c. Instantaneous pickup.
 - d. Electronic settings data file.
 2. Circuit Breakers:
 - a. Adjustable pickups.
 - b. Adjustable time-current characteristics.
 - c. Adjustable time delays.
 - d. Adjustable instantaneous pickups.
 - e. I^2t In/Out.
 - f. Zone interlocking.
 - g. Electronic settings data file.
- E. Written Summary:
1. Scope of studies performed.
 2. Summary of protective device coordination methodology.
 3. Prevailing conditions.
 4. Selected equipment deficiencies.
 5. Results of coordination study.
 6. Appendix of complete relay and circuit breaker electronic setting files, submit electronic data files from manufacturer's software.
 7. Comments or suggestions.

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1.08 ARC FLASH STUDY

- A. Perform arc flash hazard study after short circuit and protective device coordination study has been completed, reviewed and accepted.
- B. Perform arc flash study in accordance with NFPA 70E, OSHA 29 CFR, Part 1910 Subpart S, and IEEE 1584.
- C. Base Calculation: For each major part of electrical power system, determine the following:
 - 1. Flash hazard protection boundary.
 - 2. Limited approach boundary.
 - 3. Restricted approach boundary.
 - 4. Incident energy level.
 - 5. Glove class required.
- D. Produce arc flash warning labels that list items in Paragraph Base Calculation and the following additional items.
 - 1. Bus name.
 - 2. Bus voltage.
- E. Produce bus detail sheets that list items in Paragraph Base Calculation and the following additional items:
 - 1. Bus name.
 - 2. Upstream protective device name, type, and settings.
 - 3. Bus line-to-line voltage.
- F. Produce arc flash evaluation summary sheet listing the following additional items:
 - 1. Bus name.
 - 2. Upstream protective device name, type, settings.
 - 3. Bus line-to-line voltage.
 - 4. Bus bolted fault.
 - 5. Protective device bolted fault current.
 - 6. Arcing fault current.
 - 7. Protective device trip/delay time.
 - 8. Breaker opening time.

9. Solidly grounded column.
 10. Equipment type.
 11. Gap.
 12. Arc flash boundary.
 13. Working distance.
 14. Incident energy.
- G. Analyze short circuit, protective device coordination, and arc flash calculations and highlight equipment that is determined to be underrated or causes incident energy values greater than 40 cal/cm². Propose approaches to reduce energy levels.
- H. Prepare report summarizing arc flash study with conclusions and recommendations which may affect integrity of electric power distribution system. As a minimum, include the following:
1. Equipment manufacturer's information used to prepare study.
 2. Assumptions made during study.
 3. Reduced copy of one-line drawing; 11 inches by 17 inches maximum.
 4. Arc flash evaluations summary spreadsheet.
 5. Bus detail sheets.
 6. Arc flash warning labels printed in color on thermally bonded adhesive backed UV and weather-resistant labels.

PART 2 PRODUCTS

2.01 ARC FLASH WARNING LABELS

- A. Arc flash warning labels printed in color on thermally bonded adhesive backed, UV- and weather-resistant labels. An example label is located following end of section in Figure 1.

PART 3 EXECUTION

3.01 GENERAL

- A. Adjust relay and protective device settings according to values established by coordination study.
- B. Make minor modifications to equipment as required to accomplish conformance with short circuit and protective device coordination studies.
- C. Notify Engineer in writing of required major equipment modifications.

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- D. Provide laminated one-line diagrams (minimum size 11 inches by 17 inches) to post on interior of electrical room doors.
- E. Provide arc flash warning labels on equipment as specified in this section.

3.02 SUPPLEMENTS

- A. The supplement listed below, following “End of Section,” is a part of this Specification:
 - 1. Figure 1: Example Arc Flash Label.

END OF SECTION

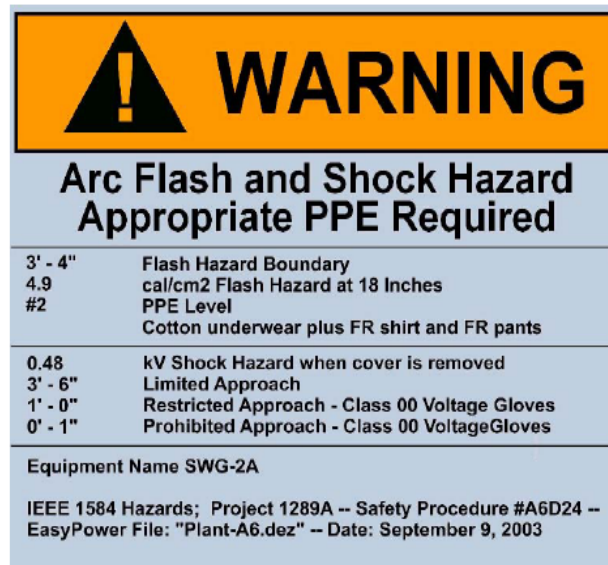


Figure 1
Example Arc Flash Label

SECTION 16050
BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. ASTM International (ASTM):
 - a. A1011/A1011M, Standard Specification for Steel, Sheet, and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low Alloy and High-Strength Low Alloy Formability.
 - b. E814, Method of Fire Tests of Through-Penetration Fire Stops.
 2. Canadian Standards Association (CSA).
 3. Institute of Electrical and Electronics Engineers, Inc. (IEEE): 18, Standard for Shunt Power Capacitors.
 4. International Society of Automation (ISA): RP12.06.01, Wiring Practices for Hazardous (Classified) Locations Instrumentation–Part 1: Intrinsic Safety.
 5. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1,000 Volts Maximum).
 - b. C12.1, Code for Electricity Metering.
 - c. C12.6, Phase-Shifting Devices Used in Metering, Marking and Arrangement of Terminals.
 - d. ICS 2, Industrial Control and Systems: Controllers, Contactors, and Overload Relays Rated 600 Volts.
 - e. ICS 5, Industrial Control and Systems: Control Circuit and Pilot Devices.
 - f. KS 1, Enclosed and Miscellaneous Distribution Switches (600 Volts Maximum).
 6. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).
 7. Underwriters Laboratories, Inc. (UL):
 - a. 98, Standard for Enclosed and Dead-Front Switches.
 - b. 248, Standard for Low Voltage Fuses.
 - c. 486E, Standard for Equipment Wiring Terminals for use with Aluminum and/or Copper Conductors.
 - d. 489, Standard for Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit Breaker Enclosures.
 - e. 508, Standard for Industrial Control Equipment.
 - f. 810, Standard for Capacitors.

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- g. 943, Standard for Ground-Fault Circuit-Interruptions.
- h. 1059, Standard for Terminal Blocks.
- i. 1479, Fire Tests of Through-Penetration Fire Stops.

1.02 SUBMITTALS

A. Action Submittals:

- 1. Provide manufacturers' data for the following:
 - a. Control devices.
 - b. Control relays.
 - c. Circuit breakers.
 - d. Timers.
 - e. Fuses.
 - f. Intrinsic safety barriers.
 - g. Firestopping.
 - h. Enclosures: Include enclosure data for products having enclosures.

1.03 EXTRA MATERIALS

A. Furnish, tag, and box for shipment and storage the following spare parts and special tools:

- 1. Fuses, 0 Volt to 600 Volts: Six of each type and each current rating installed.

PART 2 PRODUCTS

2.01 MOLDED CASE CIRCUIT BREAKER THERMAL MAGNETIC, LOW VOLTAGE

A. General:

- 1. Type: Molded case.
- 2. Trip Ratings: 15 amps to 800 amps.
- 3. Voltage Ratings: 120, 240, 277, 480, and 600V ac.
- 4. Suitable for mounting and operating in any position.
- 5. UL 489.

B. Operating Mechanism:

- 1. Overcenter, trip-free, toggle type handle.
- 2. Quick-make, quick-break action.

3. Locking provisions for padlocking breaker in OPEN position.
4. ON/OFF and TRIPPED indicating positions of operating handle.
5. Operating handle to assume a CENTER position when tripped.

C. Trip Mechanism:

1. Individual permanent thermal and magnetic trip elements in each pole.
2. Variable magnetic trip elements with a single continuous adjustment 3X to 10X for frames greater than 100 amps.
3. Two and three pole, common trip.
4. Automatically opens all poles when overcurrent occurs on one pole.
5. Test button on cover.
6. Calibrated for 40 degrees C ambient, unless shown otherwise.
7. Do not provide single-pole circuit breakers with handle ties where multi-pole circuit breakers are shown.

D. Short Circuit Interrupting Ratings: All new 480V equipment shall include a minimum short circuit rating of 42,000A. All new 208/120V or 240/120V equipment shall include a minimum short circuit rating of 10,000A. Accessories: Shunt trip, auxiliary switches, handle lock ON devices, mechanical interlocks, key interlocks, unit mounting bases, double lugs as shown or otherwise required. Shunt trip operators shall be continuous duty rated or have coil-clearing contacts.

E. Connections:

1. Supply (line side) at either end.
2. Mechanical wire lugs, except crimp compression lugs where shown.
3. Lugs removable/replaceable for breaker frames greater than 100 amperes.
4. Suitable for 75 degrees C rated conductors without derating breaker or conductor ampacity.

F. Enclosures for Independent Mounting:

1. See Article Enclosures.
2. Service Entrance Use: Breakers in required enclosure and required accessories shall be UL 489 listed.
3. Interlock: Enclosure and switch shall interlock to prevent opening cover with switch in the ON position. Provide bypass feature for use by qualified personnel.

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2.02 FUSE, 250-VOLT AND 600-VOLT

A. Power Distribution, General:

1. Current-limiting, with 200,000 ampere rms interrupting rating.
2. Provide to fit mountings specified with switches.
3. UL 248.

B. Power Distribution, Ampere Ratings 1 Amp to 600 Amps:

1. Class: RK-1.
2. Type: Dual element, with time delay.
3. Manufacturers and Products:
 - a. Bussmann; Types LPS-RK (600 volts) and LPN-RK (250 volts).
 - b. Littelfuse; Types LLS-RK (600 volts) and LLN-RK (250 volts).

C. Cable Limiters:

1. 600V or less; crimp to copper cable, bolt to bus or terminal pad.
2. Manufacturer and Product: Bussmann; K Series.

D. Ferrule:

1. 600V or less, rated for applied voltage, small dimension.
2. Ampere Ratings: 1/10 amp to 30 amps.
3. Dual-element time-delay, time-delay, or nontime-delay as required.
4. Provide with blocks or holders as indicated and suitable for location and use.
5. Manufacturers:
 - a. Bussmann.
 - b. Littlefuse, Inc.

2.03 PUSHBUTTON, INDICATING LIGHT, AND SELECTOR SWITCH

A. Contact Rating: 7,200VA make, 720VA break, at 600V, NEMA ICS 5 Designation A600.

B. Selector Switch Operating Lever: Standard.

C. Indicating Light: Push-to-test.

D. Pushbutton Color:

1. ON or START: Black.
2. OFF or STOP: Red.

- E. Pushbutton and selector switch lockable in OFF position where indicated.
- F. Legend Plate:
 - 1. Material: Aluminum.
 - 2. Engraving: Enamel filled in high contrasting color.
 - 3. Text Arrangement: 11-character/spaces on one line, 14-character/spaces on each of two lines, as required, indicating specific function.
 - 4. Letter Height: 7/64 inch.
- G. Manufacturers and Products:
 - 1. Heavy-Duty, Oil-Tight Type:
 - a. General Electric Co.; Type CR 104P.
 - b. Square D Co.; Type T.
 - c. Eaton/Cutler-Hammer; Type 10250T.
 - 2. Heavy-Duty, Watertight, and Corrosion-Resistant Type:
 - a. Square D Co.; Type SK.
 - b. General Electric Co.; Type CR 104P.
 - c. Eaton/Cutler-Hammer; Type E34.
 - d. Crouse-Hinds; Type NCS.

2.04 TERMINAL BLOCK, 600 VOLTS

- A. UL 486E and UL 1059.
- B. Size components to allow insertion of necessary wire sizes.
- C. Capable of termination of control circuits entering or leaving equipment, panels, or boxes.
- D. Screw clamp compression, dead front barrier type, with current bar providing direct contact with wire between compression screw and yoke.
- E. Yoke, current bar, and clamping screw of high strength and high conductivity metal.
- F. Yoke shall guide all strands of wire into terminal.
- G. Current bar shall ensure vibration-proof connection.
- H. Terminals:
 - 1. Capable of wire connections without special preparation other than stripping.
 - 2. Capable of jumper installation with no loss of terminal or rail space.
 - 3. Individual, rail mounted.

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- I. Marking system, allowing use of preprinted or field-marked tags.
- J. Manufacturers:
 - 1. Weidmuller, Inc.
 - 2. Ideal.
 - 3. Electrovert USA Corp.

2.05 MAGNETIC CONTROL RELAY

- A. Industrial control with field convertible contacts rated 10 amps continuous, 7,200VA make, 720VA break.
- B. NEMA ICS 2, Designation: A600 (600 volts).
- C. Time Delay Relay Attachment:
 - 1. Pneumatic type, timer adjustable as shown.
 - 2. Field convertible from ON delay to OFF delay and vice versa.
- D. Latching Attachment: Mechanical latch, having unlatching coil and coil clearing contacts.
- E. Manufacturers and Products:
 - 1. Eaton/Cutler-Hammer; D26 Type M.
 - 2. General Electric Co.; Type CR120B.
 - 3. Square D; Type X.

2.06 TIME DELAY RELAY

- A. Industrial relay with contacts rated 5 amps continuous, 3,600VA make, 360VA break.
- B. NEMA ICS 2 Designation: B150 (150 volts).
- C. Solid-state electronic, field convertible ON/OFF delay.
- D. One normally open and one normally closed contact (minimum).
- E. Repeat accuracy plus or minus 2 percent.
- F. Timer adjustment from 1 second to 60 seconds, unless otherwise indicated on Drawings.

G. Manufacturers and Products:

1. Square D Co.; Type XO.
2. Eaton/Cutler-Hammer; Type D26MR.
3. General Electric Co.; Type CR120.

2.07 RESET TIMER

- A. Drive: Synchronous motor, solenoid-operated clutch.
- B. Mounting: Semiflush panel.
- C. Contacts: 10 amps, 120 volts.
- D. Manufacturers and Products:
1. Eagle Signal Controls; Bulletin 125.
 2. Automatic Timing and Controls; Bulletin 305.

2.08 ELAPSED TIME METER

- A. Drive: Synchronous motor.
- B. Range: 0 hour to 99,999.9 hours, nonreset type.
- C. Mounting: Semiflush panel.
- D. Manufacturers and Products:
1. General Electric Co.; Type 240, 2-1/2-inch Big Look.
 2. Eagle Signal Controls; Bulletin 705.

2.09 PHASE MONITOR RELAY

- A. Features:
1. Voltage and phase monitor relay shall drop out on low voltage, voltage unbalance, loss of phase, or phase reversal.
 2. Contacts: Single-pole, double-throw, 10 amperes, 120/240V ac. Where additional contacts are shown or required, provide magnetic control relays.
 3. Adjustable trip and time delay settings.
 4. Transient Protection: 1,000V ac.
 5. Mounting: Multipin plug-in socket base.
- B. Manufacturer and Product: Automatic Timing and Controls; SLD Series.

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2.10 SUPPORT AND FRAMING CHANNELS

- A. Carbon Steel Framing Channel:
 - 1. Material: Rolled, mild strip steel, 12-gauge minimum, ASTM A1011/A1011M, Grade 33.
 - 2. Finish: Hot-dip galvanized after fabrication.
- B. Paint Coated Framing Channel: Carbon steel framing channel with electro-deposited rust inhibiting acrylic or epoxy paint.
- C. PVC-Coated Framing Channel: Carbon steel framing channel with 40-mil polyvinyl chloride coating.
- D. Stainless Steel Framing Channel: Rolled, Type 316 stainless steel, 12-gauge minimum.
- E. Extruded Aluminum Framing Channel:
 - 1. Material: Extruded from Type 6063-T6 aluminum alloy.
 - 2. Fittings fabricated from Alloy 5052-H32.
- F. Nonmetallic Framing Channel:
 - 1. Material: Fire retardant, fiber reinforced vinyl ester resin.
 - 2. Channel fitting of same material as channel.
 - 3. Nuts and bolts of long glass fiber reinforced polyurethane.
- G. Manufacturers:
 - 1. B-Line Systems, Inc.
 - 2. Unistrut Corp.
 - 3. Aickinstrut.

2.11 INTRINSIC SAFETY BARRIER

- A. Provides a safe energy level for exposed wiring in a Class I, Division 1 or Division 2 hazardous area when circuit is connected to power source in nonhazardous area.
- B. Rating: Power source shall be rated 24 volts dc, nominal, with not more than 250 volts available under fault conditions.

- C. Contact Rating: 5 amps, 250 volts ac.
- D. Mounting: Rail or surface.
- E. Manufacturers and Products:
 - 1. MTL, Inc.; Series 2000 or Series 3000.
 - 2. R. Stahl, Inc.

2.12 FIRESTOPS

- A. General:
 - 1. Provide UL 1479 classified hourly fire rating equal to, or greater than, the assembly penetrated.
 - 2. Prevent the passage of cold smoke, toxic fumes, and water before and after exposure to flame.
 - 3. Sealants and accessories shall have fire-resistance ratings as established by testing identical assemblies in accordance with ASTM E814, by Underwriters Laboratories, Inc., or other testing and inspection agency acceptable to authorities having jurisdiction.
- B. Firestop System:
 - 1. Formulated for use in through-penetration firestopping around cables, conduit, pipes, and duct penetrations through fire-rated walls and floors.
 - 2. Fill, Void, or Cavity Material: 3M Brand Fire Barrier Caulk CP25, Putty 303, Wrap/Strip FS195, Composite Sheet CS195 and Penetration Sealing Systems 7902 and 7904 Series.
 - 3. Two-Part, Foamed-In-Place, Silicone Sealant: Dow Corning Corp. Fire Stop Foam, General Electric Co. Pensil 851.
 - 4. Fire Stop Devices: See Section 16130, Raceway and Boxes, for raceway and cable fittings.

2.13 ENCLOSURES

- A. Finish: Sheet metal structural and enclosure parts shall be completely painted using an electrodeposition process so interior and exterior surfaces as well as bolted structural joints have a complete finish coat on and between them.
- B. Color: Manufacturer's standard color (gray) baked-on enamel, unless otherwise shown.

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- C. Barriers: Provide metal barriers within enclosures to separate wiring of different systems and voltage.
- D. Enclosure Selections:
1. Except as shown otherwise, provide electrical enclosures according to the following table:

Enclosures			
Location	Finish	Environment	NEMA 250 Type
Indoor	Finished	Dry	1
Indoor	Unfinished	Dry	1
Indoor	Unfinished	Industrial Use	12
Indoor and Outdoor	Any	Wet	4
Indoor and Outdoor	Any	Denoted "WP"	3R
Indoor and Outdoor	Any	Wet and Corrosive	4X, 316 Stainless Steel
Indoor and Outdoor	Any	Wet, Dust or Oil	13
Indoor and Outdoor	Any	Hazardous Gas	7
Indoor and Outdoor	Any	Hazardous Dust	9

PART 3 EXECUTION

3.01 GENERAL

- A. Install equipment in accordance with manufacturer's recommendations.

3.02 PUSHBUTTON, INDICATING LIGHT, AND SELECTOR SWITCH

- A. Install heavy-duty, oil-tight type in nonhazardous, indoor, dry locations, including motor control centers, control panels, and individual stations, unless otherwise shown.
- B. Install heavy-duty, watertight and corrosion-resistant type in nonhazardous, outdoor, or normally wet areas, unless otherwise shown.

3.03 SUPPORT AND FRAMING CHANNEL

- A. Install where required for mounting and supporting electrical equipment, raceway, and cable tray systems.

