# FULTON COUNTY

GEORGIA REGISTERED No. 028842 PROFESSIONAL ENGINEER BRIAN F. DUANE 11/02/07

*Vision*

*People* *Families* *Neighborhoods*

*Mission*

*To serve, protect and govern in concert with local municipalities*

*Values*

*People* *Customer Services*
*Ethics* *Resource Management*
*Innovation* *Equal Opportunity*

GEORGIA REGISTERED No. 26620 PROFESSIONAL ENGINEER CHARLES S. HOCKING 11/8/07

**PURCHASING DEPARTMENT**
**REQUEST FOR INVITATION TO BID NO. 07ITB58420K-RS**

# S109 - RIVERSIDE ROAD PUMP STATION UPGRADE

**For**

## DEPARTMENT OF PUBLIC WORKS

**BID DUE TIME AND DATE: 11:00 A.M., JANUARY 14, 2008**
**BID ISSUANCE DATE: NOVEMBER 14, 2007**
**PURCHASING CONTACT: RHOLANDA STANBERRY @ 404 – 730 - 4200**
**E-MAIL: RHOLANDA.STANBERRY@FULTONCOUNTYGA.GOV**

**LOCATION: FULTON COUNTY PURCHASING DEPARTMENT**
**130 PEACHTREE STREET, S.W., SUITE 1168**
**ATLANTA, GA 30303**

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# INVITATION TO BID

## S109 – RIVERSIDE ROAD PUMP STATION UPGRADE

Sealed Bids for furnishing all materials, labor, tools, equipment and appurtenances necessary for the construction of Riverside Road Pump Station Upgrade will be received by the Fulton County Department of Purchasing and Contract Compliance at 130 Peachtree Street, S.W. Suite 1168 Atlanta, GA 30303, until 11:00a.m., local time, on Monday, January 14, 2008, and then at said office publicly opened and read aloud.

**Description of Project:**

The Project consists of obtaining all permits, furnishing all materials and equipment, and performing all labor necessary for the construction of the Riverside Road Pump Station Upgrade which includes but is not limited to 6 new pumps, a new odor control system, 3 open channel sewage grinders, electrical and instrumentation & control work, landscaping and other related items shown on the Drawings and defined in the specifications.

**Permits and Easements:**

No easements are required to perform the work and the status of permits is defined in the specifications in Section 01010 – Summary of Work .

**Bid Documents:**

The Instructions to Bidders, Bid and Contract Requirements (Bid Form, Bid Bond, Performance Bond, Payment Bond, Contract Agreement), and other Documents (Drawings and/or Specifications) may be examined at the following locations:

AGC Builders Exchange
1940 The Exchange
STE 300
Atlanta, Georgia 30339

FW Dodge Corporation
4170 Ashford-Dunwoody Rd
STE 200
Atlanta, Georgia 30319

Minority Business Development Agency
401 West Peachtree St
Summit Bldg STE 1715
Atlanta Georgia 30308

Fulton County
Public Works Department
141 Pryor ST, S.W., Ste 6001
Atlanta, Georgia 30303

Reed Construction Data
30 Technology Blvd
STE 100
Norcross Georgia 30092

This document and supporting documents can be downloaded at the Fulton County Website, http://www.fultoncountyga.gov under “Bid Opportunities”.

Applications for documents, along with a non-refundable $200.00 payment must be made to Fulton Construction Management Partners, care of Department of Public Works, 141 Pryor Street, S.W., Suite 6001, Atlanta, Georgia 30303. Payment must be in the form of a company or personal check payable to **Fulton Construction Management Partners**. Checks returned for any reason will result in the bid being deemed non-responsive. This amount includes all fees for printing and distribution and will be used to defray a portion of the printing cost that may have been incurred for the tendering of the Project. Partial sets of the bid document will not be issued.

For payment information, contact Pamela Cody, FCMP, Department of Public Works at 404-612-0880. All other questions should be addressed by the procedures outlined in this ITB to Rholanda Stanberry, Fulton County Department of Purchasing and Contract Compliance at 404-730-4200, rholanda.stanberry@fultoncountyga.gov.

**Term of Contract:**

The Bidder agrees hereby to commence work under this Contract, with adequate personnel and equipment, on a date to be specified in a written order of the Contracting Officer and to fully complete all work under this Contract within **Five hundred forty-eight (548)** consecutive calendar days from and including said date.

The County will make payments, within **45** days, in response to the Contractor's monthly Applications for Payment, which are accompanied by the Engineer's Certificate for Payment, for work performed to date plus cost of stored materials, less retainage. Payments, Applications for Payment, Certificates for Payment, and retainage shall be in accordance with the provisions of the Contract Documents.

**No Contact Provision**

It is the policy of Fulton County that the evaluation and award process for County contracts shall be free from both actual and perceived impropriety, and that contacts between potential vendors and County officials, elected officials and staff regarding pending awards of County contracts shall be prohibited.

A. No person, firm, or business entity, however situated or composed, obtaining a copy of or responding to this solicitation, shall initiate or continue any verbal or written communication regarding this solicitation with any County officer, elected official, employee, or designated County representative, between the date of the issuance of this solicitation and the date of the County Manager's recommendation to the Board of Commissioners for award of the subject contract, except as may otherwise be specifically authorized and permitted by the terms and conditions of this solicitation.

B. All verbal and written communications initiated by such person, firm, or entity regarding this solicitation, if same are authorized and permitted by the terms and conditions of this solicitation, shall be directed to the Purchasing Agent.

C. Any violation of this prohibition of the initiation or continuation of verbal or written communications with County officers, elected officials, employees, or designated County representatives shall result in a written finding by the Purchasing Agent that the submitted Bid or proposal of the person, firm, or entity in violation is "non-responsive", and same shall not be considered for award.

**Bid Contact**

Information regarding the bid or bid requirements, either procedural or technical, may be obtained by submitting questions in writing to:
Fulton County Department of Purchasing and Contract Compliance
Attn: Rholanda Stanberry, Chief Assistant Purchasing Agent
Fulton County Public Safety Building
130 Peachtree Street, S.W. Suite 1168
Atlanta, GA 30303
Phone: (404) 730-4200
Fax: (404) 335-9419
Reference Bid # 07ITB58420K-RS
Or rholanda.stanberry@fultoncountyga.gov

## Basis of Award

The Contract, if awarded, will be awarded to the lowest responsive and responsible bidder. No bid may be withdrawn for a period of sixty (60) days after the date of bid opening except as permitted by O.C.G.A., §36-91-41 et seq., as amended. Each Bid must be accompanied by a Bid Bond in accordance with the Bid Bond Requirements provided in the Contract Documents, on a Surety Company's Standard Bid Bond Form acceptable to the County in an amount no less than 5% of the amount bid. The successful bidder will be required to furnish a Performance Bond and Payment Bond, **on or before** the issuance of Notice to Proceed, each in the amount of 100% of the Contract Amount. All other required Contract Documents must be fully completed and executed by the Contractor and his/her Surety, and submitted to the Owner **on or before** the issuance of the Notice to Proceed.

## Pre-Bid Conference

Date: December 10, 2007
Time: 9:30 A.M.
Location: Fulton County Department of Purchasing and Contract Compliance,
Public Safety Building
130 Peachtree Street, S.W. Suite 1168
Atlanta, GA 30303

An optional pre-bid conference will be held in the Fulton County Department of Purchasing and Contract Compliance Conference Room, located at 130 Peachtree Street, S.W. Suite 1168, Atlanta, Georgia 30303. ***Inquiries regarding the solicitation either technical or otherwise may be submitted in writing prior to the pre-bid conference and will be addressed at the pre-bid conference.*** Any additional questions asked at the pre-bid conference must be submitted in written form at the pre-bid conference and will be responded to in the form of an addendum with the County's official responses.

The Pre-bid conference will be conducted for the purpose of explaining the County's bid process, the specifications/technical documents, and to provide non-binding verbal responses to questions concerning these bid specifications and to discuss issues from the bidders perspective. However, no verbal response provided at the pre-bid conference binds the County. Only those responses to written questions that are responded to by the County in written communications will be official.

**END OF SECTION**

# INSTRUCTIONS TO BIDDERS

## A. Contract Documents

The Contract Documents include the Contract Agreement, Contractor's Bid (including all documentation accompanying the Bid and any post-Bid documentation required by the County prior to the Notice of Award), Bonds, all Special Conditions, General Conditions, Supplementary Conditions, Specifications, Drawings and addenda, together with written amendments, change orders, field orders and the Construction Manager's written interpretations and clarifications issued in accordance with the General Conditions on or after the date of the Contract Agreement.

Shop drawing submittals reviewed in accordance with the General Conditions, geotechnical investigations and soils report and drawings of physical conditions in or relating to existing surface structures at or contiguous to the site are not Contract Documents.

The Contract Documents shall define and describe the complete work to which they relate.

## B. Bid Preparation and Execution

All Bids must be made on the Bid forms contained herein. The original signed Bid with three (3) copies shall be submitted in a sealed envelope, addressed to the Department of Purchasing and Contract Compliance, Fulton County Public Safety Building, 130 Peachtree Street, S.W., Suite 1168 Atlanta, Georgia 30303, and labeled "Bid for **07ITB58420K-RS - S109 – Riverside Road Pump Station Upgrade.**

**REQUIRED SUBMITTALS:** The bidder **must complete and execute** the following:

1. Bid Form
2. Acknowledgement of each Addendum
3. Bid Bond
4. Purchasing Forms (See Submittal Check List at end of this Section), fully executed
5. Contract Compliance Forms (See Submittal Check List at end of this Section), fully executed
6. Risk Management Insurance Provisions Form

Any bids received after the stated time and date will not be considered. It shall be the sole responsibility of the bidder to have his/her bid delivered to the Fulton County Department of Purchasing and Contract Compliance for receipt on or before the stated time and date (see Section 00020). If a bid is sent by U.S. Mail, the bidder shall be responsible for its timely delivery to the Purchasing Department. Bids delayed by mail will not be considered, shall not be opened, and arrangements shall be made for their return at the bidder's request and expense.

Bid shall be publicly opened, with only the names and total bid price of the bidders disclosed at the opening.

## C. Addenda and Interpretations

No interpretations of the meaning of the Drawings, Specifications or other pre-bid documents will be made to any Bidder orally.

Bidders requiring clarification or interpretation of the Contract Documents shall make a request in writing, either by mail, hand delivery, e-mail or fax, to the Purchasing Agent at the address below. To be given consideration, requests must be received no later than

2:00 PM, December 31, 2007. The County will not respond to any requests, oral or written, received after this date. Telephone inquiries will not be accepted.

Fulton County Department of Purchasing and Contract Compliance
Attn: Rholanda Stanberry, Chief Assistant Purchasing Agent
Fulton County Public Safety Building
130 Peachtree Street, S.W., 1168
Atlanta, GA 30303
Fax: (404) 335-9419
Rholanda.stanberry@fultoncountyga.gov
Reference Bid # 07ITB58420K-RS

Only communications from firms that are in writing and signed will be recognized by the County as duly authorized expressions on behalf of proposers/bidders. Any and all such interpretations and any supplemental instructions will be in the form of written Addenda to the Contract Documents which, if issued, will be mailed, shipped or faxed to all prospective Bidders (at the respective addresses furnished) prior to the date fixed for the opening of Bids.

Failure of Bidders to receive or acknowledge any Addendum shall not relieve them of any obligation under the Bid. All Addenda shall become part of the Contract Documents.

D. **Site Examination**

There will be a site visit for this project. It will be held on **December 11, 2007 at 9:30 A.M.**. Bidders **are** required to attend.

E. **Bidder's Modification and Withdrawal of Bids**

A Bidder may modify or withdraw its bid by written request, provided that the request is received by the County prior to the bid due date and time at the address to which bids are to be submitted. Provided further, that in case of an electronic request (i.e. facsimile, e-mail, etc.) a written confirmation thereof over the authorized signature of the Bidder must be received by the County at the address to which original Bids are to be submitted within three (3) calendar days after issue of the electronic message. Following withdrawal of its bid, the Bidder may submit a new bid, providing delivery is affected prior to the established bid opening date and time. **No bid may be withdrawn after bid due date for sixty (60) calendar days.**

F. **Bid and Contract Security**

A Bid Bond for an amount equal to five percent (5%) of the bid amount must accompany each Proposal. The bid bond shall be submitted in a separate, sealed envelope marked "Bid Bond".

**Bids must be accompanied by a bid bond or certified check** in an amount of five percent (5%) of the TOTAL AMOUNT of the base bid. The bid bond or certified check shall apply ONLY TO THIS BID. The bid name and contract number must appear on the security instrument. The bond must remain in full force and effect until the Bidder executes the final Contract. Bids not satisfying the bonding requirements of this project will be declared non-responsive.

Any bid bond, performance bond, payment bond, or security deposit required for public works construction contract shall be approved and filed with purchasing agent. At the option of the County, if the surety named in the bond is other than a surety company authorized by law to do business in this state pursuant to a current certificate of authority to transact surety business by the Commissioner of Insurance, such bond shall not be

approved and filed unless such surety is on the United States Department of Treasury's list of approved bond sureties.

A Purchasing Agent shall approve as to form and as to the solvency of the surety any bid bond, performance bond, or payment bond required by this. In the case of a bid bond, such approval shall be obtained prior to acceptance of the bid or proposal. In the case of payment bonds and performance bonds, such approval shall be obtained prior to the execution of the contract.

Whenever, in the judgment of the County:
(1) Any surety on a bid, performance, or payment bond has become insolvent;
(2) Any corporation surety is not longer certified or approved by the Commissioner of Insurance to do business in the state; or
(3) For any cause there are no longer proper or sufficient sureties on any or all the bonds

The County may require the contractor to strengthen any or all of the bonds or to furnish a new or additional bond or bonds within ten days. Thereupon, if so ordered by the County, all work on the contract shall cease unless such new or additional bond or bonds are furnished. If such bond or bonds are not furnished within such time, the County may terminate the contract and complete the same as the agent of and at the expense of the contractor and his or her sureties.

As a condition of responsiveness the bidder must contain a Bid Bond for an amount equal to 5% of the bid amount. The Bid Bond shall be included in a separate envelope marked on the outside "Bid Bond". Checks or letters of credit of any type will not be accepted. A certified cashier's check will be acceptable. Provide a completed and fully executed Bid Bond. When the bidder's package is opened, a purchasing agent will verify the presence of the Bid Bond and remove it from the Proposal Package.

If the bidder withdraws its bid from the competition after the selection of its bid for a reason not authorized by Georgia law, the County will proceed on the Bid Bond, along with any other available remedies.

The Surety of the Bid Bond shall be from a surety company authorized to do business in the State of Georgia, shall be listed in the Department of Treasury Circular 570, and shall have an underwriting limitation in excess of 100% of the bid amount. The Bonds and Surety shall be subject to approval by the County Attorney.

Attorneys-in-fact for bidders who sign bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

## G. Right to Reject Bids

The County reserves the right to reject any or all bids and to waive informalities. No bids will be received after the time set for opening bids. Any unauthorized conditions, limitations or provisions attached to the Bid, except as provided herein, will render it informal and may cause its rejection. Unbalanced bids will be subject to rejection. Any bidder may withdraw his/her bid, either personally or by telegraphic or written request, at any time prior to the scheduled closing time for receipt of bids. Telegraphic or written requests for withdrawal must be in the possession of the County prior to the closing time for receipt of bids.

## H. Applicable Laws

All applicable laws and regulations of the State of Georgia and ordinances and regulations of Fulton County shall apply. Protestors shall seek resolution of their complaints in the manner provided in the Fulton County Code of Laws §2-324, which is incorporated by reference herein.

I. **Examination of Contract Documents**

Prospective bidders shall examine the contract documents and before submitting a bid, shall make a written request to the County for an interpretation or correction of any ambiguity, in consistency or error therein which could be discovered by a bidder. At the bid opening each bidder shall be presumed to have read and be familiar with the contract documents.

J. **Termination**

The County may terminate the contract resulting from this solicitation at any time the vendor fails to carry out the contract provisions, if in the opinion of the County, the performance of the contract is unreasonably delayed, or the vendor is in direct violation of the contract conditions. The County shall provide the vendor with notice of any conditions which violate or endanger the performance of the contract and, if after such notice the contractor fails to remedy such conditions within thirty (30) days, to the satisfaction of the County, the County may exercise their option in writing to terminate the Contract without further notice to the Contractor and order the Contractor to stop work immediately and vacate the premises. Vendor agrees by its bid submission that the County's decision is final and valid.

K. **Indemnification and Hold Harmless Agreement**

See Section 00490, Insurance and Risk Management Provisions, Indemnification and Hold Harmless Agreement.

L. **Bid Opening**

Bids will be opened in public and read aloud. All bidders are requested to be present at the opening.

M. **Determination of Successful Bidder**

Fulton County desires to complete this work in a timely manner. The Contract will be awarded to the lowest responsive, responsible bidder(s), if awarded.

1. **Responsibility:** The determination of the bidder's responsibility will be made by the County based on whether the bidder meets the following minimum requirements:

    a. The County reserves the right to reject any bid if the evidence submitted by, or investigation of, the bidder fails to satisfy the County that he/she is properly qualified to carry out the obligations of the Contract.
    b. Is properly licensed to perform this type of work in Fulton County. Bidders must have a utility contractors license to perform this work. O.C.G.A. §43-14-8.3 (h)
    c. Maintains a permanent place of business individually or in conjunction with the prime contractor.
    d. Has the appropriate and adequate technical experience. Designated Project Manager must be proficient in all aspects of contracted work.
    e. Has adequate personnel and equipment to do the work expeditiously.
    f. Has suitable financial means to meet obligations incidental to the work.

2. **Responsiveness:** The determination of responsiveness will be made by the County based on a consideration of whether the bidder has submitted a complete Bid form without irregularities, excisions, special conditions, or alternative bids for any item unless specifically requested in the Bid form.

N. **Wage Clause**

Pursuant to 102-391, Each Contractor shall agree that in the performance of the Contract he will comply with all lawful agreements, if any, which the Contractor had made with any association, union, or other entity, with respect to wages, salaries, and working conditions, so as not to cause inconvenience, picketing, or work stoppage.

O. **Notice of Award of Contract**

As soon as possible, and within sixty (60) days after receipt of bids, the County shall notify the successful Bidder of the Award of Contract.

The award shall be made by the Board of Commissioners of Fulton County to the lowest responsive, responsible bidder(s) as soon as possible after receipt of bids, taking into consideration price and the responsiveness to the requirements set forth in the Invitation for Bid. In such case, no claim shall be made by the selected Contractor(s) for loss of profit if the contract is not awarded or awarded for less work than is indicated and for less than the amount of his bid. The total of the awarded contract shall not exceed the available funds allocated for this project.

Should the County require additional time to award the contract, the time may be extended by mutual agreement between the County and the successful bidder. If an Award of Contract has not been made within sixty (60) days from the bid date or within the extension mutually agreed upon, the Bidder may withdraw the Bid without further liability on the part of either party.

Any award made by the Board of Commissioners as a result of this bid will begin from the date of the notice to proceed. The Bidder agrees hereby to commence work under this Contract, with adequate personnel and equipment, on a date to be specified in a written order from the user department. The contract shall become effective on the Contract Date and shall continue in effect until the end of the term of the contract or until the project has been closed-out unless earlier terminated pursuant to the termination provisions of the contract.

P. **Execution of Contract Documents**

Upon notification of Award of Contract, the County shall furnish the Contractor the conformed copies of Contract Documents for execution by the Contractor and Contractor's surety.

Within ten (10) days after receipt the Contractor shall return all the documents properly executed by the Contractor and the Contractor's surety. Attached to each document shall be an original power-of-attorney for the person executing the bonds for the surety and certificates of insurance for the required insurance coverage.

After receipt of the documents executed by the Contractor and his surety with the power-of-attorney and certificates of insurance, the County shall complete the execution of the documents. Distribution of the completed documents will be made upon completion.

Should the contractor and/or surety fail to execute the documents within the time specified, the County shall have the right to proceed on the Bid Bond accompanying the bid.

If the County fails to execute the documents within the time limit specified, the Contractor shall have the right to withdraw the Contractor's bid without penalty.

Should an extension of any of the time limits stated above be required, this shall be done only by mutual agreement between both parties.