B. Channel Type:

1. Interior, Wet or Dry (Noncorrosive) Locations:
 - a. Aluminum Raceway: Extruded aluminum or carbon steel with neoprene material isolators.
 - b. PVC-Coated Conduit: PVC coated.
 - c. Steel Raceway and Other Systems Not Covered: Carbon steel or paint coated.
2. Interior, Corrosive (Wet or Dry) Locations:
 - a. Aluminum Raceway: Extruded aluminum.
 - b. PVC Conduit: Type 316 stainless steel or nonmetallic.
 - c. PVC-Coated Steel Conduit and Other Systems Not Covered: Type 316 stainless steel, nonmetallic, or PVC-coated steel.
3. Outdoor, Noncorrosive Locations:
 - a. Steel Raceway: Carbon steel or paint coated framing channel, except where mounted on aluminum handrail, then use aluminum framing channel.
 - b. Aluminum Raceway and Other Systems Not Covered: Aluminum framing channel or carbon steel with neoprene material isolators.
4. Outdoor Corrosive Locations:
 - a. PVC Conduit: Type 316 stainless steel or nonmetallic.
 - b. Aluminum Raceway: Aluminum or carbon steel with neoprene material isolators.
 - c. PVC-Coated Steel Conduit and Other Systems Not Covered: Type 316 stainless steel, nonmetallic, or PVC-coated steel.
5. Aluminum Railings: Devices mounted on aluminum railing shall use aluminum framing channel.

C. Paint cut ends prior to installation with the following:

1. Carbon Steel Channel: Zinc-rich primer.
2. Painted Channel: Rust-inhibiting epoxy or acrylic paint.
3. Nonmetallic Channel: Epoxy resin sealer.
4. PVC-Coated Channel: PVC patch.

3.04 INTRINSIC SAFETY BARRIERS

- A. Install in compliance with ISA RP12.06.01.
- B. Arrange conductors such that wiring from hazardous areas cannot short to wiring from nonhazardous area.
- C. Stencil “INTRINSICALLY SAFE CIRCUIT” on all boxes enclosing barriers.

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3.05 FIRESTOPS

- A. Install in strict conformance with manufacturer's instructions. Comply with installation requirements established by testing and inspecting agency.
- B. Sealant: Install sealant including forming, packing, and other accessory materials, to fill openings around electrical services penetrating floors and walls, to provide firestops with fire-resistance ratings indicated for floor or wall assembly in which penetration occurs.

END OF SECTION

SECTION 16060
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. Institute of Electrical and Electronics Engineers (IEEE): C2, National Electrical Safety Code (NESC).
2. National Fire Protection Association (NFPA): 70, National Electrical Code. (NEC).

1.02 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:
 - a. Product data for the following:
 - 1) Exothermic weld connectors.
 - 2) Mechanical connectors.
 - 3) Compression connectors.
 - 4) Specialty tools.

1.03 QUALITY ASSURANCE

A. Authority Having Jurisdiction (AHJ):

1. Provide the Work in accordance with NFPA 70, National Electrical Code (NEC). Where required by the AHJ, provide material and equipment labeled or listed by a nationally recognized testing laboratory or other organization acceptable to the AHJ to provide a basis for approval under NEC.
2. Materials and equipment manufactured within the scope of standards published by UL:
 - a. Confirm conformance with UL standards.
 - b. Supply with an applied UL listing mark.

PART 2 PRODUCTS

2.01 GROUND ROD

- A. Material: Copper-clad.
- B. Diameter: Minimum 3/4 inch.
- C. Length: 20 feet.

2.02 GROUND CONDUCTORS

- A. As specified in Section 16120, Conductors.

2.03 CONNECTORS

- A. Exothermic Weld Type:
 - 1. Outdoor Weld: Suitable for exposure to elements or direct burial.
 - 2. Indoor Weld: Use low-smoke, low-emission process.
 - 3. Manufacturers:
 - a. Erico Products, Inc.; Cadweld and Cadweld Exolon.
 - b. Thermoweld.
- B. Compression Type:
 - 1. Compress-deforming type; wrought copper extrusion material.
 - 2. Single indentation for conductors 6 AWG and smaller.
 - 3. Double indentation with extended barrel for conductors 4 AWG and larger.
 - 4. Barrels prefilled with oxide-inhibiting and antiseizing compound and sealed.
 - 5. Manufacturers:
 - a. Burndy Corp.; Hyground Irreversible Compression.
 - b. Thomas and Betts Co.
 - c. ILSCO.
- C. Mechanical Type: Split-bolt, saddle, or cone screw type; copper alloy material.
 - 1. Manufacturers:
 - a. Burndy Corp.
 - b. Thomas and Betts Co.

2.04 GROUNDING WELLS

- A. Ground rod box complete with cast-iron riser ring and traffic cover marked "GROUND ROD".
- B. Manufacturers and Products:
 - 1. Christy Co.; No. G5.
 - 2. Lightning and Grounding Systems, Inc.; I-R Series.

PART 3 EXECUTION

3.01 GENERAL

- A. Grounding: In compliance with NFPA 70 and IEEE C2.
- B. Ground electrical service neutral at service entrance equipment with grounding electrode conductor to grounding electrode system.
- C. Ground each separately derived system neutral with common grounding electrode conductor to grounding electrode system.
- D. Bond together all grounding electrodes that are present at each building or structure served to form one common grounding electrode system.
- E. Bond together system neutrals, service equipment enclosures, exposed noncurrent-carrying metal parts of electrical equipment, metal raceways, ground conductor in raceways and cables, receptacle ground connections, and metal piping systems.
- F. Shielded Power Cables: Ground shields at each splice or termination in accordance with recommendations of splice or termination manufacturer.
- G. Shielded Instrumentation Cables:
 - 1. Ground shield to ground bus at power supply for analog signal.
 - 2. Expose shield minimum 1 inch at termination to field instrument and apply heat shrink tube.
 - 3. Do not ground instrumentation cable shield at more than one point.

3.02 WIRE CONNECTIONS

- A. Ground Conductors: Install in conduit containing power conductors and control circuits above 50 volts.

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- B. Nonmetallic Raceways and Flexible Tubing: Install equipment grounding conductor connected at both ends to noncurrent-carrying grounding bus.
- C. Connect ground conductors to raceway grounding bushings.
- D. Extend and connect ground conductors to ground bus in all equipment containing a ground bus.
- E. Connect enclosure of equipment containing ground bus to that bus.
- F. Bolt connections to equipment ground bus.
- G. Bond grounding conductors to metallic enclosures at each end, and to intermediate metallic enclosures.
- H. Junction Boxes: Furnish materials and connect to equipment grounding system with grounding clips mounted directly on box, or with 3/8-inch machine screws.
- I. Metallic Equipment Enclosures: Use furnished ground lug; if none furnished, tap equipment housing and install solderless terminal connected to box with machine screw. For circuits greater than 20 amps use minimum 5/16-inch diameter bolt.

3.03 MOTOR GROUNDING

- A. Extend equipment ground bus via grounding conductor installed in motor feeder raceway; connect to motor frame.
- B. Nonmetallic Raceways and Flexible Tubing: Install an equipment grounding conductor connected at both ends to noncurrent-carrying grounding bus.
- C. Motors Less Than 10 hp: Use furnished ground lug in motor connection box. If none furnished, provide compression, spade-type terminal connected to conduit box mounting screw.
- D. Motors 10 hp and Above: Use furnished ground lug in motor connection box. If none furnished, tap motor frame or equipment housing; furnish compression, one-hole, lug type terminal connected with minimum 5/16-inch brass threaded stud with bolt and washer.
- E. Circuits 20 Amps or Above: Tap motor frame or equipment housing. Install solderless terminal with minimum 5/16-inch diameter bolt.

3.04 GROUND RODS

- A. Install full length with conductor connection at upper end.
- B. Install with connection point below finished grade, unless otherwise shown.
- C. Space multiple ground rods by one rod length.
- D. Install to 8 feet below local frost depth.

3.05 GROUNDING WELLS

- A. Install for ground rods located inside buildings, asphalt and paved areas, and where shown on Drawings.
- B. Install riser ring and cover flush with surface.
- C. Place 6 inches of crushed rock in bottom of each well.

3.06 CONNECTIONS

- A. General:
 - 1. Abovegrade Connections: Install exothermic weld, mechanical, or compression-type connectors; or brazing.
 - 2. Belowgrade Connections: Install exothermic weld or compression type connectors.
 - 3. Remove paint, dirt, or other surface coverings at connection points to allow good metal-to-metal contact.
 - 4. Notify Engineer prior to backfilling ground connections.
- B. Exothermic Weld Type:
 - 1. Wire brush or file contact point to bare metal surface.
 - 2. Use welding cartridges and molds in accordance with manufacturer's recommendations.
 - 3. Avoid using badly worn molds.
 - 4. Mold to be completely filled with metal when making welds.
 - 5. After completed welds have cooled, brush slag from weld area and thoroughly clean joint.

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C. Compression Type:

1. Install in accordance with connector manufacturer's recommendations.
2. Install connectors of proper size for grounding conductors and ground rods specified.
3. Install using connector manufacturer's compression tool having proper sized dies and operate per manufacturer's instructions.

D. Mechanical Type:

1. Apply homogeneous blend of colloidal copper and rust and corrosion inhibitor before making connection.
2. Install in accordance with connector manufacturer's recommendations.
3. Do not conceal mechanical connections.

3.07 METAL STRUCTURE GROUNDING

- A. Bond metal sheathing and exposed metal vertical structural elements to grounding system.
- B. Bond electrical equipment supported by metal platforms to the platforms.
- C. Provide electrical contact between metal frames and railings supporting pushbutton stations, receptacles, and instrument cabinets, and raceways carrying circuits to these devices.

3.08 TRANSFORMER GROUNDING

- A. Bond neutrals of transformers within buildings to system ground network and to any additional indicated grounding electrodes.
- B. Bond neutrals of pad-mounted transformers to four locally driven ground rods and buried ground wire encircling transformer and system ground network.

3.09 LIGHTNING PROTECTION SYSTEMS

- A. Bond lightning protection system ground terminals to building or structure grounding electrode system.

3.10 SURGE PROTECTION EQUIPMENT GROUNDING

- A. Connect surge arrestor ground terminals to equipment ground bus.

END OF SECTION

SECTION 16080
COMMISSIONING OF ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. ASTM International (ASTM):
 - a. D877/D877M, Standard Test Method for Dielectric Breakdown Voltage of Insulating Liquids Using Disk Electrodes.
 - b. D923, Standard Practices for Sampling Electrical Insulating Liquids.
 - c. D924, Standard Test Method for Dissipation Factor (or Power Factor) and Relative Permittivity (Dielectric Constant) of Electrical Insulating Liquids.
 - d. D971, Standard Test Method for Interfacial Tension of Oil Against Water by the Ring Method.
 - e. D974, Standard Test Method for Acid and Base Number by Color-Indicator Titration.
 - f. D1298, Standard Test Method for Density, Relative Density, or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method.
 - g. D1500, Standard Test Method for ASTM Color of Petroleum Products (ASTM Color Scale).
 - h. D1524, Standard Test Method for Visual Examination of Used Electrical Insulating Liquids in the Field.
 - i. D1533, Standard Test Method for Water in Insulating Liquids by Coulometric Karl Fischer Titration.
 - j. D1816, Standard Test Method for Dielectric Breakdown Voltage of Insulating Liquids Using VDE Electrodes.
 2. Institute of Electrical and Electronics Engineers (IEEE):
 - a. 43, Recommended Practice for Testing Insulation Resistance of Electric Machinery.
 - b. 48, Standard Test Procedures and Requirements for Alternating-Current Cable Terminators Used on Shielded Cables Having Laminated Insulation Rated 2.5 kV through 765 kV or Extruded Insulation Rated 2.5 kV through 500 kV.
 - c. 81, Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.
 - d. 95, Recommended Practice for Insulation Testing of AC Electric Machinery (2,300V and Above) with High Direct Voltage.

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- e. 386, Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600V.
 - f. 400, Guide for Field Testing and Evaluation of the Insulation of Shielded Power Cable Systems Rated 5 kV and Above.
 - g. 450, Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications.
 - h. C2, National Electrical Safety Code.
 - i. C37.20.1, Standard for Metal-Enclosed Low-Voltage (1,000V ac and below, 3,200V dc and below) Power Circuit Breaker Switchgear.
 - j. C37.20.2, Standard for Metal-Clad Switchgear.
 - k. C37.20.3, Standard for Metal-Enclosed Interrupter Switchgear.
 - l. C37.23, Standard for Metal-Enclosed Bus.
 - m. C62.33, Standard Test Methods and Performance Values for Metal-Oxide Varistor Surge Protective Components.
- 3. Insulated Cable Engineers Association (ICEA):
 - a. S-93-639, 5-46 kV Shielded Power Cables for Use in the Transmission and Distribution of Electric Energy.
 - b. S-94-649, Concentric Neutral Cables Rated 5 through 46 kV.
 - c. S-97-682, Standard for Utility Shielded Power Cables Rated 5 through 46 kV.
 - 4. National Electrical Manufacturers Association (NEMA):
 - a. AB 4, Guidelines for Inspection and Preventive Maintenance of Molded Case Circuit Breakers Used in Commercial and Industrial Applications.
 - b. PB 2, Deadfront Distribution Switchboards.
 - c. WC 74, 5-46 kV Shielded Power Cable for Use in the Transmission and Distribution of Electric Energy.
 - 5. InterNational Electrical Testing Association (NETA): ATS, Acceptance Testing Specifications for Electrical Power Equipment and Systems.
 - 6. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code (NEC).
 - b. 70B, Recommended Practice for Electrical Equipment Maintenance.
 - c. 70E, Standard for Electrical Safety in the Workplace.
 - d. 101, Life Safety Code.
 - 7. National Institute for Certification in Engineering Technologies (NICET).
 - 8. Occupational Safety and Health Administration (OSHA): CFR 29, Part 1910, Occupational Safety and Health Standards.

1.02 SUBMITTALS

A. Informational Submittals:

1. Submit 30 days prior to performing inspections or tests:
 - a. Testing firm qualifications.
 - b. Schedule for performing inspection and tests.
 - c. List of references to be used for each test.
 - d. Sample copy of equipment and materials inspection form(s).
 - e. Sample copy of individual device test form.
 - f. Sample copy of individual system test form.
2. Energization Plan: Prior to initial energization of electrical distribution equipment; include the following:
 - a. Owner's representative sign-off form for complete and accurate arc flash labeling and proper protective device settings for equipment to be energized.
 - b. Staged sequence of initial energization of electrical equipment.
 - c. Lock-Out-Tag-Out plan for each stage of the progressive energization.
 - d. Barricading, signage, and communication plan notifying personnel of newly energized equipment.
3. Submit test or inspection reports and certificates for each electrical item tested within 30 days after completion of test:
4. Operation and Maintenance Data:
 - a. In accordance with Section 01730, Operating Maintenance Data.
 - b. After test or inspection reports and certificates have been reviewed by Engineer and returned, insert a copy of each in Operation and Maintenance Manual.
5. Programmable Settings: At completion of Performance Demonstration Test, submit final hardcopy printout and electronic files on compact disc of as-left setpoints, programs, and device configuration files for:
 - a. Protective relays.
 - b. Intelligent overload relays.
 - c. Power metering devices.
 - d. Electrical communications modules.

1.03 QUALITY ASSURANCE

A. Testing Firm Qualifications:

1. Corporately and financially independent organization functioning as an unbiased testing authority.
2. Professionally independent of manufacturers, suppliers, and installers of electrical equipment and systems being tested.

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3. Employer of engineers and technicians regularly engaged in testing and inspecting of electrical equipment, installations, and systems.
 4. Supervising engineer accredited as Certified Electrical Test Technologist by NICET or NETA and having a minimum of 5 years' testing experience on similar projects.
 5. Technicians certified by NICET or NETA.
 6. Assistants and apprentices assigned to Project at ratio not to exceed two certified to one noncertified assistant or apprentice.
 7. Registered Professional Engineer to provide comprehensive project report outlining services performed, results of such services, recommendations, actions taken, and opinions.
 8. In compliance with OSHA CFR 29, Part 1910.7 criteria for accreditation of testing laboratories or a full member company of NETA.
- B. Test equipment shall have an operating accuracy equal to or greater than requirements established by NETA ATS.
- C. Test Instrument Calibration: In accordance with NETA ATS.

1.04 SEQUENCING AND SCHEDULING

- A. Perform inspection and electrical tests after equipment listed herein has been installed.
- B. Perform tests with apparatus de-energized whenever feasible.
1. Scheduled with Engineer and Owner prior to de-energization.
 2. Minimized to avoid extended period of interruption to the operating plant equipment.
- C. Notify Engineer and Owner at least 24 hours prior to performing tests on energized electrical equipment.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

- A. Perform tests in accordance with requirements of Section 01810, Equipment Testing and Facility Startup.

- B. Tests and inspections shall establish:
 - 1. Electrical equipment is operational within industry and manufacturer's tolerances and standards.
 - 2. Installation operates properly.
 - 3. Equipment is suitable for energization.
 - 4. Installation conforms to requirements of Contract Documents and NFPA 70, NFPA 70E, NFPA 101, and IEEE C2.
- C. Perform inspection and testing in accordance with NETA ATS, industry standards, and manufacturer's recommendations.
- D. Set, test, and calibrate protective relays, circuit breakers, fuses, and other applicable devices in accordance with values established by short circuit, coordination, and arc flash studies as specified in Section 16015, Electrical Systems Analysis.
- E. Adjust mechanisms and moving parts of equipment for free mechanical movement.
- F. Adjust and set electromechanical electronic relays and sensors to correspond to operating conditions, or as recommended by manufacturer.
- G. Verify nameplate data for conformance to Contract Documents and approved Submittals.
- H. Realign equipment not properly aligned and correct unlevelness.
- I. Properly anchor electrical equipment found to be inadequately anchored.
- J. Tighten accessible bolted connections, including wiring connections, with calibrated torque wrench/screw driver to manufacturer's recommendations, or as otherwise specified in NETA ATS.
- K. Clean contaminated surfaces with cleaning solvents as recommended by manufacturer.
- L. Provide proper lubrication of applicable moving parts.
- M. Inform Engineer of working clearances not in accordance with NFPA 70.
- N. Investigate and repair or replace:
 - 1. Electrical items that fail tests.
 - 2. Active components not operating in accordance with manufacturer's instructions.
 - 3. Damaged electrical equipment.

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O. Electrical Enclosures:

1. Remove foreign material and moisture from enclosure interior.
2. Vacuum and wipe clean enclosure interior.
3. Remove corrosion found on metal surfaces.
4. Repair or replace, as determined by Engineer, door and panel sections having dented surfaces.
5. Repair or replace, as determined by Engineer, poor fitting doors and panel sections.
6. Repair or replace improperly operating latching, locking, or interlocking devices.
7. Replace missing or damaged hardware.
8. Finish:
 - a. Provide matching paint and touch up scratches and mars.
 - b. If required because of extensive damage, as determined by Engineer, refinish entire assembly.

P. Replace fuses and circuit breakers that do not conform to size and type required by the Contract Documents or approved Submittals.

3.02 CHECKOUT AND STARTUP

A. Voltage Field Test:

1. Check voltage at point of termination of power company supply system to Project when installation is essentially complete and is in operation.
2. Check voltage amplitude and balance between phases for loaded and unloaded conditions.
3. Unbalance Corrections:
 - a. Make written request to power company to correct condition if balance (as defined by NEMA) exceeds 1 percent, or if voltage varies throughout the day and from loaded to unloaded condition more than plus or minus 4 percent of nominal.
 - b. Obtain written certification from responsible power company official that voltage variations and unbalance are within their normal standards if corrections are not made.

B. Equipment Line Current Tests:

1. Check line current in each phase for each piece of equipment.
2. Make line current check after power company has made final adjustments to supply voltage magnitude or balance.
3. If phase current for a piece of equipment is above rated nameplate current, prepare Equipment Line Phase Current Report that identifies cause of problem and corrective action taken.

3.03 PANELBOARDS

- A. Visual and Mechanical Inspection: Include the following inspections and related work:
 - 1. Inspect for defects and physical damage, labeling, and nameplate compliance with requirements of up-to-date drawings and panelboard schedules.
 - 2. Exercise and perform operational tests of mechanical components and other operable devices in accordance with manufacturer's instruction manual.
 - 3. Check panelboard mounting, area clearances, and alignment and fit of components.
 - 4. Check tightness of bolted electrical connections with calibrated torque wrench. Refer to manufacturer's instructions for proper torque values.
 - 5. Perform visual and mechanical inspection for overcurrent protective devices.
- B. Electrical Tests: Include the following items performed in accordance with manufacturer's instruction:
 - 1. Insulation Resistance Tests:
 - a. Applied megohmmeter dc voltage in accordance with NETA ATS, Table 100.1.
 - b. Each phase of each bus section.
 - c. Phase-to-phase and phase-to-ground for 1 minute.
 - d. With breakers open.
 - e. With breakers closed.
 - f. Control wiring except that connected to solid state components.
 - g. Insulation resistance values equal to, or greater than, ohmic values established by manufacturer.
 - 2. Ground continuity test ground bus to system ground.

3.04 DRY TYPE TRANSFORMERS

- A. Visual and Mechanical Inspection:
 - 1. Physical and insulator damage.
 - 2. Proper winding connections.
 - 3. Bolt torque level in accordance with NETA ATS, Table 100.12, unless otherwise specified by manufacturer.
 - 4. Defective wiring.
 - 5. Proper operation of fans, indicators, and auxiliary devices.
 - 6. Removal of shipping brackets, fixtures, or bracing.
 - 7. Free and properly installed resilient mounts.
 - 8. Cleanliness and improper blockage of ventilation passages.

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9. Verify tap-changer is set at correct ratio for rated output voltage under normal operating conditions.
10. Verify proper secondary voltage phase-to-phase and phase-to-ground after energization and prior to loading.

B. Electrical Tests:

1. Insulation Resistance Tests:
 - a. Applied megohmmeter dc voltage in accordance with NETA ATS, Table 100.5 for each:
 - 1) Winding-to-winding.
 - 2) Winding-to-ground.
 - b. Test Duration: 10 minutes with resistances tabulated at 30 seconds, 1 minute, and 10 minutes.
 - c. Results temperature corrected in accordance with NETA ATS, Table 100.14.
 - d. Temperature corrected insulation resistance values equal to, or greater than, ohmic values established by manufacturer.
 - e. Insulation resistance test results to compare within 1 percent of adjacent windings.
2. Perform tests and adjustments for fans, controls, and alarm functions as suggested by manufacturer.

3.05 LOW VOLTAGE CABLES, 600 VOLTS MAXIMUM

A. Visual and Mechanical Inspection:

1. Inspect each individual exposed power cable No. 4 and larger for:
 - a. Physical damage.
 - b. Proper connections in accordance with single-line diagram.
 - c. Cable bends not in conformance with manufacturer's minimum allowable bending radius where applicable.
 - d. Color coding conformance with specification.
 - e. Proper circuit identification.
2. Mechanical Connections for:
 - a. Proper lug type for conductor material.
 - b. Proper lug installation.
 - c. Bolt torque level in accordance with NETA ATS, Table 100.12, unless otherwise specified by manufacturer.
3. Shielded Instrumentation Cables for:
 - a. Proper shield grounding.
 - b. Proper terminations.
 - c. Proper circuit identification.

4. Control Cables for:
 - a. Proper termination.
 - b. Proper circuit identification.
5. Cables Terminated Through Window Type CTs: Verify neutrals and grounds are terminated for correct operation of protective devices.

B. Electrical Tests for Conductors No. 4 and Larger:

1. Insulation Resistance Tests:
 - a. Utilize 1,000-volt dc megohmmeter for 600-volt insulated conductors.
 - b. Test each conductor with respect to ground and to adjacent conductors for 1 minute.
 - c. Evaluate ohmic values by comparison with conductors of same length and type.
 - d. Investigate values less than 50 megohms.
2. Continuity test by ohmmeter method to ensure proper cable connections.

C. Low-voltage cable tests may be performed by installer in lieu of independent testing firm.

3.06 MOLDED AND INSULATED CASE CIRCUIT BREAKERS

A. General: Inspection and testing limited to circuit breakers rated 100 amperes and larger and to motor circuit protector breakers rated 100 amperes and larger.

B. Visual and Mechanical Inspection:

1. Proper mounting.
2. Proper conductor size.
3. Feeder designation according to nameplate and one-line diagram.
4. Cracked casings.
5. Connection bolt torque level in accordance with NETA ATS, Table 100.12.
6. Operate breaker to verify smooth operation.
7. Compare frame size and trip setting with circuit breaker schedules or one-line diagram.
8. Verify that terminals are suitable for 75 degrees C rated insulated conductors.

C. Electrical Tests:

1. Insulation Resistance Tests:
 - a. Utilize 1,000-volt dc megohmmeter for 480-volt and 600-volt circuit breakers and 500-volt dc megohmmeter for 240-volt circuit breakers.
 - b. Pole-to-pole and pole-to-ground with breaker contacts opened for 1 minute.
 - c. Pole-to-pole and pole-to-ground with breaker contacts closed for 1 minute.
 - d. Test values to comply with NETA ATS, Table 100.1.
2. Contact Resistance Tests:
 - a. Contact resistance in microhms across each pole.
 - b. Investigate deviation of 50 percent or more from adjacent poles and similar breakers.
3. Primary Current Injection Test to Verify:
 - a. Long-time minimum pickup and delay.
 - b. Short-time pickup and delay.
 - c. Ground fault pickup and delay.
 - d. Instantaneous pickup by run-up or pulse method.
 - e. Trip characteristics of adjustable trip breakers shall be within manufacturer's published time-current characteristic tolerance band, including adjustment factors.
 - f. Trip times shall be within limits established by NEMA AB 4, Table 5-3. Alternatively, use NETA ATS, Table 100.7.
 - g. Instantaneous pickup value shall be within values established by NEMA AB 4, Table 5-4. Alternatively, use NETA ATS, Table 100.8.

3.07 PROTECTIVE RELAYS

A. Visual and Mechanical Inspection:

1. Visually check each relay for:
 - a. Tight cover gasket and proper seal.
 - b. Unbroken cover glass.
 - c. Condition of spiral spring and contacts.
 - d. Disc clearance.
 - e. Condition of case shorting contacts if present.
2. Mechanically check each relay for:
 - a. Freedom of movement.
 - b. Proper travel and alignment.
3. Verify each relay:
 - a. Complies with Contract Documents, approved Submittal, and application.
 - b. Is set in accordance with recommended settings from Coordination Study.

B. Electrical Tests:

1. Insulation resistance test on each circuit to frame, except for solid state devices.
2. Test on nominal recommended setting for:
 - a. Pickup parameters on each operating element.
 - b. Timing at three points on time-current curve.
 - c. Pickup target and seal-in units.
 - d. Special tests as required to check operation of restraint, directional, and other elements in accordance with manufacturer's instruction manual.
3. Phase angle and magnitude contribution tests on differential and directional relays after energization to vectorially verify proper polarity and connections.
4. Current Injection Tests:
 - a. For entire current circuit in each section.
 - b. Secondary injection for current flow of 1 ampere.
 - c. Test current at each device.

3.08 INSTRUMENT TRANSFORMERS

A. Visual and Mechanical Inspection:

1. Visually check current, potential, and control transformers for:
 - a. Cracked insulation.
 - b. Broken leads or defective wiring.
 - c. Proper connections.
 - d. Adequate clearances between primary and secondary circuit wiring.
2. Verify Mechanically:
 - a. Grounding and shorting connections have good contact.
 - b. Withdrawal mechanism and grounding operation, when applicable, operate properly.
3. Verify proper primary and secondary fuse sizes for potential transformers.

B. Electrical Tests:

1. Current Transformer Tests:
 - a. Insulation resistance test of transformer and wiring-to-ground at 1,000 volts dc for 30 seconds.
 - b. Polarity test.
 - c. Ratio and accuracy test.

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2. Potential Transformer Tests:
 - a. Insulation resistance test at test voltages in accordance with NETA ATS, Table 100.9, for 1 minute on:
 - 1) Winding-to-winding.
 - 2) Winding-to-ground.
 - b. Polarity test to verify polarity marks or H1-X1 relationship as applicable.
 - c. Ratio and accuracy test.
3. Insulation resistance measurement on instrument transformer shall not be less than that shown in NETA ATS, Table 100.5.

3.09 METERING

A. Visual and Mechanical Inspection:

1. Verify meter connections in accordance with appropriate diagrams.
2. Verify meter multipliers.
3. Verify meter types and scales conform to Contract Documents.
4. Check calibration of meters at cardinal points.
5. Check calibration of electrical transducers.

3.10 GROUNDING SYSTEMS

A. Visual and Mechanical Inspection:

1. Equipment and circuit grounds in motor control center and panelboard assemblies for proper connection and tightness.
2. Ground bus connections in motor control center and panelboard assemblies for proper termination and tightness.
3. Effective transformer core and equipment grounding.
4. Accessible connections to grounding electrodes for proper fit and tightness.
5. Accessible exothermic-weld grounding connections to verify that molds were fully filled and proper bonding was obtained.

B. Electrical Tests:

1. Fall-of-Potential Test:
 - a. In accordance with IEEE 81, Section 8.2.1.5 for measurement of main ground system's resistance.
 - b. Main ground electrode system resistance to ground to be no greater than 5 ohm(s).

2. Two-Point Direct Method Test:
 - a. In accordance with IEEE 81, Section 8.2.1.1 for measurement of ground resistance between main ground system, equipment frames, and system neutral and derived neutral points.
 - b. Equipment ground resistance shall not exceed main ground system resistance by 0.50 ohm.
3. Neutral Bus Isolation:
 - a. Test each neutral bus individually with neutral bonding jumper removed at service entrance or separately derived system.
 - b. Evaluate ohmic values by measuring resistance between ground bus and neutral bus.
 - c. Investigate values less than 50 megohms.

3.11 AC INDUCTION MOTORS

- A. General: Inspection and testing limited to motors rated 5 horsepower and larger.
- B. Visual and Mechanical Inspection:
 1. Proper electrical and grounding connections.
 2. Shaft alignment.
 3. Blockage of ventilating air passageways.
 4. Operate motor and check for:
 - a. Excessive mechanical and electrical noise.
 - b. Overheating.
 - c. Correct rotation.
 - d. Check vibration detectors, resistance temperature detectors, or motor inherent protectors for functionability and proper operation.
 - e. Excessive vibration, in excess of values in NETA ATS, Table 100.10.
 5. Check operation of space heaters.
- C. Electrical Tests:
 1. Insulation Resistance Tests:
 - a. In accordance with IEEE 43 at test voltages established by NETA ATS, Table 100.1 for:
 - 1) Motors 200 horsepower and less for 1-minute duration with resistances tabulated at 30 seconds and 60 seconds.
 - b. Insulation resistance values equal to, or greater than, ohmic values established by manufacturers.
 2. Insulation resistance test on insulated bearings in accordance with manufacturer's instructions.
 3. Measure running current and voltage, and evaluate relative to load conditions and nameplate full-load amperes.

3.12 AUTOMATIC TRANSFER SWITCHES

A. Visual and Mechanical Inspection:

1. Check doors and panels for proper interlocking.
2. Check connections for high resistance by calibrated torque wrench applied to bolted joints.
3. Check positive mechanical and electrical interlock between normal and alternate sources.
4. Check for proper operation:
 - a. Manual transfer function switch.
 - b. Generator under load and nonload conditions.
 - c. Auto-exerciser of generator under load and no-load conditions.
5. Verify settings and operation of control devices.

B. Electrical Tests:

1. Insulation Resistance Tests:
 - a. Applied megohmmeter dc voltage in accordance with NETA ATS, Table 100.1, for each phase with switch CLOSED in both source positions.
 - b. Phase-to-phase and phase-to-ground for 1 minute.
 - c. Test values in accordance with manufacturer's published data.
2. Contact Resistance Test:
 - a. Contact resistance in microhms across each switch blade for both source positions.
 - b. Investigate values exceeding 500 micro-ohms.
 - c. Investigate values deviating from adjacent pole by more than 50 percent.
3. Set and calibrate in accordance with Specifications, manufacturer's recommendations, and Coordination Study.
 - a. Voltage and frequency sensing relays.
 - b. Time delay relays.
 - c. Engine start and shutdown relays.
4. Perform automatic transfer tests by:
 - a. Simulating loss of normal power source.
 - b. Return to normal power.
 - c. Simulating loss of alternate power source.
 - d. Simulating single-phase conditions for normal and alternate sources.
5. Monitor and verify operation and timing of:
 - a. Normal and alternate voltage sensing relays.
 - b. Engine-start sequence.

- c. Timing delay upon transfer and retransfer.
- d. Engine cool down and shutdown.
- e. Interlocks and limit switch functions.
- f. Engine cool down and shutdown feature.

3.13 LOW VOLTAGE SURGE ARRESTORS

A. Visual and Mechanical Inspection:

- 1. Adequate clearances between arrestors and enclosures.
- 2. Ground connections to ground bus.

B. Electrical Tests:

- 1. Varistor Type Arrestors:
 - a. Clamping voltage test.
 - b. Rated RMS voltage test.
 - c. Rated dc voltage test.
 - d. Varistor arrestor test values in accordance with IEEE C62.33, Section 4.4 and Section 4.9.

3.14 STANDBY GENERATOR SYSTEMS

A. Visual and Mechanical Inspection:

- 1. Proper grounding.
- 2. Blockage of ventilating passageways.
- 3. Proper operation of jack water heaters.
- 4. Integrity of engine cooling and fuel supply systems.
- 5. Excessive mechanical and electrical noise.
- 6. Overheating of engine or generator.
- 7. Proper installation of vibration isolators.
- 8. Proper cooling liquid type and level.
- 9. Operate engine-generator and check for:
 - a. Excessive mechanical and electrical noise.
 - b. Overheating.
 - c. Correct rotation.
 - d. Check resistance temperature detectors or generator inherent thermal protectors for functionality and proper operation.
 - e. Excessive vibration.
- 10. Verify voltage regulator and governor operation will cause unit speed and output voltage to stabilize at proper values within reasonable length of time.

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11. Proper operation of meters and instruments.
12. Compare generator nameplate rating and connection with one-line diagram or approved Submittal.
13. Verify engine-generator operation with adjustable frequency drives energized and operating under normal load conditions.

B. Electrical and Mechanical Tests:

1. Cold start test by interrupting normal power source with test load consisting of connected building load to verify:
 - a. Transfer switch operation.
 - b. Automatic starting operation.
 - c. Operating ability of engine-generator.
 - d. Overcurrent devices capability to withstand inrush currents.
2. Phase rotation tests.
3. Test engine protective shutdown features for:
 - a. Low oil pressure.
 - b. Overtemperature.
 - c. Overspeed.
4. Load bank test with resistors for each load step. Record voltage, frequency, load current, oil pressure, and engine coolant temperature at 15-minute intervals:
 - a. 25 percent applied load for 30 minutes.
 - b. 50 percent applied load for 30 minutes.
 - c. 75 percent applied load for 30 minutes.
 - d. 100 percent applied load for 3 hours.
 - e. Load test results to demonstrate ability of unit to deliver rated load for test period.
5. One-Step Rated kW Load Pickup Test:
 - a. Perform test immediately after performing load bank test.
 - b. Apply rated load, minus largest rated hp motor, to generator.
 - c. Start largest rated horsepower motor and record voltage drop for 20 cycles minimum with high-speed chart recorder or digital storage oscilloscope.
 - d. Compare voltage drop with maximum allowable voltage dip for specified starting situation

3.15 THERMOGRAPHIC SURVEY

- A. Provide thermographic survey per NETA ATS Table 100.18 of connections associated with incoming service conductors, bus work, and branch feeder conductors No. 4 and larger at each:
1. Low voltage motor control center.
 2. Variable frequency drive.

3. Panelboard.
 4. Motor terminal junction box.
- B. Provide thermographic survey of feeder conductors No. 4 and larger terminating at:
1. Motor control center.
 2. Variable frequency drive.
 3. Motor terminal junction box.
 4. Automatic transfer switch.
- C. Remove necessary enclosure metal panels and covers prior to performing survey.
- D. Perform with equipment energized during periods of maximum possible loading per NFPA 70B, Section 20.17.
- E. Do not perform survey on equipment operating at less than 40 percent of rated load. If plant load is insufficient, perform test with supplemental load bank producing rated load on item being measured.
- F. Use thermographic equipment capable of:
1. Detecting emitted radiation.
 2. Converting detected radiation to visual signal.
 3. Detecting 1 degree C temperature difference between subject area and reference point of 30 degrees C.
- G. Temperature Gradients:
1. 3 degrees C to 7 degrees C indicates possible deficiency that warrants investigation.
 2. 7 degrees C to 15 degrees C indicates deficiency that is to be corrected as time permits.
 3. 16 degrees C and above indicates deficiency that is to be corrected immediately.
- H. Provide written report of:
1. Areas surveyed and the resultant temperature gradients.
 2. Locations of areas having temperature gradients of 3 degrees C or greater.
 3. Cause of heat rise and actions taken to correct cause of heat rise.
 4. Detected phase unbalance.

END OF SECTION

**SECTION 16120
CONDUCTORS**

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. Association of Edison Illuminating Companies (AEIC): CS 8, Specification for Extruded Dielectric Shielded Power Cables Rated 5 kV through 46 kV.
 2. ASTM International (ASTM):
 - a. A167, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - b. B3, Standard Specification for Soft or Annealed Copper Wire.
 - c. B8, Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
 - d. B496, Standard Specification for Compact Round Concentric-Lay-Stranded Copper Conductors.
 3. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - a. 48, Standard Test Procedures and Requirements for Alternating-Current Cable Terminations Used on Shielded Cables Having Laminated Insulation Rated 2.5 kV through 765 kV or Extruded Insulation Rated 2.5 kV Through 500 kV.
 - b. 386, Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600V.
 - c. 404, Standard for Extruded and Laminated Dielectric Shielded Cable Joints Rated 2500 V to 500000 V.
 4. Insulated Cable Engineer's Association, Inc. (ICEA):
 - a. S-58-679, Standard for Control Cable Conductor Identification.
 - b. S-73-532, Standard for Control Thermocouple Extensions and Instrumentation Cables.
 - c. T-29-520, Conducting Vertical Cable Tray Flame Tests with Theoretical Heat Input of 210,000 Btu/hour.
 5. National Electrical Manufacturers' Association (NEMA):
 - a. CC 1, Electric Power Connectors for Substations.
 - b. WC 57, Standard for Control, Thermocouple Extension, and Instrumentation Cables.
 - c. WC 70, Standard for Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy.
 - d. WC 71, Standard for Nonshielded Cables Rated 2001-5000 Volts for Use in the Distribution of Electric Energy.
 - e. WC 74, 5-46 kV Shielded Power Cable for Use in the Transmission and Distribution of Electric Energy.

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6. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code (NEC).
 - b. 262, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.
7. Telecommunications Industry Association (TIA): TIA-568-C, Commercial Building Telecommunications Cabling Standard.
8. Underwriters Laboratories Inc. (UL):
 - a. 13, Standard for Safety for Power-Limited Circuit Cables.
 - b. 44, Standard for Safety for Thermoset-Insulated Wires and Cables.
 - c. 62, Standard for Safety for Flexible Cord and Cables.
 - d. 486A-486B, Standard for Safety for Wire Connectors.
 - e. 486C, Standard for Safety for Splicing Wire Connectors.
 - f. 510, Standard for Safety for Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape.
 - g. 854, Standard for Safety for Service-Entrance Cables.
 - h. 1072, Standard for Safety for Medium-Voltage Power Cables.
 - i. 1277, Standard for Safety for Electrical Power and Control Tray Cables with Optional Optical-Fiber Members.
 - j. 1569, Standard for Safety for Metal-Clad Cables.
 - k. 1581, Standard for Safety for Reference Standard for Electrical Wires, Cables, and Flexible Cords.

1.02 SUBMITTALS

A. Action Submittals:

1. Product Data:
 - a. Wire and cable.
 - b. Wire and cable accessories.
 - c. Cable fault detection system.

B. Informational Submittals:

1. Journeyman lineman or electrician splicing credentials.
2. Factory Test Report for conductors 600 volts and below.

1.03 QUALITY ASSURANCE

A. Authority Having Jurisdiction (AHJ):

1. Provide the Work in accordance with NFPA 70. Where required by the AHJ, material and equipment shall be labeled or listed by a nationally recognized testing laboratory or other organization acceptable to the AHJ in order to provide a basis for approval under NEC.
2. Materials and equipment manufactured within the scope of standards published by Underwriters Laboratories Inc. shall conform to those standards and shall have an applied UL listing mark.

PART 2 PRODUCTS

2.01 CONDUCTORS 600 VOLTS AND BELOW

A. Conform to applicable requirements of NEMA WC 70.

B. Conductor Type:

1. 120-Volt and 277-Volt Lighting, 10 AWG and Smaller: Solid copper.
2. 120-Volt Receptacle Circuits, 10 AWG and Smaller: Solid copper.
3. All Other Circuits: Stranded copper.