Any agreement or contract resulting from the acceptance of a bid shall be on a County approved document form. The County reserves the right to reject any agreement that does not conform to the Invitation for Bid and any County requirements for agreements and contracts. The County reserves the right to modify the agreement resulting from this bid upon the recommendation of the County Attorney.

Q. **Joint Venture**

Any Bidder intending to respond to this solicitation as a joint venture must submit an executed joint venture agreement with its offer. The agreement must designate those persons or entities authorized to execute documents or otherwise bind the joint venture in all transactions with Fulton County, or be accompanied by a document, binding upon the joint venture and its constituent members, making such designation. Offers from joint ventures that do not include these documents will be rejected as being non-responsive.

R. **Contractors Compliance With All Assurances And/Or Promises Made In Response To Procurement**

Should any Bidder submit a response to the County promising to provide a certain level of service for either the scope of work, MFBE participation, or any other matter, including where such promise or assurance is greater than what is required by the procurement documents, and should this response containing the promise or assurance be accepted by the County and made a part of the Contract Documents, then this degree or level of service promised by the bidder relating to the scope of work, MFBE participation, or other matter shall be considered to be a material part of the Agreement between the bidder and the County, such that the bidder's failure to provide the agreed upon degree or level of service or participation shall be a material breach of the Agreement giving the County just cause to terminate the Agreement for cause, pursuant to the General Conditions of the Agreement.

S. **Bid General Requirements**

The following information pertains to the submission of a Bid to Fulton County, and contains instructions on how Bids must be presented in order to be considered. Listed below are the requirements for all Bidders interested in doing business with Fulton County.

1. The Bid sheets included in this Invitation to Bid ("Bid") must be fully completed and returned with the Bid unless otherwise specified in writing by the Purchasing Department. Type or neatly print the date, company name, and the full legal name and title of the person(s) signing the Bid in the place provided at the bottom of each Bid sheet. Any additional sheets submitted must contain the same signature and Bidder information.

2. All signatures must be executed by person(s) having contracting authority for the Bidder.

3. Absolutely no fax Bids or reproduction Bids will be accepted, except that photocopies may be submitted in addition to the original when multiple copies of the Bid are specifically requested in the solicitation.

4. The envelope in which the Bid response is submitted must be sealed and clearly labeled with the Bid number, project title, due date and time, and the name of the company or individual submitting the proposal. Bids must be received by the opening date and time shown on this Bid in order to be considered. The Purchasing Agent has no obligation to consider Bids which are not in properly marked envelopes. Contract Compliance submittals shall be submitted in a separate sealed envelope or package.

5. The original and the required number of copies of the Bid must be returned to:

   Fulton County Purchasing Agent
   Fulton County Department of Purchasing and Contract Compliance
   130 Peachtree Street, S.W., Suite 1168
   Atlanta, Georgia 30303

   Any inquiries, questions, clarifications or suggestions regarding this solicitation should be submitted in writing to the Purchasing Contact Person. Contact with any other County personnel in regard to a current solicitation is strictly prohibited in accordance with Fulton County "No Contact Provision" policy outlined in paragraph S, subparagraph 35 and in Section 00020, Invitation to Bid.

6. Show information and prices in the format requested. Prices are to be quoted F.O.B. Destination, and must include all costs chargeable to the Contractor executing the Contract, including taxes. Unless otherwise provided in the Contract, Fulton County shall have no liability for any cost not included in the price. The Contractor shall provide Fulton County the benefit through a reduction in price of any decrease in the Contractor's costs by reason of any tax exemption based upon Fulton County's status as a tax-exempt entity.

7. All prices Bid must be audited by the Bidder to ensure correctness before the Bid is submitted. The Bidder is solely responsible for the accuracy of information placed on a Bid sheet, including prices. Clerical or mathematical error is insufficient to void a successful Bid but a Bidder may withdraw a sealed Bid prior to opening without a penalty.

8. All prices must be submitted in the format requested and less all trade discounts. When multiple items are being Bid, Bidder must show both the unit price and the total extended price for each item. When applicable, the Bidder must include an additional lump sum Bid for groups or items. In the event a Bidder is offering an additional discount on groups of items, Bidder must indicate the total lump sum Bid for the particular group of items before any extra discount, the amount of extra discount, and the net total for the particular group. In the event of an extension error, unit pricing shall prevail.

9. By submitting a signed Bid, Bidder agrees to accept an award made as a result of that Bid under the terms and conditions spelled out in the Bid documents. In the event of a conflict between the different Bid documents, the County's cover Contract (if used) shall have precedence, followed in order by the Invitation to Bid, Purchase Order, Bid, Contractor's Warranty Agreement, Maintenance Agreement, and/or other Contractor provided agreements.

10. A Bidder may submit only one (1) Bid response for each specific Bid solicitation unless otherwise authorized in the specifications.

11. All prices submitted by the Bidder to Fulton County must be guaranteed by the authorized person(s) against any price increase for the time period designated in the Bid specifications, and Fulton County must be given the benefit of any price decrease occurring during such designated time period.

12. All items Bid must be new. Used, rebuilt and refurbished items will not be considered unless specifically authorized by Fulton County in the written specifications.

13. All Bidders must specify in the Bid response the earliest actual delivery date for each item unless otherwise specified in writing by Fulton County. The delivery date may be a factor in deciding the Bidder's capability to perform.

14. A successful Bidder's delivery ticket(s) and invoice(s) must list each item separately and must show Fulton County's purchase order number as well as the proper department and address to which delivery was made, as listed on the purchase order or in the Bidder's contract with Fulton County.

15. Substitutions: The materials, products, and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance, and quality. Unless clearly labeled in the Bidding Documents as "NO SUBSTITUTE", or other words to that effect, wherever a material, product, or piece of equipment is identified in the Bidding Documents by reference to a manufacturer's or vendor's name, trade name, catalogue number or the like, it is so identified for the purpose of establishing a quality standard and is for reference only. Such identification is intended to be descriptive but not restrictive, and is to indicate the general quality and characteristics of products that may be offered. Materials, products, or equipment of other manufacturers will be considered equally acceptable provided the material, product, or equipment so proposed is, in the opinion of the ENGINEER, of equal substance, meets or exceeds the performance criteria established and will perform adequately the duties and functions imposed by the general design.

    Whenever the design is based on a specific product of a particular manufacturer or manufacturers, the manufacturer(s) will be indicated in the Bidding Documents. Any item other than those so designated shall be considered a substitution.

    Prior to the Bid date, the ENGINEER will consider substitution requests only for major equipment items where the term "OR PRE-APPROVED EQUAL" follows the names of approved manufacturers. Bidders desiring pre-approval of products from other manufacturers must submit a Substitution Request Form no later than twenty one (21) days prior to the Bid date. After that date, the ENGINEER will not accept substitution requests for "PRE-APPROVED EQUAL" items. To assess equality and acceptability of a product or system, each Request for Substitution shall contain the required information set forth in Section 01630 – Substitutions and Product Options. Insufficient information will be grounds for rejection of the Request for Substitution.

    For equipment and/or products that are deemed equivalent by the ENGINEER, an Addendum will be issued to add the name of the additional pre-approved manufacturer(s) to the technical specifications, otherwise a written denial of the Request for Substitution will be issued. All Requests for Substitution will be resolved by seven (7) days prior to the Bid date.

    Any Bidder intending to furnish substitute products is cautioned to verify that the item being furnished will perform the same functions and have the same capabilities as the item specified. The Bidder shall include in his Bid the cost of all engineering and design services and any additional work which may be required to accommodate the substitution.

    Bidders wanting to substitute items where the term "OR EQUAL" follows the name of approved manufacturers may submit a Request for Substitution only after submitting Bids and Award of Contract in accordance with requirements specified in Section 01630 – Substitutions and Product Options.

    Bidders must base their Bids on products and systems specified in the Bidding Documents or listed by name in any Addenda.

Bids based on products which have not received the approval of the ENGINEER may be determined non-responsive by the OWNER and rejected.

16. For all Bids, Fulton County reserves the right to request representative samples. If requested, samples must be delivered at the Bidder's cost within three (3) business days. Samples are submitted at the risk of the Bidder and may be subjected to destructive tests by Fulton County. Samples must be plainly tagged with Fulton County's Bid number, item name, manufacturer, and the name of the Bidder.

17. Item(s) Bid must be complete and ready to operate. No obvious omissions of components or necessary parts shall be made even though the specifications may not detail or mention them. Unit(s) must be furnished with factory installed equipment and must be comparable with the basic form, fit, and functional requirements which are all to be included in the base price as well as any other equipment included as standard by the manufacturer or generally provided to the buying public.

18. All successful Bidders must assume full responsibility for all item(s) damaged prior to F.O.B. Destination delivery and agree to hold harmless Fulton County of all responsibility for prosecuting damage claims.

19. All successful Bidders must assume full responsibility for replacement of all defective or damaged goods within thirty (30) days of notice by Fulton County of such defect or damage.

20. All successful Bidders must assume full responsibility for providing or ensuring warranty service on any and all items including goods, materials, or equipment provided to the County with warranty coverage. If a successful Bidder is not the manufacturer, all manufacturers' warranties must be passed through to Fulton County. The Bidder and not Fulton County is responsible for contacting the manufacturer of the warranty service provided during the warranty period and supervising the completion of the warranty service to the satisfaction of Fulton County.

21. As a successful Bidder providing any equipment which requires fitting and assembly, the Bidder shall be solely responsible for such installation being performed by a manufacturer's authorized or approved servicer or an experienced worker, utilizing workmanship of the highest caliber. The Bidder must verify all dimensions at the site, shall be responsible for their correctness, and shall be responsible for the availability of replacement parts when specified in writing by Fulton County in the specifications, purchase order, or other contract.

22. A successful Bidder is solely responsible for disposing of all wrappings, crating, and other disposable material upon deliver of item(s).

23. All Bidders are required to be authorized distributors or regularly engaged in the sale or distribution of the type of goods, materials, equipment or services for which the Bidder is submitting a Bid response in addition, all Bidders are required to provide Fulton County with three (3) written references documenting the successful completion of Bids or contracts for the types of items including goods, materials, equipment, or services for which the Bidder is submitting a Bid response. In instances where a Bidder has never supplied such goods, material, equipment, or services before, the Bidder must submit with the Bid response a statement and supporting documentation demonstrating such expertise, knowledge, or experience to establish the Bidder as a responsible Bidder, capable of meeting the Bid requirements should an award be made. No exceptions to this provision will be made unless authorized in the Bid specifications.

24. Bidders may be required to furnish evidence that they maintain permanent places of business of a type and nature compatible with their Bid proposal, and are in all respects competent and eligible vendors to fulfill the terms of the specifications. Fulton County may make such investigations as it deems necessary to determine the ability of the Bidder to perform such work, and reserves the right to reject any Bidder if evidence fails to indicate that the Bidder is qualified to carry out the obligation of the Contract and to complete the work satisfactorily.

25. All Bidders must comply with all Fulton County Purchasing laws, policies, and procedures, non-discrimination in contracting and procurement ordinances, and relevant state and federal laws including but not limited to compliance with EEOC hiring guidelines and requirements under the Americans with Disabilities Act. Successful Bidder must obtain all permits, licenses, and inspections as required and furnish all labor, materials, insurance, equipment, tools, supervision, and incidentals necessary to accomplish the work in these specifications.

26. If a successful Bidder is unable or unwilling to enter into a Contract with Fulton County subsequent to being granted an award, or who fails to perform in accordance with the Bid specifications the Bidder will be subject to damages and all other relief allowed by law.

27. Successful Bidders contract directly with Fulton County and are the party or parties obligated to perform. Contracts may not be assigned and any failure to perform the Contract in accordance with the specifications will constitute a breach of Contract and may result in a Bidder being found to be “non-responsive” in the future.

28. In case of default by the successful Bidder, Fulton County may procure the articles for services from another source and hold the successful Bidder responsible for any resulting excess cost.

29. The County may award any Bid in whole or in part to one or more vendors or reject all Bids and/or waive any technicalities if it is in the best interests of the County to do so. In the event that all Bids are not rejected, Bids for items including goods, materials, equipment, and services will be awarded to the lowest “responsible” Bidder(s) as determined by Fulton County. Submitting the lowest Bid, as published at the Bid opening, does not constitute an award or the mutual expectation of an award of a Contract and purchase order. For purposes of this notice and the attached Bid sheets, a purchase order is a Contract to provide items including goods, materials, equipment, and services and is intended to have the full force and effect of a Contract. A breach of the terms and conditions of a purchase order constitutes a breach of Contract.

30. Bids for projects that are solicited pursuant to the Georgia Local Government Public Works Construction Law (O.C.G.A. § 36-91-1 et seq.) may withdrawn as follows:

    Competitive sealed Bids (“Bid”) may not be revoked or withdrawn until 60 days after the time set by the governmental entity for opening of Bids. At the end of this time period, the Bid will cease to be valid, unless the Bidder provides written notice to the County prior to the scheduled expiration date that the Bid will be extended for a time period specified by the County.

31. In the evaluation of the Bids, any award will be subject to the Bid being:

    a. Compliant to the specification – meets form, fit, and function requirements stated or implied in the specification.
    b. Lowest cost to the County over projected useful life.

c. Administratively Compliant – Including all required bonds, insurance, established quality of work and general reputation, financial responsibility, relevant experience, and related criteria.

32. All proposals and Bids submitted to Fulton County are subject to the Georgia "Open Records Act", Official Code of Georgia, Annotated (O.C.G.A.) §50-18-70 et seq.

33. All proposals and Bids submitted to Fulton County involving Utility Contracting are subject to the Georgia law governing licensing of Utility Contractors, O.C.G.A. §43-14-8.2(h). The Utility Contractor License number of the person who will perform the utility work shall be written on the face of the Bid envelope.

34. The apparent silence of this specification, and any supplement thereto, as to details, of the omission from it of a detailed description concerning any point, will be regarded as meaning only the best commercial practices are to prevail. Only materials of the highest quality, correct type, size, and design are to be used. All interpretations of this specification will be made upon the basis of this statement, with Fulton County interpretation to prevail.

35. It is the policy of Fulton County that the evaluation and award process for County contracts shall be free from both actual and perceived impropriety, and that contacts between potential vendors and County officials, elected officials and staff regarding pending awards of County contracts shall be prohibited.

    a. No person, firm, or business entity, however situated or composed, obtaining a copy of or responding to this solicitation, shall initiate or continue any verbal or written communication regarding this solicitation with any County officer, elected official, employee, or designated County representative, between the date of the issuance of this solicitation and the date of the County Manager's recommendation to the Board of Commissioners for award of the subject contract, except as may otherwise be specifically authorized and permitted by the terms and conditions of this solicitation.

    b. All verbal and written communications initiated by such person, firm, or entity regarding this solicitation, if same are authorized and permitted by the terms and conditions of this solicitation, shall be directed to the Purchasing Agent.

    c. Any violation of this prohibition of the initiation or continuation of verbal or written communications with County officers, elected officials, employees, or designated County representatives shall result in a written finding by the Purchasing Agent that the submitted Bid or proposal of the person, firm, or entity in violation is "non-responsive", and same shall not be considered for award.

36. Any Bidder intending to respond to this solicitation as a Joint Venture must submit an executed Joint Venture Agreement with this Bid. This agreement must designate those persons or entities authorized to execute documents or otherwise bind the Joint Venture in all transactions with Fulton County, or are accompanied by a document, binding upon the Joint Venture and its constituent members, making such designation. Bids from Joint Ventures that do not include these documents will be rejected as being "non-responsive".

37. Any Bidder intending to respond to this solicitation must complete all of the Procurement Affidavit Forms provided in this solicitation. Bids that do not include these completed documents will be rejected as being "non-responsive".

38. In accordance with the Georgia Local Government Public Works Construction Law (O.C.G.A. § 36-91-2), the following definitions apply when used on the Bid Form:
    a. "Alternate Bids" means the amount stated in the Bid Form to be added to or deducted from the amount of the base bid if the corresponding change in project scope or alternate materials or methods of construction is accepted.

    b. "Base Bid" means the amount of money stated in the Bid Form as the sum for which the bidder offers to perform the work.

## Required Bid Submittal Check List for Invitation To Bid (ITB)

**The following submittals shall be completed and submitted with each bid** (see table below "Required Bid Submittal Check List."). **Please check to make sure that the required submittals are in the envelope before it is sealed. Failure to submit all required submittals may deem your proposal non-responsive.**

Submit one (1) Original bid, signed and dated and three (3) **complete** copies of the Original Bid including all required documents.

| Item # | Required Bid Submittal Check List | Check (√) |
|---|---|---|
| **1** | Bid Form (Section 00300) – All dollar amounts must be both in writing AND figures and represent prices for the published scope of work without exceptions. | |
| **2** | Acknowledgement of each Addendum (acknowledged both on the Bid Form, Section 00300, and on the form included with each addendum). | |
| **3** | Bid Bond (Section 00410) (separate envelope if Public Works Construction project) | |
| **4** | Purchasing Forms (Section 00420)<br>Form A - Non-Collusion Affidavit of Prime Bidder/Offeror<br>Form B - Certificate of Acceptance of Request for Bid/Proposal Requirements<br>Form C - Georgia Utility Contractor License<br>Form D - Certificate Regarding Debarment<br>Form E - Disclosure Form & Questionnaire | |
| **5** | Office of Contract Compliance Requirements (Section 00430)<br>Exhibit A - Promise of Non-Discrimination (for Prime and each Sub)<br>Exhibit B - Employment Record (for Prime and each Sub)<br>Exhibit C - Schedule of Intended Subcontractor Utilization<br>Exhibit D - Letter of Intent to Perform as Subcontractor<br>Exhibit E - Declaration Regarding Subcontractor Practices<br>Exhibit F - Joint Venture Disclosure Affidavit<br>Exhibit G - Prime Contractor/Subcontractor Utilization Report<br>Equal Business Opportunity Plan (EBO Plan) | |
| **6** | Risk Management Insurance Provisions Form (Section 00490) and proof of insurance, either letter from insurer or Certificate of Insurance. | |

**END OF SECTION**

# BID FORM

Submitted To: Fulton County Government

Submitted By: _____

For: **S109 RIVERSIDE ROAD PUMP STATION UPGRADE**
**ITB # 07ITB58420K-RS**

Submitted on _____, 20__.

The undersigned, as Bidder, hereby declares that the only person or persons interested in the Bid as principal or principals is or are named herein and that no other person than herein mentioned has any interest in this Bid or in the Contract to be entered into; that this Bid is made without connection with any other person, company or parties making a Bid; and that it is in all respects fair and in good faith without collusion or fraud.

The Bidder further declares that he has examined the site of the work and informed himself fully in regard to all conditions pertaining to the place where the work is to be done; that he has examined the Drawings and Specifications for the work and contractual documents relative thereto, and has read all instructions to Bidders and General Conditions furnished prior to the openings of bids; that he has satisfied himself relative to the work to be performed.

The Bidder proposes and agrees, if this Bid is accepted, to contract with the Board of Commissioners of Fulton County, Atlanta, Georgia, in the form of contact specified, to furnish all necessary materials, equipment, machinery, tools, apparatus, means of transportation and labor necessary, and to complete the construction of the work in full and complete accordance with the shown, noted, and reasonably intended requirements of the Specifications and Contract Documents to the full and entire satisfaction of the Board of Commissioners of Fulton County, Atlanta, Georgia, with a definite understanding that no money will be allowed for extra work except as set forth in the attached General Conditions and Contract Documents for the following prices.

THE BASE BID TOTAL IS THE AMOUNT UPON WHICH THE BIDDER WILL BE FORMALLY EVALUATED AND WHICH WILL BE USED TO DETERMINE THE LOWEST RESPONSIBLE BIDDER. Please make sure that all line items below are accurately calculated and total up to this inclusive amount.

The base bid may not be withdrawn or modified for a period of sixty (60) days following the receipt of bids.

BASE BID TOTAL: ITEMS 1 THROUGH 3 (BELOW), INCLUSIVE, IN THE

AMOUNT OF: _____

_____DOLLARS

($_____).

Make sure that all line items below are accurately calculated and total up to the inclusive BASE BID TOTAL amount entered on Page 1.