C. Insulation: Type THHN/THWN-2, except for sizes No. 6 and larger, with XHHW-2 insulation.

D. Direct Burial and Aerial Conductors and Cables:

1. Type USE/RHH/RHW insulation, UL 854 listed, or Type RHW-2/USE-2.
2. Conform to physical and minimum thickness requirements of NEMA WC 70.

E. Flexible Cords and Cables:

1. Type SOW-A/50 with ethylene propylene rubber insulation in accordance with UL 62.
2. Conform to physical and minimum thickness requirements of NEMA WC 70.

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2.02 600-VOLT RATED CABLE

A. General:

1. Type TC, meeting requirements of UL 1277, including Vertical Tray Flame Test at 70,000 Btu per hour, and NFPA 70, Article 340, or UL 13 meeting requirements of NFPA 70, Article 725.
2. Permanently and legibly marked with manufacturer's name, maximum working voltage for which cable was tested, type of cable, and UL listing mark.
3. Suitable for installation in open air, in cable trays, or conduit.
4. Minimum Temperature Rating: 90 degrees C dry locations, 75 degrees C wet locations.
5. Overall Outer Jacket: PVC, flame-retardant, sunlight- and oil-resistant.

B. Type 1, Multiconductor Control Cable:

1. Conductors:
 - a. 14 AWG, seven-strand copper.
 - b. Insulation: 15-mil PVC with 4-mil nylon.
 - c. UL 1581 listed as Type THHN/THWN rated VW-1.
 - d. Conductor group bound with spiral wrap of barrier tape.
 - e. Color Code: In accordance with ICEA S-58-679, Method 1, Table 2.
2. Cable: Passes the ICEA T-29-520, 210,000 Btu per hour Vertical Tray Flame Test.
3. Cable Sizes:

No. of Conductors	Max. Outside Diameter (Inches)	Jacket Thickness (Mils)
3	0.41	45
5	0.48	45
7	0.52	45
12	0.72	60
19	0.83	60
25	1.00	60
37	1.15	80

4. Manufacturers:
 - a. Okonite Co.
 - b. Southwire.

- C. Type 3, 16 AWG, Twisted, Shielded Pair, Instrumentation Cable: Single pair, designed for noise rejection for process control, computer, or data log applications meeting NEMA WC 57 requirements.
1. Outer Jacket: 45-mil nominal thickness.
 2. Individual Pair Shield: 1.35-mil, double-faced aluminum/synthetic polymer overlapped to provide 100 percent coverage.
 3. Dimension: 0.31-inch nominal OD.
 4. Conductors:
 - a. Bare soft annealed copper, Class B, seven-strand concentric, meeting requirements of ASTM B8.
 - b. 20 AWG, seven-strand tinned copper drain wire.
 - c. Insulation: 15-mil nominal PVC.
 - d. Jacket: 4-mil nominal nylon.
 - e. Color Code: Pair conductors, black and red.
 5. Manufacturers:
 - a. Okonite Co.
 - b. Alpha Wire Corp.
 - c. Belden.
- D. Type 4, 16 AWG, Twisted, Shielded Triad Instrumentation Cable: Single triad, designed for noise rejection for process control, computer, or data log applications meeting NEMA WC 57 requirements.
1. Outer Jacket: 45-mil nominal.
 2. Individual Pair Shield: 1.35-mil, double-faced aluminum/synthetic polymer, overlapped to provide 100 percent coverage.
 3. Dimension: 0.32-inch nominal OD.
 4. Conductors:
 - a. Bare soft annealed copper, Class B, seven-strand concentric, meeting requirements of ASTM B8.
 - b. 20 AWG, seven-strand, tinned copper drain wire.
 - c. Insulation: 15-mil nominal PVC.
 - d. Jacket: 4-mil nylon.
 - e. Color Code: Triad conductors black, red, and blue.
 5. Manufacturers:
 - a. Okonite Co.
 - b. Alpha Wire Corp.
 - c. Belden.

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- E. Type 5, 18 AWG, Multitwisted Shielded Pairs, with a Common Overall Shield, Instrumentation Cable: Designed for use as instrumentation, process control, and computer cable, meeting NEMA WC 57 requirements.
1. Conductors:
 - a. Bare soft annealed copper, Class B, seven-strand concentric, in accordance with ASTM B8.
 - b. Tinned copper drain wires.
 - c. Pair drain wire size AWG 20, group drain wire size AWG 18.
 - d. Insulation: 15-mil PVC.
 - e. Jacket: 4-mil nylon.
 - f. Color Code: Pair conductors, black and red with red conductor numerically printed for group identification.
 - g. Individual Pair Shield: 1.35-mil, double-faced aluminum/synthetic polymer.
 2. Cable Shield: 2.35-mil, double-faced aluminum/synthetic polymer, overlapped for 100 percent coverage.
 3. Cable Sizes:

Number of Pairs	Maximum Outside Diameter (Inches)	Nominal Jacket Thickness (Mils)
4	0.50	45
8	0.68	60
12	0.82	60
16	0.95	80
24	1.16	80
36	1.33	80
50	1.56	80

4. Manufacturers:
 - a. Okonite Co.
 - b. Alpha Wire Corp.
 - c. Belden.

2.03 GROUNDING CONDUCTORS

- A. Equipment: Stranded copper with green, Type USE/RHH/RHW-XLPE or THHN/THWN, insulation.
- B. Direct Buried: Bare stranded copper.

2.04 ACCESSORIES FOR CONDUCTORS 600 VOLTS AND BELOW

A. Tape:

1. General Purpose, Flame Retardant: 7-mil, vinyl plastic, Scotch Brand 33+, rated for 90 degrees C minimum, meeting requirements of UL 510.
2. Flame Retardant, Cold and Weather Resistant: 8.5-mil, vinyl plastic, Scotch Brand 88.
3. Arc and Fireproofing:
 - a. 30-mil, elastomer.
 - b. Manufacturers and Products:
 - 1) 3M; Scotch Brand 77, with Scotch Brand 69 glass cloth tapebinder.
 - 2) Plymouth; 53 Plyarc, with 77 Plyglas glass cloth tapebinder.

B. Identification Devices:

1. Sleeve:
 - a. Permanent, PVC, yellow or white, with legible machine-printed black markings.
 - b. Manufacturers and Products:
 - 1) Raychem; Type D-SCE or ZH-SCE.
 - 2) Brady, Type 3PS.
2. Heat Bond Marker:
 - a. Transparent thermoplastic heat bonding film with acrylic pressure sensitive adhesive.
 - b. Self-laminating protective shield over text.
 - c. Machine printed black text.
 - d. Manufacturer and Product: 3M Co.; Type SCS-HB.
3. Marker Plate: Nylon, with legible designations permanently hot stamped on plate.
4. Tie-On Cable Marker Tags:
 - a. Chemical-resistant white tag.
 - b. Size: 1/2 inch by 2 inches.
 - c. Manufacturer and Product: Raychem; Type CM-SCE.
5. Grounding Conductor: Permanent green heat-shrink sleeve, 2-inch minimum.

C. Connectors and Terminations:

1. Nylon, Self-Insulated Crimp Connectors:
 - a. Manufacturers and Products:
 - 1) Thomas & Betts; Sta-Kon.
 - 2) Burndy; Insulug.
 - 3) ILSCO.

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2. Nylon, Self-Insulated, Crimp Locking-Fork, Torque-Type Terminator:
 - a. Suitable for use with 75 degrees C wire at full NFPA 70, 75 degrees C ampacity.
 - b. Seamless.
 - c. Manufacturers and Products:
 - 1) Thomas & Betts; Sta-Kon.
 - 2) Burndy; Insulink.
 - 3) ILSCO; ILSCONS.
3. Self-Insulated, Freespring Wire Connector (Wire Nuts):
 - a. UL 486C.
 - b. Plated steel, square wire springs.
 - c. Manufacturers and Products:
 - 1) Thomas & Betts.
 - 2) Ideal; Twister.
4. Self-Insulated, Set Screw Wire Connector:
 - a. Two piece compression type with set screw in brass barrel.
 - b. Insulated by insulator cap screwed over brass barrel.
 - c. Manufacturers:
 - 1) 3M Co.
 - 2) Thomas & Betts.
 - 3) Marrette.

D. Cable Lugs:

1. In accordance with NEMA CC 1.
2. Rated 600 volts of same material as conductor metal.
3. Uninsulated Crimp Connectors and Terminators:
 - a. Suitable for use with 75 degrees C wire at full NFPA 70, 75 degrees C ampacity.
 - b. Manufacturers and Products:
 - 1) Thomas & Betts; Color-Keyed.
 - 2) Burndy; Hydent.
 - 3) ILSCO.
4. Uninsulated, Bolted, Two-Way Connectors and Terminators:
 - a. Manufacturers and Products:
 - 1) Thomas & Betts; Locktite.
 - 2) Burndy; Quiklug.
 - 3) ILSCO.

E. Cable Ties:

1. Nylon, adjustable, self-locking, and reusable.
2. Manufacturer and Product: Thomas & Betts; TY-RAP.

F. Heat Shrinkable Insulation:

1. Thermally stabilized cross-linked polyolefin.
2. Single wall for insulation and strain relief.
3. Dual Wall, adhesive sealant lined, for sealing and corrosion resistance.
4. Manufacturers and Products:
 - a. Thomas & Betts; SHRINK-KON.
 - b. Raychem; RNF-100 and ES-2000.

2.05 PULLING COMPOUND

- A. Nontoxic, noncorrosive, noncombustible, nonflammable, water-based lubricant; UL listed.
- B. Suitable for rubber, neoprene, PVC, polyethylene, hypalon, CPE, and lead-covered wire and cable.
- C. Approved for intended use by cable manufacturer.
- D. Suitable for zinc-coated steel, aluminum, PVC, bituminized fiber, and fiberglass raceways.
- E. Manufacturers:
 1. Ideal Co.
 2. Polywater, Inc.
 3. Cable Grip Co.

2.06 WARNING TAPE

- A. As specified in Section 16130, Raceway and Boxes.

2.07 SOURCE QUALITY CONTROL

- A. Conductors 600 Volts and Below: Test in accordance with UL 44 and UL 854.

PART 3 EXECUTION

3.01 GENERAL

- A. Conductor installation shall be in accordance with manufacturer's recommendations.
- B. Conductor and cable sizing shown is based on copper conductors, unless noted otherwise.

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- C. Do not exceed cable manufacturer's recommendations for maximum pulling tensions and minimum bending radii.
- D. Terminate conductors and cables, unless otherwise indicated.
- E. Tighten screws and terminal bolts in accordance with UL 486A-486B for copper conductors and aluminum conductors.
- F. Cable Lugs: Provide with correct number of holes, bolt size, and center-to-center spacing as required by equipment terminals.
- G. Bundling: Where single conductors and cables in manholes, handholes, vaults, cable trays, and other indicated locations are not wrapped together by some other means, bundle conductors from each conduit throughout their exposed length with cable ties placed at intervals not exceeding 12 inches on center.
- H. Ream, remove burrs, and clear interior of installed conduit before pulling wires or cables.
- I. Concrete-Encased Raceway Installation: Prior to installation of conductors, pull through each raceway a mandrel approximately 1/4 inch smaller than raceway inside diameter.

3.02 POWER CONDUCTOR COLOR CODING

A. Conductors 600 Volts and Below:

- 1. 6 AWG and Larger: Apply general purpose, flame retardant tape at each end, and at accessible locations wrapped at least six full overlapping turns, covering area 1-1/2 inches to 2 inches wide.
- 2. 8 AWG and Smaller: Provide colored conductors.
- 3. Colors:

System	Conductor	Color
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

System	Conductor	Color
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	Grounded Neutral Phase A Phase B Phase C	White Brown Orange Yellow
Note: Phase A, B, C implies direction of positive phase rotation.		

4. Tracer: Outer covering of white with identifiable colored strip, other than green, in accordance with NFPA 70.

3.03 CIRCUIT IDENTIFICATION

- A. Identify power, instrumentation, and control conductor circuits at each termination, and in accessible locations such as manholes, handholes, panels, switchboards, motor control centers, pull boxes, and terminal boxes.
- B. Circuits Appearing in Circuit Schedules: Identify using circuit schedule designations.
- C. Circuits Not Appearing in Circuit Schedules:
 1. Assign circuit name based on device or equipment at load end of circuit.
 2. Where this would result in same name being assigned to more than one circuit, add number or letter to each otherwise identical circuit name to make it unique.
- D. Method:
 1. Conductors 3 AWG and Smaller: Identify with sleeves or heat bond markers.
 2. Cables and Conductors 2 AWG and Larger:
 - a. Identify with marker plates or tie-on cable marker tags.
 - b. Attach with nylon tie cord.
 3. Taped-on markers or tags relying on adhesives not permitted.

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3.04 CONDUCTORS 600 VOLTS AND BELOW

- A. Install 10 AWG or 12 AWG conductors for branch circuit power wiring in lighting and receptacle circuits.
- B. Do not splice incoming service conductors and branch power distribution conductors 6 AWG and larger, unless specifically indicated or approved by Engineer.
- C. Connections and Terminations:
 - 1. Install wire nuts only on solid conductors. Wire nuts are not allowed on stranded conductors.
 - 2. Install nylon self-insulated crimp connectors and terminators for instrumentation and control, circuit conductors.
 - 3. Install self-insulated, set screw wire connectors for two-way connection of power circuit conductors 12 AWG and smaller.
 - 4. Install uninsulated crimp connectors and terminators for instrumentation, control, and power circuit conductors 4 AWG through 2/0 AWG.
 - 5. Install uninsulated, bolted, two-way connectors and terminators for power circuit conductors 3/0 AWG and larger.
 - 6. Install uninsulated terminators bolted together on motor circuit conductors 10 AWG and larger.
 - 7. Place no more than one conductor in any single-barrel pressure connection.
 - 8. Install crimp connectors with tools approved by connector manufacturer.
 - 9. Install terminals and connectors acceptable for type of material used.
 - 10. Compression Lugs:
 - a. Attach with a tool specifically designed for purpose. Tool shall provide complete, controlled crimp and shall not release until crimp is complete.
 - b. Do not use plier type crimpers.
- D. Do not use soldered mechanical joints.
- E. Splices and Terminations:
 - 1. Insulate uninsulated connections.
 - 2. Indoors: Use general purpose, flame retardant tape or single wall heat shrink.
 - 3. Outdoors, Dry Locations: Use flame retardant, cold- and weather-resistant tape or single wall heat shrink.
 - 4. Below Grade and Wet or Damp Locations: Use dual wall heat shrink.

- F. Cap spare conductors with UL listed end caps.
- G. Cabinets, Panels, and Motor Control Centers:
 - 1. Remove surplus wire, bridle and secure.
 - 2. Where conductors pass through openings or over edges in sheet metal, remove burrs, chamfer edges, and install bushings and protective strips of insulating material to protect the conductors.
- H. Control and Instrumentation Wiring:
 - 1. Where terminals provided will accept such lugs, terminate control and instrumentation wiring, except solid thermocouple leads, with insulated, locking-fork compression lugs.
 - 2. Terminate with methods consistent with terminals provided, and in accordance with terminal manufacturer's instructions.
 - 3. Locate splices in readily accessible cabinets or junction boxes using terminal strips.
 - 4. Cable Protection:
 - a. Under Infinite Access Floors: May install without bundling.
 - b. All Other Areas: Install individual wires, pairs, or triads in flex conduit under floor or grouped into bundles at least 1/2 inch in diameter.
 - c. Maintain integrity of shielding of instrumentation cables.
 - d. Ensure grounds do not occur because of damage to jacket over shield.
- I. Extra Conductor Length: For conductors to be connected by others, install minimum 6 feet of extra conductor in freestanding panels and minimum 2 feet in other assemblies.

3.05 CONDUCTOR ARC AND FIREPROOFING

- A. Install arc and fireproofing tape on 600-volt single conductors and cables, except those rated Type TC at splices in manholes, handholes, vaults, cable trays, and other indicated locations.
- B. Wrap conductors of same circuit entering from separate conduit together as single cable.
- C. Follow tape manufacturer's installation instructions.
- D. Secure tape at intervals of 5 feet with bands of tape binder. Each band to consist of a minimum of two wraps directly over each other.

END OF SECTION

**SECTION 16130
RACEWAY AND BOXES**

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. American Association of State Highway and Transportation Officials (AASHTO): HB, Standard Specifications for Highway Bridges.
 2. ASTM International (ASTM):
 - a. A123/123M, Standard Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products.
 - b. A167, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - c. A240/A240M, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - d. C857, Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures.
 - e. D149, Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies.
 3. Telecommunications Industry Association (TIA): 569B, Commercial Building Standard for Telecommunications Pathways and Spaces.
 4. National Electrical Contractor's Association, Inc. (NECA): Installation standards.
 5. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1,000 Volts Maximum).
 - b. C80.1, Electrical Rigid Steel Conduit (ERSC).
 - c. C80.3, Steel Electrical Metallic Tubing (EMT).
 - d. C80.5, Electrical Rigid Aluminum Conduit (ERAC).
 - e. C80.6, Electrical Intermediate Metal Conduit (EIMC).
 - f. RN 1, Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
 - g. TC 2, Electrical Polyvinyl Chloride (PVC) Conduit.
 - h. TC 3, Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing.
 - i. TC 6, Polyvinyl Chloride (PVC) Plastic Utilities Duct for Underground Installation.

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- j. TC 14, Reinforced Thermosetting Resin Conduit (RTRC) and Fittings.
- k. VE 1, Metallic Cable Tray Systems.
- 6. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).
- 7. Underwriters Laboratories Inc. (UL):
 - a. 1, Standard for Safety for Flexible Metal Conduit.
 - b. 5, Standard for Safety for Surface Metal Raceways and Fittings.
 - c. 6, Standard for Safety for Electrical Rigid Metal Conduit – Steel.
 - d. 6A, Standard for Safety for Electrical Rigid Metal Conduit – Aluminum, Red Brass and Stainless.
 - e. 360, Standard for Safety for Liquid-Tight Flexible Steel Conduit.
 - f. 514B, Standard for Safety for Conduit, Tubing, and Cable Fittings.
 - g. 651, Standard for Safety for Schedule 40 and 80 Rigid PVC Conduit and Fittings.
 - h. 651A, Standard for Safety for Type EB and A Rigid PVC Conduit and HDPE Conduit.
 - i. 797, Standard for Safety for Electrical Metallic Tubing – Steel.
 - j. 870, Standard for Safety for Wireways, Auxiliary Gutters, and Associated Fittings.
 - k. 1242, Standard for Safety for Electrical Intermediate Metal Conduit – Steel.
 - l. 1660, Standard for Safety for Liquid-Tight Flexible Nonmetallic Conduit.
 - m. 1684, Standard for Safety for Reinforced Thermosetting Resin Conduit (RTRC) and Fittings.
 - n. 2024, Standard for Safety for Optical Fiber and Communication Cable Raceway.

1.02 SUBMITTALS

A. Action Submittals:

- 1. Manufacturer's Literature:
 - a. Rigid galvanized steel conduit.
 - b. Rigid Aluminum Conduit.
 - c. PVC Schedule 40 conduit.
 - d. Flexible, nonmetallic, liquid-tight conduit.
 - e. Conduit fittings.
 - f. Wireways.
 - g. Device boxes for use in hazardous areas.
 - h. Junction and pull boxes used at or below grade.
 - i. Large junction and pull boxes.
 - j. Terminal junction boxes.

2. Cable Tray Systems:
 - a. Dimensional drawings, calculations, and descriptive information.
 - b. NEMA load/span designation and how it was selected.
 - c. Support span length and pounds-per-foot actual and future cable loading at locations, with safety factor used.
 - d. Location and magnitude of maximum simple beam deflection of tray for loading specified.
 - e. Layout drawings and list of accessories being provided.
 3. Equipment and machinery proposed for bending metal conduit.
 4. Method for bending PVC conduit less than 30 degrees.
- B. Informational Submittals: Manufacturer's certification of training for PVC-coated rigid galvanized steel conduit installer.

1.03 QUALITY ASSURANCE

- A. Authority Having Jurisdiction (AHJ):
1. Provide the Work in accordance with NFPA 70, National Electrical Code (NEC). Where required by the AHJ, material and equipment shall be labeled or listed by a nationally recognized testing laboratory or other organization acceptable to the AHJ in order to provide a basis for approval under NEC.
 2. Materials and equipment manufactured within scope of standards published by Underwriters Laboratories, Inc. shall conform to those standards and shall have an applied UL listing mark.
- B. PVC-Coated, Rigid Galvanized Steel Conduit Installer: Certified by conduit manufacturer as having received minimum 2 hours of training on installation procedures.