**Method of Bidding**

The unit or lump sum price for each of the several items in the Bid of each Bidder shall include its 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 may be rejected. Additionally, Unbalanced Bids or conditional Bids will be subject to rejection. The special attention of all Bidders is called to this provision, for should conditions make it necessary to revise the quantities, no limit will be fixed for such increased or decreased quantities nor extra compensation allowed.

Work included within each Bid Item in the Bid Schedule is described in Section 01025 – Measurement and Payment.

## BID SCHEDULE

**Item 1 – Lump Sum Items**

| Bid Item No. | Description | Bid Price |
|---|---|---|
| 1.1 | Five Year Generator Preventative Maintenance Contract | $ |
| 1.2 | Pump Station Upgrade – All Remaining Work Shown on the Drawings or Defined in the Specifications, Excluding the Unit Price Items and Cash Allowance Items (Below) and Item 1.1, (Above). | $ |
| Subtotal Item 1 – Lump Sum Items | | $ |

**Item 2 – Unit Price Items**

| Bid Item No. | Estimated Quantity | Unit | Description | Unit Price | Bid Price |
|---|---|---|---|---|---|
| 2.1 | 700 | LF | Silt Fencing (Sd1-C) | $ | $ |
| 2.2 | 0.5 | Acre | Temporary Mulching (Ds1) | $ | $ |
| 2.3 | 0.5 | Acre | Temporary Seeding (Ds2) | $ | $ |
| 2.4 | 0.5 | Acre | Permanent Grassing (Ds4) | $ | $ |
| 2.5 | 1 | EA | Stone Check Dam (Cd-St) | $ | $ |
| 2.6 | 700 | CY | Wet Well Cleaning | $ | $ |
| Subtotal Item 2 – Unit Price Items | | | | | $ |

**Item 3 – Allowances**

| Bid Item No. | Description | Bid Price |
|---|---|---|
| 3.1 | Testing Allowance | $ 10,000 |
| 3.2 | Elevator Repair Allowance (per Specification Section 14200) | $ 225,000 |
| 3.3 | Un-Foreseen Utility Conflict Allowance | $ 50,000 |
| 3.4 | Owner Directed Work Allowance | $ 350,000 |
| Subtotal Item 3 – Cash Allowance Items | | $ 635,000 |

**SCHEDULE OF "PRE-APPROVED EQUIPMENT"**

Contractor shall circle the name of the manufacturer (one and only one) included in the base bid.

| Section Number | Description | Manufacturer/Supplier |
|---|---|---|
| 11141 | Chopper-Type Submersible Pumps | (A) Vaughn<br>(B) Hayward Gordon |
| 11151 | Vertical Non-Clog Pumps | (A) Morris Pumps<br>(B) Flowserve |
| 11395 | Medium Voltage Variable Frequency Drives | (A) Rockwell Automation/Allen Bradley<br>(B) Siemens Robicon<br>(C) Toshiba |
| 11221 | Medium Voltage Motors | (A) Reliance Electric Co.<br>(B) Siemens<br>(C) US Motors/Emerson Electric Co<br>(D) GE |
| 11241 | Venturi Mixer | (A) Waste Tec, Inc. |
| 11431 | Open Channel Sewage Grinders | (A) JWC Environmental, Inc |
| 13251 | Modular Odor Control Scrubber Equipment | (A) US Filter/Siemens Water Technologies<br>(B) Duall Division/MetPro Corporation<br>(C) Indusco |
| 13252 | Carbon Odor Control System & Accessories | (A) Calgon Carbon Corporation<br>(B) Bay Products, Inc. |
| 15566 | Indoor Packaged Air Conditioning System | (A) Liebert |
| 16620 | Packaged Engine Generator System | (A) Caterpillar<br>(B) Cummins<br>(C) Detroit Diesel |

## SCHEDULE OF PRE-APPROVED SYSTEM INTEGRATORS

| | | |
|---|---|---|
| 17000 | Control and Information System Scope and General Requirements | |

The Bidder agrees hereby to commence work under this Contract, with adequate personnel and equipment, on a date to be specified in a written order of the Contracting Officer and to fully complete all work under this Contract within **Five hundred forty eight (548)** consecutive calendar days from and including said date.

The Bidder declares that he understands that the quantities shown for the unit prices items are subject to either increase or decrease, and that should the quantities of any of the items of work be increased, the Bidder proposes to do the additional work at the unit prices stated herein; and should the quantities be decreased, the Bidder also understands that payment will be made on the basis of actual quantities at the unit price bid and will make no claim for anticipated profits for any decrease in quantities; and that actual quantities will be determined upon completion of work, at which time adjustments will be made to the contract amount by direct increase or decrease.

In case of discrepancies between the figures shown in the unit prices and the totals, the unit prices shall apply and the totals shall be corrected to agree with the unit prices. In case of discrepancies between written amounts and figures, written amounts shall take precedence over figures and the sum of all Bid extensions (of unit prices) plus lump sum items shall take precedence over BID TOTAL.

The Bidder furthermore agrees that, in the case of a failure on his part to execute the Contract Agreement and Bonds within ten (10) days after receipt of conformed contract documents for execution, the Bid Bond accompanying his bid and the monies payable thereon shall be paid into the funds of the Owner as liquidated damages for such failure.

Enclosed is a Bid Bond in the approved form, in the sum of:_____

_____Dollars

($_____) according to the conditions of “Instructions to Bidders” and provisions thereof.

The undersigned acknowledges receipt of the following addenda (list by the number and date appearing on each addendum) and thereby affirms that its Bid considers and incorporates any modifications to the originally issued Bidding Documents included therein.

ADDENDUM # _____DATED _____

ADDENDUM # _____DATED _____

ADDENDUM # _____DATED _____

ADDENDUM # _____DATED _____

**BIDDER:** _____

By: _____
*[Name Typed or Printed]*

_____
*[ Name Signed]*

Title: _____

Business Address: _____

_____

_____

Business Phone: _____

Bidder's Contractor License No: _____
*[State/County]*
License Expiration Date: _____

Note: If the Bidder is a corporation, the Bid shall be signed by an officer of the corporation; if a partnership, it shall be signed by a partner. If signed by others, authority for signature shall be attached.

The full name and addresses of persons or parties interested in the foregoing Bid, as principals, are as follows:

| Name | Address |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| | |

The Bidder shall list below work he has done of similar nature to this bid as references that will afford the Owner opportunity to judge the Bidder's experience and skill.

| PROJECT NAME AND OWNER | OWNERS REPRESENTATIVE | PHONE |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |

**END OF SECTION**

# BID BOND

No bid for a contract in Fulton County for work to be done shall be valid for any purpose unless the Contractor shall give a Bid Bond with good and sufficient surety payable to, in favor of, and for the protection of Fulton County. The Bid Bond shall not be less than 5% of the total amount payable by the terms of the Contract. No bid shall be read aloud or considered if a proper bid bond has not been submitted.

Surety companies executing Bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State of Georgia.

Attestation for the corporation must be by the corporate officer; for a partnership by another partner; for an individual by a notary with the corporate seal.

# BID BOND
## S109 – RIVERSIDE ROAD PUMP STATION UPGRADE
## FULTON COUNTY GOVERNMENT

KNOW ALL MEN BY THESE PRESENTS, THAT WE_____

_____

hereinafter called the PRINCIPAL, and _____

_____

hereinafter call the SURETY, a corporation chartered and existing under the laws of the State of _____and duly authorized to transact Surety business in the State of Georgia, are held and firmly bound unto the Fulton County Government (COUNTY), in the penal sum of _____ _____Dollars and Cents ($_____) good and lawful money of the United States of America, to be paid upon demand of the COUNTY, to which payment well and truly to be made we bind ourselves, our heirs, executors, and administrators and assigns, jointly and severally and firmly by these presents.

WHEREAS the PRINCIPAL has submitted to the COUNTY, for S109 – RIVERSIDE ROAD PUMP STATION UPGRADE**,** a Bid;

WHEREAS the PRINCIPAL desires to file this Bond in accordance with law:

NOW THEREFORE: The conditions of this obligation are such that if the Bid be accepted, the PRINCIPAL shall within ten (10) calendar days after receipt of written notification from the COUNTY of the award of the Contract execute the Contract in accordance with the Bid and upon the terms, conditions and prices set forth therein, in the form and manner required by the COUNTY, and execute sufficient and satisfactory Performance and Payments Bonds payable to the COUNTY, each in the amount of one hundred percent (100%) of the total contract price, in form and with security satisfactory to said COUNTY, then this obligation to be void; otherwise, to be and remain in full force and virtue in law; and the SURETY shall upon failure of the PRINCIPAL to comply with any or all of the foregoing requirements within the time specified above immediately pay to the COUNTY, upon demand the amount hereof in good and lawful money of the United States of America, not as a penalty, but as liquidated damages.

In the event suit is brought upon this Bond by the COUNTY and judgment is recovered, the SURETY shall pay all costs incurred by the COUNTY in such suit, including attorney's fees to be fixed by the Court.

Enclosed is a Bid Bond in the approved form, in the amount of _____ _____Dollars ($_____) being in the amount of five percent (5%) of the Contract Sum. The money payable on this bond shall be paid to the COUNTY, for the failure of the Bidder to execute a Contract within ten (10) days after receipt of the Contract and at the same time furnish a Payment Bond and Performance Bond.

(SIGNATURES ON NEXT PAGE)

IN TESTIMONY THEREOF, the PRINCIPAL and SURETY have caused these presents to be duly signed and sealed this _____day of _____,_200_.

ATTEST:

_____
PRINCIPAL

_____ BY_____

(SEAL)

**CERTIFICATE AS TO CORPORATE PRINCIPAL**

I, _____, certify that I am the Secretary of the Corporation named as principal in the within bond; that _____, who signed the said bond of said corporation; that I know this signature, and his/her signature thereto is genuine; and that said bond was duly signed, sealed and attested for in behalf of said Corporation by authority of its governing body.

_____
SECRETARY

(CORPORATE SEAL)

_____
SURETY

_____ BY_____
(SEAL)

**END OF SECTION**

# PURCHASING FORMS & INSTRUCTIONS

This section contains the procurement forms that are required to be executed and submitted with the bid package. This section does not contain all forms required to be included with the bid package submittal.

To be deemed responsive to this RFP, Bidders must provide the information requested and complete in detail all Purchasing Forms. The appropriate individual(s) authorized to commit the Bidder to the Project must sign the Purchasing Forms. Bidders should reproduce each Purchasing Form, as required, and complete the appropriate portions of the forms provided in this section.

- Form A: Non-Collusion Affidavit of Prime Bidder/Offeror
- Form B: Certificate of Acceptance of Request for Bid/Proposal Requirements
- Form C: Contractor's Georgia Utility License Certification
- Form D: Certification Regarding Debarment
- Form E: Disclosure Form and Questionnaire
- Form F: Declaration of Employee-Number Categories
- Form G: Georgia Security and Immigration Contractor Affidavit and Agreement
- Form H: Georgia Security and Immigration Subcontractor Affidavit

## FORM A: NON-COLLUSION AFFIDAVIT OF BIDDER/OFFEROR

**STATE OF GEORGIA**

**COUNTY OF FULTON**

I, _____ certify that pursuant to Fulton County Code Section 2-320 (11), this bid or proposal is made without prior understanding, agreement or connection with any corporation, firm or person submitting a bid for the same work, labor or service to be done or the supplies, materials or equipment to be furnished and is in all respects fair and without collusion or fraud. I understand collusive bidding is a violation of state and federal law and can result in fines, prison sentences and civil damages awards. I agree to abide by all conditions of this bid or proposal and certify that I am authorized to sign this bid or proposal for the bidder.

Affiant further states that pursuant to O.C.G.A. Section 36-91-21 (d) and (e), _____ has not, by itself or with others, directly or indirectly, prevented or attempted to prevent competition in such bidding or proposals by any means whatsoever. Affiant further states that (s)he has not prevented or endeavored to prevent anyone from making a bid or offer on the project by any means whatever, nor has Affiant caused or induced another to withdraw a bid or offer for the work.

Affiant further states that the said offer of _____ is bona fide, and that no one has gone to any supplier and attempted to get such person or company to furnish the materials to the bidder only, or if furnished to any other bidder, that the material shall be at a higher price.

_____
(COMPANY NAME)

_____
(PRESIDENT/VICE PRESIDENT)

Sworn to and subscribed before me this _____ day of _____, 200__.

_____
(SECRETARY/ASSISTANT SECRETARY)

(Affix corporate seal here, if a corporation)

Notary Public: _____

County: _____

Commission Expires: _____

**NOTE:**

**IF THE OFFEROR 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 ALSO MAKE THIS OATH.**

**IF THE OFFEROR 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.**

## FORM B: FULTON COUNTY CERTIFICATE OF ACCEPTANCE OF BID/PROPOSAL REQUIREMENTS

This Is To Certify That On This Day Bidder/Proposer Acknowledges That He/She Has Read This Bid Document, Pages _____ To _____ Inclusive, Including Addendum(s) ____ To ____, And/Or Appendices ____ To ____, In Its Entirety, And Agrees That No Pages Or Parts Of The Document Have Been Omitted, That He/She Understands, Accepts And Agrees To Fully Comply With The Requirements Therein, And That The Undersigned Is Authorized By The Bidding/Proposing Company To Submit The Bid/Proposal Herein And To Legally Obligate The Bidder/Proposer Thereto.

Company: _____

Signature: _____

Name: _____

Title: _____

Date: _____

(Corporate Seal)

## FORM C: CONTRACTOR'S GEORGIA UTILITY LICENSE CERTIFICATION

Contractor's Name: _____

Utility Contractor's Name: _____

Expiration Date of License:_____

(ATTACHED COPY OF LICENSE)

I certify that the above information is true and correct and that the classification noted is applicable to the Bid for this Project.

Signed: _____

Date: _____

## FORM D: CERTIFICATION REGARDING DEBARMENT

(1) The Offeror certifies that neither it or its subcontractors is presently debarred, suspended, proposed for debarment, declared ineligible, or otherwise excluded from doing business with any government agency. Any such exclusion may cause prohibition of your firm from participating in any procurement by the Fulton County Government.

(2) If the Offeror is unable to certify to any of the statements in this certification, such Offeror or subcontractor shall attach an explanation to this bid or proposal.

### INSTRUCTIONS FOR CERTIFICATION

By signing and submitting this certification, the Offeror is providing the certification set out below:

(1) The certification in this clause is a material representation of fact upon which reliance will be placed. If it is later determined that the prospective vendor knowingly rendered a false certification, the Purchasing Agent may pursue all available remedies, including suspension and/or debarment, for withdrawal of award or termination of a contract.

(2) The prospective Offeror shall provide immediate written notice to the Purchasing Agent if at anytime the Offeror learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

(3) Offeror shall be under a continuing duty to immediately inform the Purchasing Agent in writing of any changes, if as a result of such changes, the Offeror certification regarding debarment is affected.

### DEBARMENT ORDINANCE

The following Section 2-322 of Fulton County Code of Laws establishes the procedure for the debarment of contractors.

**(a)** ***Authority to suspend.***

After reasonable notice to the entity involved and reasonable opportunity for that entity to be heard, the Purchasing Agent, after consultation with user department, the County Manager and the County Attorney shall have the authority to suspend an entity for cause from consideration for award of county contracts. As used in this section, the term entity means any business entity, individual, firm, contractor, subcontractor or business corporation, partnership, limited liability corporation, firm, contractor, subcontractor or business structured; provided, further, that any such entity shall also be subject to suspension under this section if any of its constituents, members, subcontractors at any tier of such entity's and the entity, or any constituent or member, knew or should have known of the commission of the act. The suspension shall be for a period not to exceed three (3) years unless cause is based on a felony conviction for an offense related or associated with fraudulent contracting or misappropriation of funds wherein the suspension shall not exceed seven (7) years.

**(b)** ***Causes for Suspension. The causes for suspension include:***

(1) Conviction for commission of a criminal offense as an incident to obtain or attempting to obtain a public or private contract or subcontract, or in performance of such contract or subcontract;

(2) Conviction of state or federal statutes of embezzlement, theft, forgery, bribery, falsification or destruction of records, receiving stolen property or other offense indicating a lack of business integrity or business honesty which currently, seriously and directly affects responsibility as a county contractor.

(3) Conviction of state or federal anti-trust statues arising out of the solicitation and submission of bids and proposals;

(4) Violation of contract provisions, as set forth below, of a character which is regarded by the Purchasing Agent to be so serious as to justify suspension action:

a. Failure to perform in accordance with the specifications within a time limit provided in a county contract;

b. A recent record of failure to perform or unsatisfactory performance in accordance with the terms of one or more contracts; provided, that failure to perform or unsatisfactory performance caused by acts beyond the control of the contractor shall not be considered to be a basis for suspension;

c. Material representation of the composition of the ownership or workforce or business entity certified to the county as a minority business enterprise; or

d. Falsification of any documents.

(5) For violation of the ethical standards set forth in Fulton County Code Chapter 9, Code of Ethics.

(6) Knowing misrepresentation to the county, of the use which a majority owned contractor intends to make a minority business enterprise (a business entity at least 51 percent of which is owned and controlled by minority persons, as defined in Fulton County Code Chapter 6, Article B, Minority Business Enterprise Affirmative Action Program and certified as such by the County) as a subcontractor or a joint venture partner, in performing work under contract with the County.

Failure to fully and truthfully provide the information required, may result in the disqualification of your bid/proposal from consideration or termination of the Contract, once awarded. This document must be completed and included as a part of the bid/proposal package along with other required documents.

[SIGNATURES ON NEXT PAGE]

Under penalty of perjury, I declare that I have examined this certification and all attachments hereto, if applicable, to the best of my knowledge and belief, and all statements contained hereto are true, correct, and complete.

On this _____ day of _____, 200__

_____
(Legal Name of Offeror) (Date)

_____
(Signature of Authorized Representative) (Date)

_____
(Title)

## FORM E: DISCLOSURE FORM AND QUESTIONNAIRE

1. Please provide the names and business addresses of each of the Offeror's firm's officers and directors.

   For the purposes of this form, the term "Offeror" means an entity that responds to a solicitation for a County contract by either submitting a proposal in response to a Request for Proposal or a Request for Qualification or a Bid in response to an Invitation to Bid.

   Describe accurately, fully and completely, their respective relationships with said Offeror, including their ownership interests and their anticipated role in the management and operations of said Offeror.

2. Please describe the general development of said Offeror's business during the past five (5) years, or such shorter period of time that said Offeror has been in business.

3. Please state whether any employee, agent or representative of said Offeror who is or will be directly involved in the subject project has or had within the last five (5) years: (i) directly or indirectly had a business relationship with Fulton County; (ii) directly or indirectly received revenues from Fulton County; or (iii) directly or indirectly receives revenues from the result of conducting business on Fulton County property or pursuant to any contract with Fulton County. Please describe in detail any such relationship.

**LITIGATION DISCLOSURE:**

Failure to fully and truthfully disclose the information required, may result in the disqualification of your bid or proposal from consideration or termination of the Contract, once awarded.

1. Please state whether any of the following events have occurred in the last five (5) years with respect to said Offeror. If any answer is yes, explain fully the following:

   (a) whether a petition under the federal bankruptcy laws or state insolvency laws was filed by or against said Offeror, or a receiver fiscal agent or similar officer was appointed by a court for the business or property of said Offeror;

   (b) whether Offeror was subject of any order, judgment, or decree not subsequently reversed, suspended or vacated by any court of competent jurisdiction, permanently enjoining said Offeror from engaging in any type of business practice, or otherwise eliminating any type of business practice; and

   (c) whether said Offeror's business was the subject of any civil or criminal proceeding in which there was a final adjudication adverse to said or Offeror, which directly arose from activities conducted by the business unit or corporate division of said Offeror which submitted a bid or proposal for the subject project. If so please explain.

2. Have you or any member of your firm or team to be assigned to this engagement been indicted or convicted of a criminal offense within the last five (5) years?

   Circle One: YES NO

3. Have you or any member of your firm or team ever been terminated (for cause or otherwise) from any work being performed for Fulton County or any other Federal, State or Local Government ?

   Circle One: YES NO

4. Have you or any member of your firm or team been involved in any claim or litigation adverse to Fulton County or any other Federal, State or Local Government, or private entity during the last three (3) years?

   Circle One: YES NO

5. Has any offeror, member of offeror's team, or officer of any of them (with respect to any matter involving the business practices or activities of his or her employer), been notified within the five (5) years preceding the date of this offer that any of them are the target of a criminal investigation, grand jury investigation, or civil enforcement proceeding?