PART 2 PRODUCTS

2.01 CONDUIT AND TUBING

- A. Rigid Galvanized Steel Conduit (RGS):
1. Meet requirements of NEMA C80.1 and UL 6.
 2. Material: Hot-dip galvanized with chromated protective layer.
- B. Rigid Aluminum Conduit:
1. Meet requirements of NEMA C80.5 and UL 6A.
 2. Material: Type 6063, copper-free aluminum alloy.

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C. PVC Schedule 40 Conduit:

1. Meet requirements of NEMA TC 2 and UL 651.
2. UL listed for concrete encasement, underground direct burial, concealed or direct sunlight exposure, and 90 degrees C insulated conductors.
3. Furnish without factory-formed bell.

D. Flexible, Nonmetallic, Liquid-Tight Conduit (Heavy Duty):

1. Material: PVC core with fused flexible PVC jacket.
2. UL 1660 listed for:
 - a. Dry Conditions: 80 degrees C insulated conductors.
 - b. Wet Conditions: 60 degrees C insulated conductors.
3. Manufacturers and Products:
 - a. Carlon; Carflex or X-Flex.
 - b. T & B; Xtraflex LTC or EFC.

2.02 FITTINGS

A. Rigid Galvanized Steel Conduit:

1. General:
 - a. Meet requirements of UL 514B.
 - b. Type: Threaded, galvanized. Set screw and threadless compression fittings not permitted.
2. Bushing:
 - a. Material: Malleable iron with integral insulated throat, rated for 150 degrees C.
 - b. Manufacturers and Products:
 - 1) Appleton; Series BU-I.
 - 2) O-Z/Gedney; Type HB.
3. Grounding Bushing:
 - a. Material: Malleable iron with integral insulated throat rated for 150 degrees C, with solderless lugs.
 - b. Manufacturers and Products:
 - 1) Appleton; Series GIB.
 - 2) O-Z/Gedney; Type HBLG.
4. Conduit Hub:
 - a. Material: Malleable iron with insulated throat with bonding screw.
 - b. UL listed for use in wet locations.
 - c. Manufacturers and Products:
 - 1) Appleton, Series HUB-B.
 - 2) O-Z/Gedney; Series CH.
 - 3) Meyers; ST Series.

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5. Conduit Bodies:
 - a. Sized as required by NFPA 70.
 - b. Manufacturers and Products (For Normal Conditions):
 - 1) Appleton; Form 35 threaded unilets.
 - 2) Crouse-Hinds; Form 7 or Form 8 threaded condulets.
 - 3) Killark; Series O electrolets.
 - 4) Thomas & Betts; Form 7 or Form 8.
 - c. Manufacturers (For Hazardous Locations):
 - 1) Appleton.
 - 2) Crouse-Hinds.
 - 3) Killark.
6. Couplings: As supplied by conduit manufacturer.
7. Unions:
 - a. Concrete tight, hot-dip galvanized malleable iron.
 - b. Manufacturers and Products:
 - 1) Appleton; Series SCC bolt-on coupling or Series EC three-piece union.
 - 2) O-Z/Gedney; Type SSP split coupling or Type 4 Series, three-piece coupling.
8. Conduit Sealing Fitting:
 - a. Manufacturers and Products:
 - 1) Appleton; Type EYF, EYM, or ESU.
 - 2) Crouse-Hinds; Type EYS or EZS.
 - 3) Killark; Type EY or Type EYS.
9. Drain Seal:
 - a. Manufacturers and Products:
 - 1) Appleton; Type EYD.
 - 2) Crouse-Hinds; Type EYD or Type EZD.
10. Drain/Breather Fitting:
 - a. Manufacturers and Products:
 - 1) Appleton; Type ECDB.
 - 2) Crouse-Hinds; ECD.
11. Expansion Fitting:
 - a. Manufacturers and Products:
 - 1) Deflection/Expansion Movement:
 - a) Appleton; Type DF.
 - b) Crouse-Hinds; Type XD.
 - 2) Expansion Movement Only:
 - a) Appleton; Type XJ.
 - b) Crouse-Hinds; Type XJ.
 - c) Thomas & Betts; XJG-TP.

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12. Cable Sealing Fitting:
 - a. To form watertight nonslip cord or cable connection to conduit.
 - b. For Conductors with OD of 1/2 inch or Less: Neoprene bushing at connector entry.
 - c. Manufacturers and Products:
 - 1) Appleton; CG-S.
 - 2) Crouse-Hinds; CGBS.

B. Rigid Aluminum Conduit:

1. General:
 - a. Meet requirements of UL 514B.
 - b. Type: Threaded, copper-free. Set screw fittings not permitted.
2. Insulated Bushing:
 - a. Material: Cast aluminum, with integral insulated throat, rated for 150 degrees C.
 - b. Manufacturer and Product: O-Z/Gedney; Type AB.
3. Grounding Bushing:
 - a. Material: Cast aluminum with integral insulated throat, rated for 150 degrees, with solderless lugs.
 - b. Manufacturer and Product: O-Z/Gedney; Type ABLG.
4. Conduit Hub:
 - a. Material: Cast aluminum, with insulated throat.
 - b. UL listed for use in wet locations.
 - c. Manufacturers and Products:
 - 1) O-Z/Gedney; Type CHA.
 - 2) Thomas & Betts; Series 370AL.
 - 3) Meyers; Series SA.
5. Conduit Bodies:
 - a. Manufacturers and Products (For Normal Conditions):
 - 1) Appleton; Form 85 threaded unilets.
 - 2) Crouse-Hinds; Mark 9 or Form 7-SA threaded condulets.
 - 3) Killark; Series O electrolets.
 - b. Manufacturers (For Hazardous Locations):
 - 1) Appleton.
 - 2) Crouse-Hinds.
 - 3) Killark.
6. Couplings: As supplied by conduit manufacturer.
7. Conduit Sealing Fitting:
 - a. Manufacturers and Products:
 - 1) Appleton; Type EYF-AL or Type EYM-AL.
 - 2) Crouse-Hinds; Type EYS-SA or Type EZS-SA.
 - 3) Killark; Type EY or Type EYS.

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8. Drain Seal:
 - a. Manufacturers and Products:
 - 1) Appleton; Type EYDM-A.
 - 2) Crouse-Hinds; Type EYD-SA or Type EZD-SA.
 9. Drain/Breather Fitting:
 - a. Manufacturers and Products:
 - 1) Appleton; Type ECDB.
 - 2) Crouse-Hinds; ECD.
 10. Expansion Fitting:
 - a. Manufacturers and Products:
 - 1) Deflection/Expansion Movement: Steel City; Type DF-A.
 - 2) Expansion Movement Only: Steel City; Type AF-A.
 11. Cable Sealing Fittings:
 - a. To form watertight nonslip cord or cable connection to conduit.
 - b. Bushing: Neoprene at connector entry.
 - c. Manufacturer and Product: Appleton; CG-S.
- C. PVC Conduit:
1. Meet requirements of NEMA TC 3.
 2. Type: PVC, slip-on.
- D. Flexible, Nonmetallic, Liquid-Tight Conduit:
1. Meet requirements of UL 514B.
 2. Type: High strength plastic body, complete with lock nut, O-ring, threaded ferrule, sealing ring, and compression nut.
 3. Body/compression nut (gland) design to ensure high mechanical pullout strength and watertight seal.
 4. Manufacturers and Products:
 - a. Carlon; Type LT.
 - b. O-Z/Gedney; Type 4Q-P.
 - c. Thomas & Betts; Series 6300.
- E. Flexible Coupling, Hazardous Locations:
1. Approved for use in atmosphere involved.
 2. Rating: Watertight and UL listed for use in Class I, Division 1 and 2 areas.
 3. Outer bronze braid and an insulating liner.
 4. Conductivity equal to a similar length of rigid metal conduit.
 5. Manufacturers and Products:
 - a. Crouse-Hinds; Type ECGJH or Type ECLK.
 - b. Appleton; EXGJH or EXLK.

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F. Watertight Entrance Seal Device:

1. New Construction:
 - a. Material: Oversized sleeve, malleable iron body with sealing ring, pressure ring, grommet seal, and pressure clamp.
 - b. Manufacturer and Product: O-Z/Gedney; Type FSK or Type WSK, as required.
2. Cored-Hole Application:
 - a. Material: Assembled dual pressure disks, neoprene sealing ring, and membrane clamp.
 - b. Manufacturer and Product: O-Z/Gedney; Series CSM.

2.03 OUTLET AND DEVICE BOXES

A. Sheet Steel: One-piece drawn type, zinc-plated or cadmium-plated.

B. Cast Metal:

1. Box: Malleable iron or Cast ferrous metal.
2. Cover: Gasketed, weatherproof, malleable iron, or cast ferrous metal, with stainless steel screws.
3. Hubs: Threaded.
4. Lugs: Cast Mounting.
5. Manufacturers and Products, Nonhazardous Locations:
 - a. Crouse-Hinds; Type FS or Type FD.
 - b. Appleton; Type FS or Type FD.
 - c. Killark.
6. Manufacturers and Products, Hazardous Locations:
 - a. Crouse-Hinds; Type GUA or Type EAJ.
 - b. Appleton; Type GR.

C. Cast Aluminum:

1. Material:
 - a. Box: Cast, copper-free aluminum.
 - b. Cover: Gasketed, weatherproof, cast copper-free aluminum with stainless steel screws.
2. Hubs: Threaded.
3. Lugs: Cast mounting.
4. Manufacturers and Products, Nonhazardous Locations:
 - a. Crouse-Hinds; Type FS-SA or Type FD-SA.
 - b. Appleton; Type FS or Type FD.
 - c. Killark.
5. Manufacturers and Products, Hazardous Locations:
 - a. Crouse-Hinds; Type GUA-SA.
 - b. Appleton; Type GR.

D. PVC-Coated Cast Metal:

1. Type: One-piece.
2. Material: Malleable iron, cast ferrous metal, or cast aluminum.
3. Coating:
 - a. Exterior Surfaces: 40-mil PVC.
 - b. Interior Surfaces: 2-mil urethane.
4. Manufacturers:
 - a. Robroy Industries.
 - b. Ocal.

E. Nonmetallic:

1. Box: PVC.
2. Cover: PVC, weatherproof, with stainless steel screws.
3. Manufacturer and Product: Carlon; Type FS or Type FD, with Type E98 or Type E96 covers.

2.04 JUNCTION AND PULL BOXES

A. Outlet Box Used as Junction or Pull Box: As specified under Article Outlet and Device Boxes.

B. Conduit Bodies Used as Junction Boxes: As specified under Article Fittings.

C. Large Sheet Steel Box:

1. NEMA 250, Type 1.
2. Box: Code-gauge, galvanized steel.
3. Cover: Full access, screw type.
4. Machine Screws: Corrosion-resistant.

D. Large Cast Metal Box:

1. NEMA 250, Type 4.
2. Box: Cast malleable iron, or ferrous metal, electrogalvanized finished with drilled and tapped conduit entrances and exterior mounting lugs.
3. Cover: Hinged with clamps.
4. Gasket: Neoprene.
5. Hardware and Machine Screws: ASTM A167, Type 316 stainless steel.
6. Manufacturers and Products, Surface Mounted Nonhinged Type:
 - a. Crouse-Hinds; Series W.
 - b. O-Z/Gedney; Series Y.

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7. Manufacturer and Product, Surface Mounted, Hinged Type:
O-Z/Gedney; Series YW.
 8. Manufacturers and Products, Recessed Type:
 - a. Crouse-Hinds; Type WJBF.
 - b. O-Z/Gedney; Series YR.
- E. Large Cast Metal Box, Hazardous Locations:
1. NEMA 250 Type 7 as required for Class, Division, and Group involved.
 2. Box: Cast ferrous metal, electro-galvanize finished or copper-free aluminum with drilled and tapped conduit entrances.
 3. Cover: Hinged with screws.
 4. Hardware and Machine Screws: ASTM A167, Type 316 stainless steel.
 5. Manufacturers and Products:
 - a. Crouse-Hinds; Type EJB.
 - b. Appleton; Type AJBEW.
- F. Large Stainless Steel Box:
1. NEMA 250 Type 4X.
 2. Box: 14-gauge, ASTM A240/A240M, Type 316 stainless steel.
 3. Cover: Hinged with clamps.
 4. Hardware and Machine Screws: ASTM A167, Type 316 stainless steel.
 5. Manufacturers:
 - a. Hoffman Engineering Co.
 - b. Robroy Industries.
 - c. Wiegman.
- G. Concrete Box, Nontraffic Areas:
1. Box: Reinforced, cast concrete with extension.
 2. Cover: Steel diamond plate with locking bolts.
 3. Cover Marking: ELECTRICAL, TELEPHONE, or as shown.
 4. Size: 10 inches by 17 inches, minimum.
 5. Manufacturers and Products:
 - a. Utility Vault Co.; Series 36-1017.
 - b. Christy, Concrete Products, Inc.; N9.
 - c. Quazite; "PG" Style.
- H. Concrete Box, Traffic Areas:
1. Box: Reinforced, cast concrete with extension and bottom slab.
 2. Cover: Steel checked plate; H/20 loading with screw down.

3. Cover Marking: ELECTRICAL, TELEPHONE, or as shown.
4. Manufacturers and Products:
 - a. Christy, Concrete Products, Inc.; B1017BOX.
 - b. Utility Vault Co.; 3030 SB.

2.05 TERMINAL JUNCTION BOX

- A. Cover: Hinged, unless otherwise shown.
- B. Interior Finish: Paint with white enamel or lacquer.
- C. Terminal Blocks:
 1. Separate connection point for each conductor entering or leaving box.
 2. Spare Terminal Points: 25 percent, minimum.

2.06 METAL WIREWAYS

- A. Meet requirements of UL 870.
- B. Type: Steel-enclosed, lay-in type.
- C. Cover: Hinged with friction latch.
- D. Rating: Outdoor raintight.
- E. Finish: Rust inhibiting phosphatizing primer and gray baked enamel.
- F. Hardware: Plated to prevent corrosion; screws installed toward the inside protected by spring nuts or otherwise guarded to prevent wire insulation damage.
- G. Knockouts: Without knockouts, unless otherwise indicated.
- H. Manufacturers:
 1. Circle AW.
 2. Hoffman.
 3. Square D.

2.07 CABLE TRAYS

- A. Meet requirements of NEMA VE 1.
- B. Type: Ladder of welded construction.
- C. Material: Copper-free aluminum alloy 6063-T6 finish.

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- D. Dimensions: 18 inches wide, with 6-inch NEMA nominal inside fill depth and fittings with 24 inch bending radius.
- E. Barrier Strip: Vertical, solid type, with horizontal fittings and strip clamps.
- F. Fittings of same material as cross-sectional tray area and hardware of same material as cable tray.
- G. Tray Grounding: Conform to NFPA 70 and NEMA VE 1.
- H. Provide next higher NEMA VE 1 class designation than required for support of designed span length.
- I. Design Loads: Use working load adequate for actual cable installed plus 10 percent additional weight allowance for future cables with safety factor of 2 in accordance with NEMA VE 1, Table 3-1.
- J. Expansion Joints: NEMA VE 1 for 25 degrees F maximum temperature variation.
- K. Furnish cable tray with no sharp edges, burrs, or weld projections.
- L. Warning Signs: 1-1/2-inch high black lettering on yellow background with legend, "WARNING, NOT TO BE USED AS WALKWAY, LADDER, OR SUPPORT FOR LADDERS OR PERSONNEL."
- M. Manufacturers:
 - 1. B-Line Systems, Inc.
 - 2. Square-D.
 - 3. P. W. Industries.
 - 4. T. J. Cope, Inc.

2.08 ACCESSORIES

- A. Identification Devices:
 - 1. Raceway Tags:
 - a. Material: Permanent, nonferrous metal.
 - b. Shape: Round.
 - c. Raceway Designation: Pressure stamped, embossed, or engraved.
 - d. Tags relying on adhesives or taped-on markers not permitted.
 - 2. Warning Tape:
 - a. Material: Polyethylene, 4-mil gauge with detectable strip.
 - b. Color: Red.
 - c. Width: Minimum 6 inches.

- d. Designation: Warning on tape that electric circuit is located below tape.
- e. Identifying Letters: Minimum 1-inch-high permanent black lettering imprinted continuously over entire length.
- f. Manufacturers and Products:
 - 1) Panduit; Type HTDU.
 - 2) Reef Industries; Terra Tape.
- 3. Buried Raceway Marker:
 - a. Material: Sheet bronze, consisting of double-ended arrows, straight for straight runs and bent at locations where runs change direction.
 - b. Designation: Engrave to depth of 3/32 inch; ELECTRIC CABLES, in letters 1/4-inch high.
 - c. Minimum Dimension: 1/4 inch thick, 10 inches long, and 3/4 inch wide.

PART 3 EXECUTION

3.01 GENERAL

- A. Conduit and tubing sizes shown are based on use of copper conductors. Reference Section 16120, Conductors, concerning conduit sizing for aluminum conductors.
- B. Comply with NECA Installation Standards.
- C. Crushed or deformed raceways not permitted.
- D. Maintain raceway entirely free of obstructions and moisture.
- E. Immediately after installation, plug or cap raceway ends with watertight and dust-tight seals until time for pulling in conductors.
- F. Aluminum Conduit: Do not install in direct contact with concrete. Install in PVC sleeve or cored hole through concrete walls and slabs.
- G. Sealing Fittings: Provide drain seal in vertical raceways where condensate may collect above sealing fitting.
- H. Avoid moisture traps where possible. When unavoidable in exposed conduit runs, provide junction box and drain fitting at conduit low point.
- I. Group raceways installed in same area.
- J. Proximity to Heated Piping: Install raceways minimum 12 inches from parallel runs.

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- K. Follow structural surface contours when installing exposed raceways. Avoid obstruction of passageways.
- L. Run exposed raceways parallel or perpendicular to walls, structural members, or intersections of vertical planes.
- M. Block Walls: Do not install raceways in same horizontal course or vertical cell with reinforcing steel.
- N. Install watertight fittings in outdoor, underground, or wet locations.
- O. Paint threads and cut ends, before assembly of fittings, galvanized conduit, PVC-coated galvanized conduit, or IMC installed in exposed or damp locations with zinc-rich paint or liquid galvanizing compound.
- P. Metal conduit shall be reamed, burrs removed, and cleaned before installation of conductors, wires, or cables.
- Q. Do not install raceways in concrete equipment pads, foundations, or beams without Engineer approval.
- R. Horizontal raceways installed under floor slabs shall lie completely under slab, with no part embedded within slab.
- S. Install concealed, embedded, and buried raceways so that they emerge at right angles to surface and have no curved portion exposed.

3.02 REUSE OF EXISTING CONDUITS

- A. Where Drawings indicate existing conduits may be reused, they may be reused only where they meet the following criteria.
 - 1. Conduit is in useable condition with no deformation, corrosion, or damage to exterior surface.
 - 2. Conduit is sized per the NEC.
 - 3. Conduit is of the type specified in Contract Documents.
 - 4. Conduit is supported as specified in Contract Documents.
- B. Conduit shall be reamed with wire brush, then with a mandrel approximately 1/4-inch smaller than raceway inside diameter then cleaned prior to pulling new conductors.

3.03 CONDUIT APPLICATION

- A. Diameter: Minimum 3/4 inch.
- B. Exterior, Exposed: Rigid aluminum.

- C. Interior, Exposed: Rigid aluminum.
- D. Interior, Concealed (Not Embedded in Concrete): Rigid aluminum.
- E. Aboveground, Embedded in Concrete Walls, Ceilings, or Floors: Rigid galvanized steel.
- F. Direct Earth Burial: PVC-coated rigid galvanized steel.
- G. Concrete-Encased Ductbank: PVC-Coated Rigid Galvanized Steel for dc circuits.
- H. Under Slabs-On-Grade: Rigid galvanized steel.
- I. Transition from Underground or Concrete Embedded to Exposed: Rigid galvanized steel conduit.
- J. Under Equipment Mounting Pads: Rigid galvanized steel conduit.
- K. Exterior Light Pole Foundations: Rigid galvanized steel conduit.
- L. Corrosive Areas: PVC-coated rigid galvanized steel.
- M. Hazardous Gas Areas: Rigid galvanized steel.