   Circle One: YES NO

If you have answered "YES" to any of the above questions, please indicate the name(s) of the person(s), the nature, and the status and/or outcome of the information, indictment, conviction, termination, claim or litigation, the name of the court and the file or reference number of the case, as applicable. Any such information should be provided on a separate page, attached to this form and submitted with your proposal.

**NOTE: If any response to any question set forth in this questionnaire has been disclosed in any other document, a response may be made by attaching a copy of such disclosure. (For example, said Offeror's most recent filings with the Securities and Exchange Commission ("SEC") may be provided if they are responsive to certain items within the questionnaire.) However, for purposes of clarity, Offeror should correlate its responses with the exhibits by identifying the exhibit and its relevant text.**

Disclosures must specifically address, completely respond and comply with all information requested and fully answer all questions requested by Fulton County. Such disclosure must be submitted at the time of the bid or proposal submission and included as a part of the bid/proposal submitted for this project. Disclosure is required for Offerors, joint venture partners and first-tier subcontractors.

Failure to provide required disclosure, submit officially signed and notarized documents or respond to any and all information requested/required by Fulton County can result in the bid/proposal declared as non-responsive. This document must be completed and included as a part of the bid/proposal package along with other required documents.

[SIGNATURES ON NEXT PAGE]

Under penalty or\f perjury, I declare that I have examined this questionnaire and all attachments hereto, if applicable, to the best of my knowledge and belief, and all statements contained hereto are true, correct, and complete.

On this _____ day of _____, 200__

_____
(Legal Name of Proponent) (Date)

_____
(Signature of Authorized Representative) (Date)

_____
(Title)

**Sworn to and subscribed before me,**

this _____ day of _____, 200__

_____
(Notary Public) (Seal)

Commission Expires _____
(Date)

## FORM F: DECLARATION OF EMPLOYEE-NUMBER CATEGORIES

Please affirmatively indicate by checking the appropriate box the employee-number category applicable to your company:

☐ 500 or more employees

☐ 100 or more employees

☐ fewer than 100 employees

Company Name: _____

I certify that the above classification is true and correct.

Signed: _____

Printed: _____

Title: _____

Date: _____

## FORM G: GEORGIA SECURITY AND IMMIGRATION CONTRACTOR AFFIDAVIT AND AGREEMENT

**Instructions:**

Contractors must attest to compliance with the requirements of O.C.G.A 13-10-91 and the Georgia Department of Labor Rule 300-10-01-.02 by executing the Contractor Affidavit provided. The affidavit should be executed by Contractors who have indicated on Form F, Declaration of Employee-Number Categories, that they have 500 or more employees.

**STATE OF GEORGIA**

**COUNTY OF FULTON**

**FORM G: GEORGIA SECURITY AND IMMIGRATION CONTRACTOR AFFIDAVIT AND AGREEMENT**

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 engaged in the physical performance of services under a contract with **[insert name of prime contractor]** _____ on behalf of **Fulton County Government** has registered with and is participating in a federal work authorization program* [any of the electronic verification of work authorization programs operated by the United States Department of Homeland Security or any equivalent federal work authorization program operated by the United States Department of Homeland Security to verify information of newly hired employees, pursuant to the Immigration Reform and Control Act of 1986 (IRCA), P.L. 99-603], in accordance with the applicability provisions and deadlines established in O.C.G.A. 13-10-91.

The undersigned further agrees that, should it employ or contract with any subcontractor(s) in connection with the physical performance of services to this contract with **Fulton County Government**, contractor will secure from such subcontractor(s) similar verification of compliance with O.C.G.A/ 13-10-91 on the Subcontractor Affidavit provided in Rule 300-10-01-.08 or a substantially similar form. Contractor further agrees to maintain records of such compliance and provide a copy of each such verification to the **Fulton County Government** at the time the subcontractor(s) is retained to perform such service.

_____
EEV/Basic Pilot Program* User Identification Number

_____
BY: Authorized Officer of Agent
(Insert Subcontract Name)

_____
Title of Authorized Officer or Agent of Subcontractor

_____
Printed Name of Authorized Officer or Agent

Sworn to and subscribed before me this _____ day of _____, 200__.

Notary Public: _____

County: _____

Commission Expires: _____

**NOTE:**

*** As of the effective date of O.C.G.A. 13-10-91, the applicable federal work authorization program is the "EEV/Basic Pilot Program" operated by the U.S. Citizenship and Immigration Services Bureau of the U.S. Department of Homeland Security, in conjunction with the Social Security Administration (SSA).**

## FORM H: GEORGIA SECURITY AND IMMIGRATION SUBCONTRACTOR AFFIDAVIT

**Instructions:**

In the event that your company is awarded the contract for this project, and will be utilizing the services of any subcontractor(s) in connection with the physical performance of services pursuant to this contract, the following affidavit must be completed by such subcontractor(s). Your company must provide a copy of each such affidavit to Fulton County Government, Department of Purchasing & Contract Compliance with the proposal submittal.

All subcontractor affidavit(s) shall become a part of the contract and all subcontractor(s) affidavits shall be maintained by your company and available for inspection by Fulton County Government at any time during the term of the contract. All subcontractor(s) affidavit(s) shall become a part of any contractor/subcontractor agreement(s) entered into by your company.

**STATE OF GEORGIA**

**COUNTY OF FULTON**

**FORM H: GEORGIA SECURITY AND IMMIGRATION SUBCONTRACTOR AFFIDAVIT**

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 under a contract with **[insert name of prime contractor]** _____behalf of **Fulton County Government** has registered with and is participating in a federal work authorization program* [any of the electronic verification of work authorization programs operated by the United States Department of Homeland Security or any equivalent federal work authorization program operated by the United States Department of Homeland Security to verify information of newly hired employees, pursuant to the Immigration Reform and Control Act of 1986 (IRCA), P.L. 99-603], in accordance with the applicability provisions and deadlines established in O.C.G.A. 13-10-91.

_____
EEV/Basic Pilot Program* User Identification Number

_____
BY: Authorized Officer of Agent
(Insert Subcontract Name)

_____
Title of Authorized Officer or Agent of Subcontractor

_____
Printed Name of Authorized Officer or Agent

Sworn to and subscribed before me this _____ day of _____, 200__.

Notary Public: _____

County: _____

Commission Expires: _____

**NOTE:**

*** As of the effective date of O.C.G.A. 13-10-91, the applicable federal work authorization program is the "EEV/Basic Pilot Program" operated by the U.S. Citizenship and Immigration Services Bureau of the U.S. Department of Homeland Security, in conjunction with the Social Security Administration (SSA).**

# CONTRACT COMPLIANCE REQUIREMENTS

## NON-DISCRIMINATION IN CONTRACTING AND PROCUREMENT

**Policy Statement:** It is the policy of Fulton County Government that discrimination against businesses by reason of the race, color, gender or national origin of the ownership of any such business is prohibited. Furthermore, it is the policy of the Board of Commissioners ("Board") that Fulton County and all vendors and contractors doing business with Fulton County shall provide to all businesses the opportunity to participate in contracting and procurement paid, in whole or in part, with monetary appropriations of the Board. Similarly, it is the policy of the Board that the contracting and procurement practices of Fulton County should not implicate Fulton County as either an active or passive participant in the discriminatory practices engaged in by private contractors seeking to obtain contracts with Fulton County.

**Equal Business Opportunity Plan (EBO Plan):** In addition to the proposal submission requirements, each vendor **must** submit an Equal Business Opportunity Plan (EBO Plan) with their bid/proposal. The EBO Plan is designed to enhance the utilization of a particular racial, gender or ethnic group by a bidder/proposer, contractor, or vendor or by Fulton County. The respondent **must** outline a plan of action to encourage and achieve diversity and equality in the available procurement and contracting opportunities with *this solicitation*.

The EBO Plan **must** identify and include:

1. Potential opportunities within the scope of work of *this solicitation* that will allow for participation of racial, gender or ethnic groups.

2. Efforts that will be made by the bidder/proposer to encourage and solicit minority and female business utilization in this solicitation.

Fulton County encourages joint ventures, teaming, partnering and mentor-protégé relationships with minority and female businesses in an effort to achieve contracting and procurement diversity.

**Prompt Payment:** The prime contractor must certify in writing and must document on the Exhibit G Form (Prime Contractor/Subcontractor Utilization Report) that all subcontractors, sub-consultants and suppliers have been promptly paid for work and materials, (less any retainage by the prime contractor prior to receipt of any further progress payments). In the event the prime contractor is unable to pay subcontractors, sub-consultants or suppliers until it has received a progress payment from Fulton County, the prime contractor shall pay all subcontractors, sub-consultants or suppliers funds due from said progress payments within forty-eight (48) hours of receipt of payment from Fulton County. In no event shall a subcontractor, sub-consultant or supplier be paid later than fifteen (15) days as provided for by state law.

## REQUIRED FORMS AND EBO PLAN:

In order to be compliant with the intent and provisions of the Fulton County Non-Discrimination in Purchasing and Contracting Ordinance (99-0960), bidders/proposers must submit the following completed documents. Failure to provide this information shall result in the bid/proposal being deemed non-responsive:

- **Exhibit A** - Promise of Non-Discrimination (for Prime and each Sub-contractor)
- **Exhibit B** - Employment Report (for Prime and each Sub-contractor)
- **Exhibit C** - Schedule of Intended Subcontractor Utilization
- **Exhibit D** - Letter of Intent to Perform As a Subcontractor or Provide Materials or Services
- **Exhibit E** - Declaration Regarding Subcontractor Practices
- **Exhibit F** - Joint Venture Disclosure Affidavit
- **Equal Business Opportunity Plan (EBO Plan)** – This document is not a form. It is a statement created by the bidder/proposer on its company letter head addressing the EBO Plan requirements.

All Contract Compliance documents (Exhibits A – F and EBO Plan) are to be placed in a **separate sealed envelope** clearly marked "Contract Compliance". The EBO Plan must be submitted on company letterhead. These documents are considered part of and should be submitted with the Technical Proposal.