3.04 FLEXIBLE CONNECTIONS

- A. For motors, wall or ceiling mounted fans and unit heaters, dry type transformers, electrically operated valves, instrumentation, and other locations approved by Engineer where flexible connection is required to minimize vibration:
 - 1. Conduit Size 4 Inches or Less: Flexible, liquid-tight conduit.
 - 2. Conduit Size Over 4 Inches: Nonflexible.
 - 3. Wet or Corrosive Areas: Flexible metal, liquid-tight.
 - 4. Dry Areas: Flexible, metallic liquid-tight.
 - 5. Hazardous Areas: Flexible coupling suitable for Class I, Division 1 and 2 areas.
- B. Suspended Lighting Fixtures in Dry Areas: Flexible steel, nonliquid-tight conduit.
- C. Outdoor Areas, Process Areas Exposed to Moisture, and Areas Required to be Oiltight and Dust-Tight: Flexible metal, liquid-tight conduit.
- D. Flexible Conduit Length: 18 inches minimum, 60 inches maximum; sufficient to allow movement or adjustment of equipment.

3.05 PENETRATIONS

- A. Make at right angles, unless otherwise shown.
- B. Notching or penetration of structural members, including footings and beams, not permitted.
- C. Fire-Rated Walls, Floors, or Ceilings: Firestop openings around penetrations to maintain fire-resistance rating as specified in Section 16050, Basic Electrical Materials and Methods.
- D. Apply heat shrinkable tubing or single layer of wraparound duct band to metallic conduit protruding through concrete floor slabs to a point 2 inches above and 2 inches below concrete surface.
- E. Concrete Walls, Floors, or Ceilings (Aboveground): Provide nonshrink grout dry-pack, or use watertight seal device.
- F. Entering Structures:
 - 1. General: Seal raceway at first box or outlet with oakum or expandable plastic compound to prevent entrance of gases or liquids from one area to another.
 - 2. Concrete Roof or Membrane Waterproofed Wall or Floor:
 - a. Provide a watertight seal.
 - b. Without Concrete Encasement: Install watertight entrance seal device on each side.
 - c. With Concrete Encasement: Install watertight entrance seal device on accessible side.
 - d. Securely anchor malleable iron body of watertight entrance seal device into construction with one or more integral flanges.
 - e. Secure membrane waterproofing to watertight entrance seal device in a permanent, watertight manner.
 - 3. Heating, Ventilating, and Air Conditioning Equipment:
 - a. Penetrate equipment in area established by manufacturer.
 - b. Terminate conduit with flexible metal conduit at junction box or conduit attached to exterior surface of equipment prior to penetrating equipment.
 - 4. Existing or Precast Wall (Underground): Core drill wall and install watertight entrance seal device.
 - 5. Nonwaterproofed Wall or Floor (Underground, without Concrete Encasement):
 - a. Provide Schedule 40 galvanized pipe sleeve, or watertight entrance seal device.
 - b. Fill space between raceway and sleeve with expandable plastic compound or oakum and lead joint, on each side.

3.06 SUPPORT

- A. Support from structural members only, at intervals not exceeding NFPA 70 requirements. Do not exceed 10 feet in any application. Do not support from piping, pipe supports, or other raceways.
- B. Multiple Adjacent Raceways: Provide ceiling trapeze.
- C. Application/Type of Conduit Strap:
 - 1. Aluminum Conduit: Aluminum or stainless steel.
 - 2. Rigid Steel Conduit: Zinc coated steel, pregalvanized steel or malleable iron.
 - 3. PVC-Coated Rigid Steel Conduit: PVC-coated metal.
 - 4. Nonmetallic Conduit: Nonmetallic or PVC-coated metal.
- D. Provide and attach wall brackets, strap hangers, or ceiling trapeze as follows:
 - 1. Wood: Wood screws.
 - 2. Hollow Masonry Units: Toggle bolts.
 - 3. Concrete or Brick: Expansion shields, or threaded studs driven in by powder charge, with lock washers and nuts.
 - 4. Steelwork: Machine screws.
 - 5. Location/Type of Hardware:
 - a. Dry, Noncorrosive Areas: Galvanized.
 - b. Wet, Noncorrosive Areas: Stainless steel.
 - c. Corrosive Areas: Stainless steel.
- E. Nails or wooden plugs inserted in concrete or masonry for attaching raceway not permitted. Do not weld raceways or pipe straps to steel structures. Do not use wire in lieu of straps or hangers.
- F. Support aluminum conduit on concrete surfaces with stainless steel or nonmetallic spacers, or aluminum or nonmetallic framing channel.

3.07 BENDS

- A. Install concealed raceways with a minimum of bends in the shortest practical distance.
- B. Make bends and offsets of longest practical radius. Bends in conduits and ducts being installed for fiber optic cables shall be not less than 20 times cable diameter, 15 inches minimum.
- C. Install with symmetrical bends or cast metal fittings.

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- D. Avoid field-made bends and offsets, but where necessary, make with acceptable hickey or bending machine. Do not heat metal raceways to facilitate bending.
- E. Make bends in parallel or banked runs from same center or centerline with same radius so that bends are parallel.
- F. Factory elbows may be installed in parallel or banked raceways if there is change in plane of run, and raceways are same size.
- G. PVC Conduit:
 - 1. Bends 30 Degrees and Larger: Provide factory-made elbows.
 - 2. 90-Degree Bends: Provide rigid steel elbows, PVC-coated where direct buried.
 - 3. Use manufacturer's recommended method for forming smaller bends.
- H. Flexible Conduit: Do not make bends that exceed allowable conductor bending radius of cable to be installed or that significantly restricts conduit flexibility.

3.08 EXPANSION/DEFLECTION FITTINGS

- A. Provide on raceways at structural expansion joints and in long tangential runs.
- B. Provide expansion/deflection joints for 25 degrees F maximum temperature variation.
- C. Install in accordance with manufacturer's instructions.

3.09 PVC CONDUIT

- A. Solvent Welding:
 - 1. Apply manufacturer recommended solvent to joints.
 - 2. Install in order that joint is watertight.
- B. Adapters:
 - 1. PVC to Metallic Fittings: PVC terminal type.
 - 2. PVC to Rigid Metal Conduit or IMC: PVC female adapter.
- C. Belled-End Conduit: Bevel unbelled end of joint prior to joining.

3.10 PVC-COATED RIGID STEEL CONDUIT

- A. Install in accordance with manufacturer's instructions.
- B. Tools and equipment used in cutting, bending, threading and installation of PVC-coated rigid conduit shall be designed to limit damage to PVC coating.
- C. Provide PVC boot to cover exposed threading.

3.11 WIREWAYS

- A. Install in accordance with manufacturer's instructions.
- B. Locate with cover on accessible vertical face of wireway, unless otherwise shown.
- C. Applications:
 - 1. Metal wireway in indoor dry locations.
 - 2. Nonmetallic wireway in indoor wet, outdoor, and corrosive locations.

3.12 CABLE TRAYS

- A. Install in accordance with NEMA VE 1, section Application Information.
- B. Install accessories as necessary for complete system.
- C. Install in order that joints are not made at support brackets.
- D. Install horizontal section support brackets between support point and quarter point of tray span.
- E. Provide ceiling trapeze for horizontal cable tray.
- F. Install support within 2 feet on each side of expansion joints and within 2 feet of fitting extremity.
- G. Provide expansion joints in accordance with NEMA VE 1 for 25 degrees F maximum temperature variation.
- H. Install horizontal tray level, plumb, straight, and true to line or grade within a tolerance of 1/8-inch in 10 feet and within a cumulative maximum of 1/2 inch.
- I. Install vertical tray plumb within a tolerance of 1/8-inch in 10 feet.
- J. Install without exposed raw edges.

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- K. Provide bonding jumper at each expansion joint and adjustable connection.
- L. Ground Conductor: Provide properly sized clamps for each section, elbow, tee, cross, and reducer.

3.13 TERMINATION AT ENCLOSURES

- A. Cast Metal Enclosure: Install manufacturer's premolded insulating sleeve inside metallic conduit terminating in threaded hubs.
- B. Nonmetallic, Cabinets, and Enclosures:
 - 1. Terminate conduit in threaded conduit hubs, maintaining enclosure integrity.
 - 2. Metallic Conduit: Provide ground terminal for connection to maintain continuity of ground system.
- C. Sheet Metal Boxes, Cabinets, and Enclosures:
 - 1. General:
 - a. Install insulated bushing on ends of conduit where grounding is not required.
 - b. Provide insulated throat when conduit terminates in sheet metal boxes having threaded hubs.
 - c. Utilize sealing locknuts or threaded hubs on sides and bottom of NEMA 3R and NEMA 12 enclosures.
 - d. Terminate conduits at threaded hubs at the tops of NEMA 3R and NEMA 12 boxes and enclosures.
 - e. Terminate conduits at threaded conduit hubs at NEMA 4 and NEMA 4X boxes and enclosures.
 - 2. Rigid Galvanized or Aluminum Conduit:
 - a. Provide one lock nut each on inside and outside of enclosure.
 - b. Install grounding bushing at source enclosure.
 - c. Provide bonding jumper from grounding bushing to equipment ground bus or ground pad.
 - 3. Flexible Metal Conduit: Provide two screw type, insulated, malleable iron connectors.
 - 4. Flexible, Nonmetallic Conduit: Provide nonmetallic, liquid-tight strain relief connectors.
 - 5. PVC-Coated Rigid Galvanized Steel Conduit: Provide PVC-coated, liquid-tight, metallic connector.
 - 6. PVC Schedule 40 Conduit: Provide PVC terminal adapter with lock nut, except where threaded hubs required above.

D. Motor Control Center and Free-Standing Enclosures:

1. Terminate metal conduit entering bottom with grounding bushing; provide grounding jumper extending to equipment ground bus or grounding pad.
2. Terminate PVC conduit entering bottom with bell end fittings.

3.14 OUTLET AND DEVICE BOXES

A. General:

1. Install plumb and level.
2. Install suitable for conditions encountered at each outlet or device in wiring or raceway system, sized to meet NFPA 70 requirements.
3. Open no more knockouts in sheet steel device boxes than are required; seal unused openings.
4. Install galvanized mounting hardware in industrial areas.

B. Size:

1. Depth: Minimum 2 inches, unless otherwise required by structural conditions. Box extensions not permitted.
 - a. Hollow Masonry Construction: Install with sufficient depth such that conduit knockouts or hubs are in masonry void space.
2. Ceiling Outlet: Minimum 4-inch octagonal device box, unless otherwise required for installed fixture.
3. Switch and Receptacle: Minimum 2-inch by 4-inch device box.

C. Locations:

1. Drawing locations are approximate.
2. To avoid interference with mechanical equipment or structural features, relocate outlets as directed by Engineer.
3. Light Fixture: Install in symmetrical pattern according to room layout, unless otherwise shown.

D. Mounting Height:

1. General:
 - a. Dimensions given to centerline of box.
 - b. Where specified heights do not suit building construction or finish, adjust up or down to avoid interference.
 - c. Do not straddle CMU block or other construction joints.
2. Light Switch:
 - a. 48 inches above floor.
 - b. When located next to door, install on lock side of door.

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3. Thermostat: 54 inches above floor.
 4. Convenience Receptacle:
 - a. General Interior Areas: 15 inches above floor.
 - b. General Interior Areas (Counter Tops): Install device plate bottom or side flush with top of backsplash, or 6 inches above counter tops without backsplash.
 - c. Outdoor Areas: 24 inches above finished grade.
- E. Flush Mounted:
1. Install with concealed conduit.
 2. Install proper type extension rings or plaster covers to make edges of boxes flush with finished surface.
 3. Holes in surrounding surface shall be no larger than required to receive box.
- F. Supports:
1. Support boxes independently of conduit by attachment to building structure or structural member.
 2. Install bar hangers in frame construction or fasten boxes directly as follows:
 - a. Wood: Wood screws.
 - b. Concrete or Brick: Bolts and expansion shields.
 - c. Hollow Masonry Units: Toggle bolts.
 - d. Steelwork: Machine screws.
 3. Threaded studs driven in by powder charge and provided with lock washers and nuts are acceptable in lieu of expansion shields.
 4. Provide plaster rings where necessary.
 5. Boxes embedded in concrete or masonry need not be additionally supported.
- G. Install separate junction boxes for flush or recessed lighting fixtures where required by fixture terminal temperature.
- H. Boxes Supporting Fixtures: Provide means of attachment with adequate strength to support fixture

3.15 JUNCTION AND PULL BOXES

- A. General:
1. Install plumb and level.
 2. Installed boxes shall be accessible.
 3. Do not install on finished surfaces.

4. Use outlet boxes as junction and pull boxes wherever possible and allowed by applicable codes.
5. Use conduit bodies as junction and pull boxes where no splices are required and allowed by applicable codes.
6. Install pull boxes where necessary in raceway system to facilitate conductor installation.
7. Install where shown and where necessary to terminate, tap-off, or redirect multiple conduit runs.
8. Install in conduit runs at least every 150 feet or after the equivalent of three right-angle bends.

B. Flush Mounted:

1. Install with concealed conduit.
2. Holes in surrounding surface shall be no larger than required to receive box.
3. Make edges of boxes flush with final surface.

C. Mounting Hardware:

1. Noncorrosive Dry Areas: Galvanized.
2. Noncorrosive Wet Areas: Stainless steel.
3. Corrosive Areas: Stainless steel.

D. Supports:

1. Support boxes independently of conduit by attachment to building structure or structural member.
2. Install bar hangers in frame construction or fasten boxes directly as follows:
 - a. Wood: Wood screws.
 - b. Concrete or Brick: Bolts and expansion shields.
 - c. Hollow Masonry Units: Toggle bolts.
 - d. Steelwork: Machine screws.
3. Threaded studs driven in by powder charge and provided with lock washers and nuts are acceptable in lieu of expansion shields.
4. Boxes embedded in concrete or masonry need not be additionally supported.

E. At or Below Grade:

1. Install boxes for below grade conduit flush with finished grade in locations outside of paved areas, roadways, or walkways.
2. If adjacent structure is available, box may be mounted on structure surface just above finished grade in accessible but unobtrusive location.

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3. Obtain Engineer's written acceptance prior to installation in paved areas, roadways, or walkways.
4. Use boxes and covers suitable to support anticipated weights.

F. Install Drain/breather fittings in NEMA 250 Type 4 and Type 4X enclosures.

3.16 IDENTIFICATION DEVICES

A. Raceway Tags:

1. Identify origin and destination.
2. For exposed raceways, install tags at each terminus, near midpoint, and at minimum intervals of every 50 feet, whether in ceiling space or surface mounted.
3. Install tags at each terminus for concealed raceways.
4. Provide noncorrosive wire for attachment.

B. Warning Tape: Install approximately 12 inches above underground or concrete-encased raceways. Align parallel to, and within 12 inches of, centerline of run.

3.17 PROTECTION OF INSTALLED WORK

- A. Protect products from effects of moisture, corrosion, and physical damage during construction.
- B. Provide and maintain manufactured watertight and dust-tight seals over conduit openings during construction.
- C. Touchup painted conduit threads after assembly to cover nicks or scars.
- D. Touchup coating damage to PVC-coated conduit with patching compound approved by manufacturer. Compound shall be kept refrigerated according to manufacturers' instructions until time of use.

END OF SECTION

**SECTION 16230
DIESEL ENGINE GENERATOR SET**

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. ASTM International (ASTM): A335/A335M, Specification for Seamless Ferritic Alloy-Steel Pipe for High-Temperature Service.
2. California Air Resources Board (CARB).
3. Code of Federal Regulations (CRF): Title 40 Volume 18, Control of Emissions from New and In-Use Non-road Compression-Ignition Engines.
4. International Organization for Standardization (DIN/ISO): 9001, Quality Management Systems—Fundamentals and Vocabulary.
5. National Electric Manufacturer's Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1,000 Volts Maximum).
 - b. MG 1, Motors and Generators.
6. National Electrical Contractors Association (NECA): 404, Recommended Practice for Installing Generator Sets.
7. National Fire Protection Association (NFPA):
 - a. 37, Installation and Use of Stationary Combustion Engines and Gas Turbines.
 - b. 70, National Electric Code.
 - c. 110, Emergency and Standby Power Systems.
8. SAE International (SAE): J1074, Engine Sound Level Measurement.
9. UL:
 - a. 142, Steel Aboveground Tanks for Flammable and Combustible Liquids.
 - b. 508, Industrial Control Equipment.
 - c. 1236, Battery Chargers for Charging Engine-Starter Batteries.
 - d. 2085, Protected Aboveground Tanks for Flammable and Combustible Liquids.
 - e. 2200, Stationary Engine Generator.

1.02 SUBMITTALS

A. Action Submittals:

1. Dimensioned outline Drawing showing plan and elevations of engine generator set and drive system.

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2. Paragraph by paragraph specification compliance statement, describing differences between specified and proposed equipment.
3. Engine and generator weight, and anchoring requirements.
4. Catalog information and technical description; include materials for block, heads, valves, rings, cylinders, pistons, crankshaft, and major bearings and wear surfaces.
5. Complete list of accessories provided.
6. Performance curves showing engine efficiency (fuel consumed per kWh output), gross fuel consumption rate, and kW output at design rated output, one-half load, and one-quarter load. Account for design altitude, temperature corrections, and engine parasitic loads.
7. Transient and subtransient reactances per unit.
8. Output waveform and telephone interference factor (TIF).
9. Circuit breaker data, including make model, catalog number, settings, and time current curves and enclosure size.
10. Cable termination lug data sheets.
11. Control panel instrument identification inscriptions.
12. Sample guarantee.
13. Electrical schematic and wiring diagrams for the following:
 - a. Generator control panel.
 - b. Main generator.
 - c. Voltage regulator.
 - d. Battery charging system.
 - e. Governing system.
 - f. Interconnection wiring diagram for automatic transfer switch specified in Section 16412, Automatic Transfer Switch.
 - g. Enclosed electrical components.
 - h. Load bank.
14. Engine generator set motor starting capability and percent voltage dip curve.
15. Block heater size and voltage.
16. Jacket water heater size and voltage.
17. Subbase tank size and dimensions.
18. Noise data for enclosed engine generator at 50 percent, 75 percent, and full load.
19. Exhaust system silencer pipe supports.
20. Load bank data.
21. Anchorage and bracing Drawings and cut sheets as required by Section 01611, Anchorage and Bracing.
22. Generator sizing analysis.

B. Informational Submittals:

1. Anchorage and bracing calculations as required by Section 01611, Anchorage and Bracing.
2. Generator set manufacturer qualifications.
3. Generator set UL 2200 certification documentation or independent certification.
4. Manufacturer's Certificate of compliance with specified EPA emissions requirements and in accordance with Section 01640, Manufacturers' Services.
5. Certification, copies of analyses, or test reports demonstrating appropriate vibration analysis and design in all modes.
6. Certified Factory Test Report.
7. Operation and Maintenance Data: As specified in Section 01730, Operation and Maintenance Data.
8. Description of parts and service availability.
9. Manufacturer's Certificate of Proper Installation, in accordance with Section 01640, Manufacturers' Services.
10. Special guarantee.

1.03 QUALITY ASSURANCE

A. Authority Having Jurisdiction (AHJ):

1. Provide Work in accordance with NFPA 70, National Electrical Code (NEC). Where required by the AHJ, provide material and equipment labeled or listed by a nationally recognized testing laboratory or other organization acceptable to the AHJ to provide a basis for approval under NEC.
2. Provide materials and equipment manufactured within the scope of standards published by UL in conformance with those standards documented with an applied UL listing mark.

B. Manufacturer Special Requirements:

1. Generator Set: Listed to UL 2200 or submitted to an independent third party certification process to verify compliance as installed.
2. Generator Set Manufacturer: Certified to ISO 9001 with third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

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1.04 SPECIAL GUARANTEE

- A. Provide manufacturer's guarantee or warranty with no deductibles and including travel time, service hours, repair parts and expendables (oil, filters, antifreeze and other items required for the complete repair) with Owner named as beneficiary, in writing, as special guarantee. Special guarantee shall provide for correction of the Work specified in this Specification section found defective during a period of 5 years after the date of Substantial Completion. Duties and obligations for correction or removal and replacement of defective Work as specified in the General Conditions.

1.05 EXTRA MATERIALS

- A. Furnish, tag, and box for shipment and storage the following spare parts and special tools:

Item	Quantity
Diesel fuel line filter elements	3 complete sets per unit
Lubricating oil filter elements with gasket	3 complete sets per unit
Air cleaner filter element	1 complete set per unit
Cooling fan drive belt (if applicable)	2 complete sets per unit
Hydrometer	1 each
Two-pronged battery voltmeter	1 each
Spare fuses, if used in control panel	1 complete set per unit
Spare indicating lamps (if applicable)	4 each type used per unit
Touch up paint	1 quart each color used
Special tools required to maintain or dismantle engine generator set	1 complete set for each different size unit

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Materials and equipment specified in this section shall be products of:
1. Kohler Power Series.
 2. Caterpillar.
 3. Cummins.

2.02 SERVICE CONDITIONS

- A. Ambient Temperature at Air Intake: 105 degrees F maximum.
- B. Ambient Temperature at Engine Generator Set: 105 degrees F maximum.

2.03 GENERAL

- A. Ratings:
 - 1. Operate at 1800 rpm.
 - 2. Rating: See Drawings.
 - 3. Voltage: See Drawings.
 - 4. Rated based on standby service.
- B. Emissions:
 - 1. Engines: Meet emission requirements specified in 40 CFR Chapter I Part 89 for stationary Internal Combustion (IC) engines.

2.04 ENGINE

- A. General:
 - 1. Manufacturer's standard design, unless otherwise specified.
 - 2. Engine parts designed with adequate strength for specified duty.
- B. Type:
 - 1. Diesel Cycle, four-stroke type with unit mounted radiator and fan cooling.
 - 2. Minimum Number of Cylinders: As recommended by generator manufacturer.
- C. Starting System:
 - 1. Type: Automatic, using 12-volt or 24-volt battery-driven starter acting in response to control panel.
 - 2. Starter: Capable of three complete cranking cycles without overheating.
 - 3. Batteries:
 - a. Sized as recommended by engine manufacturer.
 - b. Lead-acid type.
 - c. Capable of providing 15 seconds minimum of cranking current at 0 degree C and three complete 15-second cranking cycles at 40 degrees C.

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- d. Housed in acid-resistant frame isolated from engine generator main frame.
- e. Located such that maintenance and inspection of engine is not hindered.
- f. Complete with battery cables and connectors.
- 4. Battery Charger:
 - a. UL 1236 listed and labeled.
 - b. 10-amp automatic float, taper and equalize charge type, with plus or minus 1 percent voltage regulation over a plus or minus 10 percent input voltage variation.
 - c. Temperature compensated to operate over an ambient range of minus 30 degrees C to 50 degrees C.
 - d. Located by generator manufacturer in automatic transfer switch, generator control panel, or wall mounted in generator enclosure.
 - e. Include:
 - 1) Ammeter and voltmeter.
 - 2) Fused ac input and dc output.
 - 3) Power ON pilot light.
 - 4) AC failure relay and light.
 - 5) Low and high dc voltage alarm relay and light.
 - f. Alarm relay dry contacts rated 4 amps at 120V ac.
 - g. Wire battery charger status and alarm contacts back to generator control panel, terminate and identify contacts.

D. Fuel System:

- 1. Engine driven, mechanical, positive displacement fuel pump.
- 2. Fuel filter with replaceable spin-on canister element.
- 3. Provide fuel cooler, suitable for operation of generator set at full rated load in ambient temperature specified if required for operation due to design of engine and installation.
- 4. As specified under Article Integral Subbase Fuel Tank.
- 5. Fuel Connections to Engine: Flexible hose, suitable for application.

E. Governing System:

- 1. Electro-mechanical or electro-hydraulic type.
- 2. Regulates speed as required to hold generating frequency within tolerable limits and within 5 percent of nominal design speed.
- 3. Accessories:
 - a. Manual speed control device.
 - b. Positive overspeed trip switch.

F. Jacket Water Cooling System:

1. Radiator:
 - a. Consisting of jacket water pump, fan assembly, fan guard, and duct flange outlet.
 - b. Cooling System: Rated for full load operation in 122 degrees F (50 degrees C) ambient as measured at alternator air inlet.
 - c. Fan: Suitable for use in a system with 0.5 in H₂O restriction.
 - d. Sized based on a core temperature that is 20 degrees F higher than rated operation temperature.
2. Engine Thermostat: As recommended by manufacturer to regulate engine water temperature.
3. Jacket Water Heater:
 - a. Suitable for operation on 120-volt, single-phase, 60-Hz current.
 - b. Maintain engine water temperature at 120 degrees F with an ambient temperature of 50 degrees F.
 - c. Thermostatically controlled.
4. Engine Cooling Liquid: Fill cooling system with a 50/50-ethylene glycol/water mixture prior to shipping.

G. Lubrication System:

1. Type: Full-pressure.
2. Accessories:
 - a. Pressure switch to initiate shutdown on low oil pressure.
 - b. Oil filter with replaceable element.
 - c. Bayonet type oil level stick.
 - d. Valved oil drain extension.
3. Oil Cooling System (if required): Water-cooled heat exchanger utilizing jacket water.

H. Exhaust System:

1. Muffler: Rated for Critical Grade.
2. Exhaust Pipe: ASTM A335, Grade P11, standard wall, with fittings selected to match piping materials.
3. Pipe Connections: Welded.
4. Engine Connection:
 - a. Flanged, flexible, corrugated, Type 321 stainless steel expansion fitting, specifically suited for diesel exhaust service.
 - b. Length as required for flexibility and expansion in piping arrangement shown on Drawings.

I. Air Intake System: Equip with dry type air cleaner with filter service (restriction) indicator.

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2.05 GENERATOR

A. General:

1. Meet requirements of NEMA MG 1.
2. Synchronous type with 2/3 pitch, revolving field, drip-proof construction, air cooled by a direct drive centrifugal blower fan.
3. Stator Windings:
 - a. Skewed for smooth voltage waveform.
 - b. Reconnectable, 12 lead.
4. Overspeed Capability: 125 percent.
5. Waveform Deviation from Sine Wave: 5 percent maximum.
6. Telephone Interference Factor: 50 maximum.
7. Total Harmonic Current and Voltage Distortion: 5 percent maximum, measured at generator main circuit breaker.

B. Insulation System:

1. Class H, with a maximum rise of 125 degrees C over 40 degree C ambient in accordance with NEMA MG 1.
2. Vacuum pressure impregnated (VPI) fungus resistant in accordance with MIL E-4970A.

C. Excitation System:

1. Field brushless type or permanent magnet generator (PMG) exciter.
2. PMG and Controls: Capable of providing regulated current, at a rate of 300 percent of nameplate current, to a single-phase or three-phase fault for 10 seconds.

D. Voltage Regulation:

1. Solid state, three-phase sensing type.
2. Adjustable output voltage level to plus or minus 5 percent.

E. Voltage and Frequency Regulation Performance:

1. Steady State Voltage Regulation: Less than plus or minus 1 percent from no load to continuous rating point.
2. NEMA MG 1 Defined Transient Voltage Dip:
 - a. Less than 20 percent at rapid application of rated load.
 - b. Recovery to rated voltage and frequency within 2 seconds following initial load application.
3. Steady State Frequency Regulation: Plus or minus 1.5-Hz overload range.

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F. Motor Starting Capability:

1. Allatoona Beach Pump Station: 100KW, 120/240V, 3PH (See Drawings for Generator size chart) is minimum required. Generator vendor shall provide unit suitable for loads listed below. Apply loads in the order listed in the following table:

Load Table					
Step	Load Description	Rating	Type (Hp, Kw, Amps)	Starting Type	Largest Motor
1	Misc. load	5	KW		
2	Pump 1	30	HP	FVNR	
3	Pump 2	30	HP	FVNR	

2. West Hampton #2 Pump Station: 20KW, 240V/120V, 1PH (See Drawings for Generator size chart) is minimum required. Generator vendor shall provide unit suitable for loads listed below. Apply loads in the order listed in the following table:

Load Table					
Step	Load Description	Rating	Type (Hp, Kw, Amps)	Starting Type	Largest Motor
1	Misc. load	5	KW		
2	Pump 1 (3 PH)	2.7	HP	FVNR	
3	Pump 2 (3 PH)	2.7	HP	FVNR	

3. Plant Atkinson Pump Station: 125KW, 480/277V, 3PH (See Drawings for Generator size chart) is minimum required. Generator vendor shall provide unit suitable for loads listed below. Apply loads in the order listed in the following table:

Load Table					
Step	Load Description	Rating	Type (Hp, Kw, Amps)	Starting Type	Largest Motor
1	Misc. load	5	KW		
2	Pump 1	45	HP	FVNR	
3	Pump 2	45	HP	FVNR	

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4. Wood Valley Pump Station: 40KW, 240/120V, 3PH (See Drawings for Generator size chart) is minimum required. Generator vendor shall provide unit suitable for loads listed below. Apply loads in the order listed in the following table:

Load Table					
Step	Load Description	Rating	Type (Hp, Kw, Amps)	Starting Type	Largest Motor
1	Misc. load	5	KW		
2	Pump 1	10	HP	FVNR	
3	Pump 2	10	HP	FVNR	

5. West Hampton #1 Pump Station: 50KW, 240/120V, 3PH (See Drawings for Generator size chart) is minimum required. Generator vendor shall provide unit suitable for loads listed below. Apply loads in the order listed in the following table:

Load Table					
Step	Load Description	Rating	Type (Hp, Kw, Amps)	Starting Type	Largest Motor
1	Misc. load	5	KW		
2	Pump 1	15	HP	FVNR	
3	Pump 2	15	HP	FVNR	

6. Brushy Mountain Water Pump Station: 125KW, 480/277V, 3PH (See Drawings for Generator size chart) is minimum required. Generator vendor shall provide unit suitable for loads listed below. Pump 2 is standby pump and shall not be included. Apply loads in the order listed in the following table:

Load Table					
Step	Load Description	Rating	Type (Hp, Kw, Amps)	Starting Type	Largest Motor
1	Misc. load	10	KW		
2	Pump 1	40	HP	FVNR	
3	Pump 2 (Standby)	40	HP	FVNR	
4	Pump 3	10	HP	FVNR	

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7. Marina Trace Pump Station: 40KW, 480/277V, 3PH (See Drawings for Generator size chart) is minimum required. Generator vendor shall provide unit suitable for loads listed below. Apply loads in the order listed in the following table:

Load Table					
Step	Load Description	Rating	Type (Hp, Kw, Amps)	Starting Type	Largest Motor
1	Misc. load	5	KW		
2	Pump 1	10	HP	FVNR	
3	Pump 2	10	HP	FVNR	

- G. Short Circuit Capabilities: Sustain 300 percent of rated current for 10 seconds for external three-phase bolted fault without exceeding rated temperatures.
- H. Main Circuit Breaker:
1. Type: Molded case.
 2. Current Rating: As recommended by generator manufacturer.
 3. Interrupt Rating:
 - a. 65,000 amps RMS symmetrical at 480 volts.
 - b. 42,000 amps RMS symmetrical at 240 volts.
 4. Short Time Rating: 35000 amps RMS symmetrical.
 5. Compression lugs for all feeder conductors including neutral and ground.
 6. Trips: Thermal-magnetic with inverse time characteristics and adjustable magnetic pickup.
 7. Enclosure:
 - a. Rating: NEMA 250, Type 12.
 - b. Mounted with vibration isolation from engine generator set.
 8. Surge Protective Devices: Three-phase capacitors and arresters mounted in terminal compartment.

2.06 BASEPLATE

- A. Mount engine generator set on a rigid common steel base frame.
- B. Stiffen base frame to minimize deflections.

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2.07 INTEGRAL SUBBASE FUEL TANK

A. General:

1. Full load operation of generator set for 24 hours.
2. UL 142 listed and labeled.
3. Installation: In compliance with NFPA 37.
4. Double-walled, steel construction including the following features:
 - a. Emergency tank and basin vents.
 - b. Mechanical level gauge.
 - c. Fuel supply and return lines, connected to generator set with flexible fuel lines as recommended by engine manufacturer and in compliance to UL 2200 and NFPA 37 requirements.
 - d. Leak detection provisions, wired to generator set control for local and remote alarm indication.
 - e. High and low level float switches to indicate fuel level. Wire switches to generator control for local and remote indication of fuel level.
 - f. Basin drain.
 - g. Integral lifting provisions.
 - h. Overfill Prevention Valve: An overfill prevention valve must be installed at the fill port of the generator subbase tank. The valve shall prevent tank overfills by closing when the liquid reaches a pre-set 95% fuel level. Install the appropriate size valve that has a built-in venting mechanism that allows for filling hose pressure to be relieved after valve shuts. Install valve per manufacturer recommendation.

2.08 VIBRATION ISOLATORS

- A. Performance: Meet code requirements..
- B. Provide vibration isolators, spring/pad type.
- C. Include seismic restraints if required by Site location.

2.09 AUTOMATIC LOAD TRANSFER CONTROL

- A. Provide automatic run controls suitable for remote interface and control by automatic transfer switch. Engine generator set shall start and run upon closure of a remote dry contact provided in Section 16412, Automatic Transfer Switch.

2.10 CONTROL SYSTEM

- A. Control Panel:

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1. Rating: NEMA 250, Type 12.
2. Material: Steel.
3. Instrument Identification: Face label or engraved, black, laminated plastic nameplate with white 1/4-inch-high letters, attached with Type 422 stainless steel screws.
4. UL 508 listed.
5. Tested to meet or exceed IEEE 587 requirements for voltage surge resistance.
6. Controls: Solid-state, microprocessor based.
7. Control Panel: Designed and built by generator manufacturer to provide operating, monitoring, and control functions for generator set.
8. Control Panel Mounting Height: 6 feet 6 inches maximum above where personnel will access panel, modify mounting height if a sub-base fuel tank is used.

B. Instrumentation:

1. Type: Suitable for engine-mounted vibration environment.
2. Mounting: Nonshock mounted.
3. Alarm and Signal Contacts: Rated 5 amps at 120V ac, dry.
4. Fault Indication Lamps: Manufacturer's standard.
5. Meters: Digital with analog display, plus or minus 2 percent accuracy.

C. Operator Controls and Indicators:

1. HANDCRANK/STOP/AUTO/ENGINE TEST selector switch.
2. Generator voltage adjustment.
3. Voltmeter PHASE SELECTOR switch.
4. Ammeter PHASE SELECTOR switch.
5. Voltmeter.
6. Ammeter.
7. Kilo-Watts (kW).
8. FREQUENCY meter.
9. Engine OIL PRESSURE indicator.
10. Engine jacket WATER TEMPERATURE indicator.
11. Engine SPEED indicator (RPM).
12. Engine OIL TEMPERATURE indicator.
13. RUNNING TIME indicator.
14. DC battery voltage.
15. Emergency Stop button.

D. Alarm Indicators with Manual Pushbutton RESET:

1. Low oil pressure.
2. High jacket water temperature.

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3. Engine overspeed.
4. Engine overcrank.
5. Low/high dc voltage.

E. External Interfaces:

1. Furnish a single, common DPDT relay output upon occurrence of alarm condition.
2. Output: Dry contact rated 5 amps at 120V ac.
3. Accept remote dry start contact closure from automatic transfer switch, rated 10 amps at 32V dc.
4. PLC/SCADA Interface
 - a. Generator set interface to the PLC/SCADA system hardwired I/O shall include:
 - 1) PLC digital input – Generator Run Status.
 - 2) PLC digital input – Generator Fault.
 - 3) PLC digital input – Generator Low Fuel.

F. Functional Requirements:

1. LCD text display of alarm/event descriptions.
2. Recracking Lockout: When engine fires, starting control shall automatically disconnect cranking control to prevent recracking for a preset period of time after engine stop.
3. Overcranking Lockout: Initiate after four cranking cycles of 10 seconds on and 10 seconds off or provide continuous cranking cycle with crank time limiter.
4. Cooldown timer, adjustable from 5 minutes to 60 minutes.
5. Alarms:
 - a. Low coolant level.
 - b. Low fuel level.
 - c. Low battery voltage
 - d. High battery voltage.
 - e. Battery charger failure.
6. Engine shutdown upon any of the following conditions:
 - a. Engine overspeed.
 - b. Emergency stop button depressed.
 - c. High jacket water temperature alarm setpoint and shutdown setpoint.
 - d. Low oil pressure alarm setpoint and shutdown setpoint.
7. Air Inlet Damper Opening:
 - a. Upon engine start sequence initiation, a normally closed, dry contact, rated 5 amps at 120V ac, from engine start circuit shall open to provide a signal to open air inlet dampers.
 - b. Air Inlet Dampers: Fail open.

G. Special Requirements:

1. Mount battery charger in control panel.
2. Mount battery charger instrumentation on face of control panel and match generator instrumentation.

H. Power Requirements: Manufacturers stands internally connected.

2.11 OUTDOOR WEATHER-PROTECTIVE ENCLOSURE

A. General:

1. Provide generator set with outdoor enclosure, with entire package listed under UL 2200.
2. Package shall comply with requirements of NEC for wiring materials and component spacing.
3. Design total assembly of generator set, enclosure, and subbase fuel tank (when used) to be lifted into place using spreader bars.
4. Housing:
 - a. Provide ample airflow for generator set operation at rated load in ambient temperature of 100 degrees F.
 - b. Doors:
 - 1) Hinged access doors as required to maintain easy access for operating and service functions.
 - 2) Lockable and include retainers to hold door open during service.
 - 3) Able to open 180 degrees without obstruction, except rear control panel door, which must open at least 135 degrees.
5. Roof: Cambered to prevent rainwater accumulation.
6. Openings: Screened to limit rodent access into enclosure.
7. Make electrical power and control interconnections within perimeter of enclosure.
8. Finishes:
 - a. Prime sheet metal for corrosion protection and finish painted with manufacturer's standard color using a two-step electrocoating paint process, or equal meeting performance requirements specified below.
 - b. Prime and paint surfaces of metal parts. Minimum coating requirements:
 - 1) Primer: 0.5 mil to 2.0 mils thick.
 - 2) Top Coat: 0.8 mil to 1.2 mils thick.
 - 3) Gloss:
 - a) In accordance with ASTM D523, 80 percent plus or minus 5 percent.
 - b) Gloss Retention After 1 Year: 50 percent minimum.
 - 4) Crosshatch Adhesion: In accordance with ASTM D3359, 4B-5B.

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- 5) Impact Resistance: In accordance with ASTM D2794, 120-inch to 160-inch pounds.
 - 6) Salt Spray: In accordance with ASTM B117, plus 1,000 hours.
 - 7) Humidity: In accordance with ASTM D2247, plus 1,000 hours.
 - 8) Water Soak: In accordance with ASTM D2247, plus 1,000 hours.
- c. Do not paint hoses, clamps, wiring harnesses, and other nonmetallic service parts.
 - d. Provide corrosion-resistant fasteners designed to minimize marring of painted surface when removed for normal installation or service work.
9. Enclosure Minimum Steel Thickness: 12-gauge for framework and 14-gauge for panels.
10. Hardware and Hinges: Austenitic stainless steel.
11. Exhaust Silencer:
 - a. Install factory-mounted exhaust silencer inside enclosure.
 - b. Exhaust shall exit enclosure through a rain collar and terminate with a rain cap.
 - c. Provide seamless flexible exhaust connections to generator set.
12. Maintenance Provisions:
 - a. Flexible coolant and lubricating oil drain lines that extend to exterior of enclosure, with internal drain valves.
 - b. External radiator-fill provision.
 - c. External fuel fill provision (if equipped with a sub-based fuel tank).
13. Provide motorized louvers to minimize air flow through enclosure when generator set is not operating. Louvers shall include provisions to prevent accumulation of ice or snow that might prevent operation.
14. Provide rain hoods for inlet ducts.
15. Provide external emergency stop switch that is protected from accidental actuation.
16. Sound Attenuation:
 - a. Provide with sound-attenuated housing which allows generator set to operate at full rated load in an ambient temperature of up to 100 degrees F.
 - b. Design, provide, and install enclosure to reduce sound level of generator set while operating at full rated load to a maximum of 74 dBA for generator sets greater than 80 KW and 66 dBA for generator sets less than 80 KW at any location 7 meters from generator set in a free field environment when tested in accordance with SAE J1074.
 - c. Insulate enclosure with nonhygroscopic materials.

2.12 FACTORY FINISHING

- A. Engine Generator Set and Instrument Panel: Factory-applied primer and two finish coats of manufacturer's standard heat-resistant engine paint.

2.13 FACTORY TESTS

- A. General: Conform to NFPA 110.
- B. Steady Load Test: Test engine generator set at steady load run of 60 minutes minimum duration at 100 percent full-rated load.
- C. Transient Load Test: Conduct transient load test to demonstrate ability to meet load pickup and load release requirements specified.
- D. Harmonic Test: Conduct at full load conditions on the actual unit or one of the same model and size.
- E. Record and Report:
 - 1. Strip chart recording and full harmonic analysis measuring up to 50th harmonic for both voltage and current and three phases simultaneously.
 - 2. Transient response.
 - 3. Load/speed stability.
 - 4. Engine fuel consumption.
 - 5. Power output.
 - 6. Harmonic analysis.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Level and securely mount engine generator set in accordance with manufacturer's recommendations on existing concrete pads.
- B. Install in accordance with NECA 404.
- C. Where applicable, mount engine generator set on vibration isolators in accordance with isolator manufacturer's recommendations.

3.02 FIELD FINISHING

- A. Touch up damaged coating with paint system compatible to existing.

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3.03 FIELD TESTS BY GENERATOR MANUFACTURER

- A. General: Conform to NFPA 110.
- B. Performance Test:
 - 1. Perform upon completion of installation.
 - 2. Operate 2 hours minimum, 1 hour at 50 percent load and 1 hour at full load.
 - a. Manufacture shall provide a resistive load bank and all required connecting materials for the load testing.
 - 3. Manufacturer's representative shall make necessary adjustments.
 - 4. Demonstrate ability of engine generator set to carry specified loads.
 - 5. Demonstrate engine generator set safety shutdowns.
- C. Test Report: Record and report the following:
 - 1. Electric load on generator.
 - 2. Fuel consumption.
 - 3. Exhaust temperature.
 - 4. Ambient air temperature.
 - 5. Safety shutdown performance results.
 - 6. Noise levels at 7 meters distance and at Property line.
- D. Post-test Requirements:
 - 1. Make final adjustments.
 - 2. Replace fuel and oil filters.
 - 3. Check belt drive tensions.
 - 4. Demonstrate proper operation of equipment, including automatic operation with control from automatic transfer switch, to Engineer and Owner.

3.04 MANUFACTURER'S SERVICES

- A. Manufacturer's Representative: Present at Site for minimum person-days listed below, travel time excluded:
 - 1. 1/2 person-day for installation assistance and inspection.
 - 2. 1 person-day for functional and performance testing and completion of Manufacturer's Certificate of Proper Installation.
 - 3. 1/2 person-day for prestartup Site training.
 - 4. 1 person-day for facility startup.
 - 5. 1 person-day for post-startup training of Owner's personnel. Training shall not commence until an accepted detailed lesson plan for each training activity has been reviewed by Owner.

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- B. See Section 01640, Manufacturers' Services and Section 01810, Equipment Testing and Facility Startup.

3.05 SUPPLEMENTS

- A. The supplement listed below, following "End of Section," is a part of this Specification:
 - 1. Cobb County Fire Marshal's Office; Generator and Base Tank Installation - Plan Review Check Sheet.

END OF SECTION

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Cobb County Fire Marshal's Office Generator and Base Tank Installation—Plan Review Check Sheet NFPA 30 2003 ed., NFPA 110 2005 ed., NFPA 37 2006 ed.

This check sheet applies to tanks used to supply generators, with a maximum of 25 gals. gasoline or 660 gals. diesel fuel. For larger tanks, see aboveground tank check sheet for additional requirements. Tanks larger than 660 gallons must also be permitted through the State Fire Marshal's Office.

Job Name _____ **Date** _____

Address _____
(Street) (Suite #) (City) (Zip)

Reviewer _____ **Tank Size in Gallons** _____ **Tank Contents** _____

ITEM	PASS	FAIL	N/A
Zoning – check zoning on Cobb GIS. No aboveground tanks to be installed in a residential area. 54-54.1(b)(2)			
Tank			
Tank is UL approved for aboveground (UL 142), 30-4.2.3.1.1			
Top fill tank – fill pipe terminates within 6" of bottom of tank, 30-4.3.2.5.4			
Tank has appropriate NFPA 704 or plain language markings, 30-4.6.2			
Secondary Containment –must have on site tightness test 3-5 psi 30-4.3.2.3.3 (9). see also 110-5-9.11?			
Double wall tanks require overfill protection if greater than 200 gallons (AHJ) and 4.3.2.3.3(5). Tanks greater than 24" high shall also have a fill tube with the overfill protection. Device shall stop filling automatically at 95% capacity.			
Double wall tanks require overfill alarm at 90% tank capacity 4.3.2.3.3(5)			
Fire extinguisher – 40BC max. 30' 37-11.2.1			
Minimum 30" working space around generator 110-7.2.4 and 7.9.12.1			
Normal Vent, 30-4.2.5.1			
Emergency Vent—Main Tank 30-4.2.5.2			
Emergency Vent—Secondary Tank 30-4.2.5.2			
Tank Location—Inside Building			
Size - max. 660 gals. diesel, 25 gals. gasoline, can be placed inside of buildings or on the roof 110-7.9.5, 37-6.3			
Room with 2 hr fire separation 30-4.3.4.3.1			
Fill connections shall be outside of buildings and 5 ft from any building opening 30-4.3.2.5.5			
Minimum 3' clear space around all sides of tank 30-4.3.2.2.			
Minimum 36" working space around generator 110-7.2.5			
All tank vents must be to exterior 30-4.3.4.6.2, 37-6.3.5.4			
Ventilation – a sealed letter from a PE or FPE stating ventilation is adequate to prevent dangerous levels of vapors forming. 30-7.3.4, 110-7.10			
Tank Location—Outside of Building			
Minimum Clearances Property Line Building			
Table 4.3.2.1.1(b)			
275 gallons or less—minimum 5 feet			5 feet
276-750 gallons—minimum 10 feet			5 feet
751-12,000 gallons—minimum 15 feet			5 feet

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ITEM	PASS	FAIL	N/A
Minimum 3 ft clear space around all sides of tank 30-4.3.2.2.			
Minimum 20 ft clearance to LP tanks 30-4.3.2.2.4 See exceptions			
Vehicle Impact Protection —30-4.3.2.7, see Section 312, 2006 International Fire Code for installation details.			
Tank secured on reinforced concrete, 6" – 8" 30-4.3.1.1			
Fuel System			
Low fuel sensing switch Table 110-5.6.5.2—Life Safety Generators only			
Filling tank—closed pipe system that terminates outside the building at least 24" away from any building opening. Exception: From containers when engine is shut down. 37-6.6			

Life Safety Generator Items to Confirm at Plan Review

ITEM	PASS	FAIL	N/A
NFPA 110 Annunciator NFPA 110-5.6.5.2(4) with the following items: <ul style="list-style-type: none"> <input type="checkbox"/> Overcrank <input type="checkbox"/> High engine temp pre-alarm <input type="checkbox"/> High engine temp <input type="checkbox"/> Low lube oil pressure <input type="checkbox"/> Overspeed <input type="checkbox"/> Low fuel (low gas pressure for Natural Gas) <input type="checkbox"/> Low coolant level <input type="checkbox"/> EPS Supplying load <input type="checkbox"/> Control Switch not in automatic position <input type="checkbox"/> High battery voltage <input type="checkbox"/> Low cranking voltage <input type="checkbox"/> Battery charger ac failure <input type="checkbox"/> Lamp test <input type="checkbox"/> Audible alarm silencing switch <input type="checkbox"/> Air shutdown damper (when used) 			
Annunciator —may be mounted on the generator. Must be located in Fire Control Room in high-rise buildings. 110-5.6.5.2(4).			
Remote Stop —must be outside the generator room. May be inside the generator shroud if the generator is located outside. Must be in Fire Control Room in high rise. Manual stop shall be labeled. 110-5.6.5.6, 5.6.5.6.1			
Remote audible Annunciator with an audible alarm shall be located at a worksite observable by personnel, cannot be in EPS room (transfer switch room). Not required to be visual. 110-5.6.6.			
Remote Manual Start —required on high-rise buildings by section 911.1(14) of the 2006 IBC and section 509.1 of the 2006 IFC.			
Natural Gas —two gas meters be installed where a new generator is being installed for Life Safety purposes, or Level I operations. The meter for the generator must be located as close to the generator as possible. No single valve can turn off the gas supply to the building and the generator simultaneously. 110-7.9.7 and 110-7.9.8.			
Level I EPSS equipment shall not be installed in the same room with the normal service equipment, where the service equipment is rated over 150 volts to ground and equal to or greater than 1000 amperes. 7.2.2			

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Installation Acceptance Test—Life Safety Generator

ITEM—Inspection performed and items confirmed by Life Safety Inspector	PASS	FAIL	N/A
Confirm plan review items above			
Test must be done from cold start with emergency load at a standard operating level (elevators operating, fire pumps, etc.) 110-7.13.4.1(1)			
Primary power failure shall be initiation by opening all switches or breakers supplying the primary power to the building or facility. 110-7.13.4.1(1)			
Maximum 10 sec. delay to transfer to emergency power. 101-7.9.1.2			
Time delay for retransfer to normal power. Minimum 5 minutes. 7-13.4.1(12)			
Minimum 36" working space around generator 110-7.2.5			
Battery powered emergency light in room 110-7.3.2			
Instruction manual—minimum 2 sets on site in secure location 110-8.2.1			
Confirm low fuel level switch (diesel) or low fuel pressure switch (natural gas or propane) Table 110-5.6.5.2(h) and note 7.			
Written Documentation			
Copy of written record of 2-hour full load test. 110-7.13.6			
Copy of acceptance test required by 110-7.13.4.1			
Compliance Letter —must state that the generator is installed according to NFPA 101, 110 and 70 standards			

SECTION 16412
AUTOMATIC TRANSFER SWITCHES

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. Institute of Electrical and Electronics Engineers (IEEE): C37.90.1, Standard for Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus.
 2. National Electrical Manufacturers Association (NEMA):
 - a. ICS 1, General Standards for Industrial Control and Systems: General Requirements.
 - b. ICS 2, Industrial Control and Systems Controllers, Contactors, and Overload Relays not more than 2,000 volts ac or 750 volts ac.
 - c. ICS 6, Industrial Control and Systems: Enclosures 250, Enclosures for Electrical Equipment (1,000 Volts Maximum).
 3. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).
 4. UL: 1008, Transfer Switch Equipment.

1.02 SUBMITTALS

- A. Action Submittals:
1. Descriptive product information.
 2. Dimensional drawings.
 3. Control diagrams.
 4. Conduit entrance locations.
 5. Equipment ratings.
 6. Cable size terminations.
 7. Anchorage and bracing Drawings and cut sheets, as required by Section 01611, Anchorage and Bracing.
- B. Informational Submittals:
1. Anchorage and bracing calculations as required by Section 01611, Anchorage and Bracing.
 2. Factory test reports.
 3. Component and attachment testing seismic certificate of compliance as required by Division 01, General Requirements.
 4. Operation and Maintenance Data: As specified in Section 01730, Operating Maintenance Data.

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1.03 QUALITY ASSURANCE

A. Authority Having Jurisdiction (AHJ):

1. Provide the Work in accordance with NFPA 70, National Electrical Code (NEC). Where required by the AHJ, material and equipment shall be labeled or listed by a nationally recognized testing laboratory or other organization acceptable to the AHJ in order to provide a basis for approval under NEC.
2. Materials and equipment manufactured within the scope of standards published by UL shall conform to those standards and shall have an applied UL listing mark.
3. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Caterpillar.
- B. Cummins.
- C. Kohler.
- D. Zenith.
- E. ASCO.
- F. Eaton.

2.02 GENERAL

- A. Transfer switch to be product of a single manufacturer in order to achieve standardization for appearance, operation, maintenance, spare parts, and manufacturer's service.
- B. In accordance with applicable standards of NFPA 70, NEMA ICS 1, NEMA ICS 2, NEMA ICS 6, IEEE C37.90.1, and UL 1008.
- C. Transfer switch consisting of inherently double-throw power switch unit with interconnected control module.

- D. Rated 100 percent, in amperes, for total system transfer of motor, electric heating, discharge lamp loads, and tungsten-filament lamp loads.
 - 1. Switches rated 400 amperes and below suitable for 100 percent tungsten-filament lamp loads.
 - 2. Switches rated above 400 amperes suitable for 30 percent tungsten-filament lamp loads.
- E. Main and arcing contacts visible for inspection with cabinet door and barrier covers removed.
- F. Number of Switched Poles: As shown on one-line Drawings.
- G. Nominal Voltage, Full Load Current, and Short Circuit Withstand Current Rating: As shown on one-line drawing. Provide a three-cycle Withstand Current Rating, unless a longer time period is shown on the one-line drawing.
- H. Switch Rating: As shown on one-line Drawing.
- I. Current carrying capacity of arcing contacts shall not be used to determine the transfer switch rating.
- J. Suitable for use with 75 degrees C wire at full NFPA 70, 75 degrees C ampacity.
- K. Operating Conditions:
 - 1. Ambient Temperature: Maximum 40 degrees C.
 - 2. Equipment to be fully rated without any derating for operating conditions listed above.

2.03 ENCLOSURE

- A. Type:
 - 1. Indoor: Nonventilated NEMA 250, Type 1 with enclosure grounding terminal.
 - 2. Outdoor: Nonventilated NEMA 250, Type 4X, 316 Stainless Steel with enclosure grounding terminal.
- B. Dead front, front accessible cabinet with 14-gauge welded steel construction.
- C. Continuously hinged single door, with handle and lock cylinder.
- D. Finish: Baked enamel applied over rust-inhibiting, phosphate based coating.
 - 1. Exterior and Interior Color: Provide gray finish as approved by Owner.
 - 2. Unpainted Metal Parts: Plated for corrosion resistance.

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2.04 TRANSFER SWITCH

- A. Type: Electrically operated, mechanically held, double-throw.
- B. Momentarily energized, single-electrically operated mechanism energized from source to which load is to be transferred.
- C. Locking mechanism to maintain constant contact pressure.
- D. Mechanical interlock switch to ensure only one of two possible switch positions with a time delay in the neutral position.
- E. Silver alloy contacts protected by arcing contacts.
- F. Main and arcing contacts visible when door is open and barrier covers removed.
- G. Manual operating handle for transfer in either direction under unloaded conditions.
- H. Internal control wire connections made with ring or spade type terminals, lock washers, and sleeve type marking labels.

2.05 CONTROL MODULE

- A. Completely enclosed and mounted separately from the transfer switch unit.
- B. Microprocessor for sensing and logic control with inherent digital communications capability.
- C. Plug-in, industrial grade interfacing relays with dust covers.
- D. Connected to transfer switch by wiring harness having keyed disconnect plug.
- E. Plug-in printed circuit boards for sensing and control logic.
- F. Adjustable solid state undervoltage sensors for all three phases of normal and for three phases of standby source:
 - 1. Pick up 85 percent to 100 percent nominal.
 - 2. Dropout 75 percent to 98 percent of pickup setting.
- G. Adjustable frequency sensors for standby source:
 - 1. Pick up 90 percent to 100 percent nominal.
 - 2. Dropout 87 percent to 89 percent of pickup setting.

- H. Control module with adjustable time delays:
 - 1. 0-minute to 5-minute load transfer to standby source delay.
 - 2. 0-minute to 30-minute retransfer to normal delay.
 - 3. 0-minute to 30-minute unload running time delay.
 - 4. 0-minute to 5-minute time delay neutral on retransfer to normal source.
 - 5. Switch to bypass any of the above time delays during testing.
- I. Form-C start contacts, rated 10 amperes, 32-volt dc, for two-wire engine control, wired to terminal block.
- J. Exerciser, adjustable in 15-minute increments, 7-day dial clock to simulate normal power failure and transfer load to standby source complete with door mounted NO LOAD and LOAD selector switch.

2.06 METERING INSTRUMENTS

- A. Connect meters to load side of transfer switch.
- B. Show voltage, current, and kW on an average and per-phase basis, and track and record peak kW.

2.07 INDICATORS

- A. Type: Manufacturer's standard.
- B. Green lens to indicate switch position for normal power source.
- C. Red lens to indicate switch position for standby power source.
- D. Green lens to indicate normal power source is available within parameters established by pickup and dropout settings.
- E. Red lens to indicate standby power source is available within parameters established by pickup and dropout settings.
- F. Provide one normally open and one normally closed, 5 amperes, 120-volt contact for remote indication when transfer switch is in either position.

2.08 FACTORY TESTS

- A. Test to ensure correct:
 - 1. Operation of individual components.
 - 2. Sequence of operation.
 - 3. Transfer time, voltage, frequency, and time delay settings.
- B. Dielectric strength test per NEMA ICS 1.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Secure enclosure to floor using anchor bolts of sufficient size and number adequate for specified conditions.

3.02 MANUFACTURER'S SERVICES

- A. Furnish manufacturer's representative in accordance with Section 01640, Manufacturers' Services, for the following services at Site, for minimum person-days listed below, travel time excluded:
 - 1. 1 person-day for installation assistance, final adjustment, and initial energization of equipment.
 - 2. 1 person-day for functional and performance testing.
 - 3. 1/2 person-day for adjustment of relay settings.
- B. Furnish startup services and training of Owner's personnel at such times as requested by Owner.

END OF SECTION

SECTION 16460
LOW-VOLTAGE TRANSFORMERS

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. Code of Federal Regulations (CFR): 10 CFR Part 431, DOE 2016 efficiency.
 2. Institute of Electrical and Electronics Engineers (IEEE): C57.96, Guide for Loading Dry Type Transformers.
 3. National Electrical Contractor's Association (NECA): 409, Recommended Practice for Installing and Maintaining Dry-Type Transformers.
 4. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1,000 Volts Maximum).
 - b. ST 20, Dry-Type Transformers for General Applications.
 5. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).
 6. Underwriters Laboratories, Inc. (UL):
 - a. 486E, Standard for Equipment Wiring Terminals for use with Aluminum and/or Copper Conductors.
 - b. 489, Standard for Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit Breaker Enclosures.
 - c. 1561, Standard for Dry-Type, General Purpose, and Power Transformers.

1.02 SUBMITTALS

- A. Action Submittals:
1. Descriptive information.
 2. Dimensions and weight.
 3. Transformer nameplate data, including efficiency.
 4. Schematic and connection diagrams.
- B. Informational Submittals:
1. Test Report: Sound test certification for dry type power transformers (0 volt to 600 volt, primary).

PART 2 PRODUCTS

2.01 GENERAL

- A. UL 1561, NEMA ST 20, unless otherwise indicated.
- B. Dry-type, self-cooled, two-winding, with aluminum windings.
- C. Units larger than 5 kVA suitable for use with 75 degrees C wire at full NFPA 70, 75 degrees C ampacity.
- D. Efficiency: Meet or exceed DOE 2016 efficiency requirements.
- E. Maximum Sound Level per NEMA ST 20:
 - 1. 40 decibels for 0 kVA to 9 kVA.
 - 2. 45 decibels for 10 kVA to 50 kVA.
- F. Overload capability: Short-term overload per IEEE C57.96.
- G. Vibration Isolators:
 - 1. Rated for transformer's weight.
 - 2. Isolation Efficiency: 99 percent, at fundamental frequency of sound emitted by transformer.
 - 3. Less Than 30 kVA: Isolate entire unit from structure with external vibration isolators.
- H. Manufacturers:
 - 1. Square D Co.
 - 2. Eaton/Cutler-Hammer.
 - 3. General Electric Co.
 - 4. Approved Equal.

2.02 MINI-POWER CENTER (MPC)

- A. General: Transformer, primary, and secondary main circuit breakers, and secondary panelboard section enclosed in NEMA 250, Type 3R enclosure.
- B. Transformer:
 - 1. Insulation Class and Temperature Rise: Manufacturer's standard.
 - 2. Efficiency: Manufacturer's standard (DOE 2016 efficiency).
 - 3. Core and Coil: Encapsulated.

4. Full capacity, 5 percent voltage taps, two below normal voltage.
 5. Primary Voltage: 480, three-phase.
 6. Secondary Voltage: 240/120 volts, single-phase, three-wire
- C. Panelboard: Full, UL 489, short-circuit current rated.
1. Type: Thermal-magnetic, quick-make, quick-break, indicating, with noninterchangeable molded case circuit breakers.
 2. Number and Breaker Ampere Ratings: As required.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with NECA and manufacturer's instructions.
- B. Load external vibration isolator such that no direct transformer unit metal is in direct contact with mounting surface.
- C. Provide moisture-proof, flexible conduit for electrical connections.
- D. Connect voltage taps to achieve (approximately) rated output voltage under normal plant load conditions.

END OF SECTION