The following document must be completed as instructed if awarded the bid:

- **Exhibit G** - Prime Contractor's Subcontractor Utilization Report

## EXHIBIT A – PROMISE OF NON-DISCRIMINATION

"Know all persons by these presents, that I/WE (_____),
Name

_____ _____
Title Firm Name

Hereinafter "Company"), in consideration of the privilege to bid on or obtain contracts funded, in whole or in part, by Fulton County, hereby consent, covenant and agree as follows:

(1) No person shall be excluded from participation in, denied the benefit of, or otherwise discriminated against on the basis of race, color, national origin or gender in connection with any bid submitted to Fulton County for the performance of any resulting there from,

(2) That it is and shall be the policy of this Company to provide equal opportunity to all businesses seeking to contract or otherwise interested in contracting with this Company without regard to the race, color, gender or national origin of the ownership of this business,

(3) That the promises of non-discrimination as made and set forth herein shall be continuing in nature and shall remain in full force and effect without interruption,

(4) That the promise of non-discrimination as made and set forth herein shall be made a part of, and incorporated by reference into, any contract or portion thereof which this Company may hereafter obtain,

(5) That the failure of this Company to satisfactorily discharge any of the promises of non-discrimination as made and set forth herein shall constitute a material breach of contract entitling the Board to declare the contract in default and to exercise any and all applicable rights and remedies, including but not limited to cancellation of the contract, termination of the contract, suspension and debarment from future contracting opportunities, and withholding and/or forfeiture of compensation due and owning on a contract; and

(6) That the bidder shall provide such information as may be required by the Director of Contract Compliance pursuant to Section 4.4 of the Fulton County Non-Discrimination in Purchasing and Contracting Ordinance.

SIGNATURE: _____

ADDRESS: _____

_____

TELEPHONE NUMBER: _____

## EXHIBIT B – EMPLOYMENT REPORT

The demographic employment make-up for the bidder **must** be identified and submitted with this bid/proposal. In addition, if subcontractors will be utilized by the bidder/proposer to complete this project, then the demographic employment make-up of the subcontractor(s) must be identified and submitted with this bid.

EMPLOYEES

| CATEGORY | NATIVE INDIAN | | AFRICAN AMERICAN | | ASIAN AMERICAN | | HISPANIC AMERICAN | | CACUSIAN AMERICAN | | OTHER | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Male/Female | M | F | M | F | M | F | M | F | M | F | M | F |
| Mgmt/Official | | | | | | | | | | | | |
| Professional (Arch., P.E., etc.) | | | | | | | | | | | | |
| Supervisors | | | | | | | | | | | | |
| Office/ Clerical | | | | | | | | | | | | |
| Craftsmen | | | | | | | | | | | | |
| Laborers | | | | | | | | | | | | |
| Others (Specify) | | | | | | | | | | | | |
| TOTALS | | | | | | | | | | | | |

FIRM'S NAME:_____

ADDRESS:_____

_____

TELEPHONE NUMBER:_____

This completed form is for (Check one) _____Bidder/Proposer _____Subcontractor

Submitted by: _____ Date Completed:_____

## EXHIBIT C – SCHEDULE OF INTENDED SUBCONTRACTOR UTILIZATION

If the bidder/proposer intends to subcontract any portion of this scope of work/service(s), this form **must be** completed and **submitted with the bid/proposal.** All prime bidders/proposers **must** include Letter(s) of Intent (Exhibit D) in the bid document for all subcontractors who will be utilized under the scope of work/services.

**Prime Bidder/Proposer:**_____

**ITB/RFP NUMBER:**_____

**Project Name or Description of Work/Service(s):**_____

_____

_____

1. My firm, as Prime Bidder/Proposer on this scope of work/service(s) is_____is not_____a minority or female owned and controlled business. (Please indicate below the portion of work, including, percentage of bid amount that your firm will carry out directly):

   _____

   _____

   If the Prime Bidder/Proposer is a Joint Venture, please complete Exhibit F: Joint Venture Disclosure Affidavit and attach a copy of the executed Joint Venture Agreement.

2. Sub-Contractors (Including suppliers) to be utilized in the performance of this scope of work/service(s), if awarded, are:

SUBCONTRACTOR NAME:_____

ADDRESS:_____

_____

PHONE:_____

CONTACT PERSON:_____

ETHNIC GROUP*:_____COUNTY CERTIFIED**_____

WORK TO BE PERFORMED:_____

_____

DOLLAR VALUE OF WORK: $_____ PERCENTAGE VALUE:_____%

***Ethnic Groups: African American (AABE); Asian American (ABE); Hispanic American (HBE); Native American (NABE); White Female American (WFBE);**
****If yes, attach copy of recent certification letter.**

## EXHIBIT C – SCHEDULE OF INTENDED SUBCONTRACTOR UTILIZATION

SUBCONTRACTOR NAME:_____
ADDRESS:_____
_____
PHONE:_____
CONTACT PERSON:_____
ETHNIC GROUP*:_____COUNTY CERTIFIED**_____
WORK TO BE PERFORMED:_____
DOLLAR VALUE OF WORK: $_____PERCENTAGE VALUE:_____%

---

SUBCONTRACTOR NAME:_____
ADDRESS:_____
_____
PHONE:_____
CONTACT PERSON:_____
ETHNIC GROUP*:_____COUNTY CERTIFIED**_____
WORK TO BE PERFORMED:_____
DOLLAR VALUE OF WORK: $_____PERCENTAGE VALUE:_____%

---

SUBCONTRACTOR NAME:_____
ADDRESS:_____
_____
PHONE:_____
CONTACT PERSON:_____
ETHNIC GROUP*:_____COUNTY CERTIFIED**_____
WORK TO BE PERFORMED:_____
DOLLAR VALUE OF WORK: $_____PERCENTAGE VALUE:_____%

---

SUBCONTRACTOR NAME:_____
ADDRESS:_____
_____
PHONE:_____
CONTACT PERSON:_____
ETHNIC GROUP*:_____COUNTY CERTIFIED**_____
WORK TO BE PERFORMED:_____
DOLLAR VALUE OF WORK: $_____PERCENTAGE VALUE:_____%

---

***Ethnic Groups: African American (AABE); Asian American (ABE); Hispanic American (HBE); Native American (NABE); White Female American (WFBE); **If yes, attach copy of recent certification letter.**

## EXHIBIT C – SCHEDULE OF INTENDED SUBCONTRACTOR UTILIZATION

| **Total Dollar Value of Subcontractor Agreements: ($)** |
|---|

| **Total Percentage Value: (%)** |
|---|

**CERTIFICATION:** The undersigned certifies that he/she has read, understands and agrees to be bound by the Bid provisions, including the accompanying Exhibits and other terms and conditions regarding sub-contractor utilization. The undersigned further certifies that he/she is legally authorized by the Bidder to make the statement and representation in this Exhibit and that said statements and representations are true and correct to the best of his/her knowledge and belief. The undersigned understands and agrees that if any of the statements and representations are made by the Bidder knowing them to be false, or if there is a failure of the intentions, objectives and commitments set forth herein without prior approval of the County, then in any such event the Contractor's acts or failure to act, as the case may be, shall constitute a material breach of the contract, entitling the County to terminate the Contract for default. The right to so terminate shall be in addition to, and in lieu of, any other rights and remedies the County may have for other defaults under the contract.

Signature/Title:_____

Firm or Corporate Name:_____

Address:_____

_____

Telephone: (  )_____

Fax Number: (  )_____

Email Address:_____

## EXHIBIT D

## LETTER OF INTENT TO PERFORM AS A SUBCONTRACTOR OR PROVIDE MATERIALS OR SERVICES

This form must be completed by ALL known subcontractors/suppliers and submitted with the bid. The Prime Contractor must submit Letters of Intent for ALL known subcontractors/suppliers at time of bid submission.

**To:**_____
(Name of Prime Contractor Firm)

**From:**_____
(Name of Subcontractor Firm)

**ITB/RFP Number:**_____

**Project Name:**_____

The undersigned is prepared to perform the following described work or provide materials or services in connection with the above project (specify in detail particular work items, materials, or services to be performed or provided):

| Description of Work | Project Commence Date | Project Completion Date | Estimated Dollar Amount |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

_____ _____
**(Prime Bidder)** **(Subcontractor)**

**Signature**_____ **Signature**_____

**Title**_____ **Title**_____

**Date**_____ **Date**_____

## EXHIBIT E – DECLARATION REGARDING SUBCONTRACTING PRACTICES

If the bidder/proposer **does not intend to subcontract** any portion of the scope of work services(s), this form **must be** completed and submitted with the bid.

_____Hereby declares that it is my/our intent to
**(Bidder)**

Perform 100% of the work required for_____
**(IFB/RFP Number)**

_____
**(Description of Work)**

In making this declaration, the bidder/proposer states the following:

1. That the bidder does not customarily subcontract elements of this type project, and normally performs and has the capability to perform and will perform **all elements** of the work on this project with his/her own current work forces;

2. If it should become necessary to subcontract some portion of the work at a later date, the bidder will comply with all requirements of the County's Non-Discrimination Ordinance in providing equal opportunities to all firms to subcontract the work. The determination to subcontract some portion of the work at a later date shall be made in good faith and the County reserves the right to require additional information to substantiate a bidder's decision to subcontract work following the award of the contract. Nothing contained in this provision shall be employed to circumvent the spirit and intent of the County's Non-Discrimination Ordinances;

3. The bidder will provide, upon request, information sufficient for the County to verify Item Number one.

**AUTHORIZED COMPANY REPRESENTATIVE**

**Name:**_____**Title:**_____ **Date:**_____

**Signature:**_____

**Firm:**_____

**Address:**_____

**Phone Number:**_____

**Fax Number:**_____

**Email Address:**_____

## EXHIBIT F – JOINT VENTURE DISCLOSURE AFFIDAVIT

**IFB No.**_____

**Project Name**_____

This form must be completed and submitted with the bid if a Joint Venture approach is to be undertaken.

The firms listed below do hereby declare that they have entered into a joint venture agreement pursuant to the above mentioned project. The information requested below is to clearly identify and explain the extent of participation of each firm in the proposed joint venture. All items must be properly addressed before the business entity can be evaluated.

1. Firms:

1) Name of Business:_____
Street Address: _____
City/State/Zip:_____
County: _____
Nature of Business:_____

2) Name of Business:_____
Street Address: _____
City/State/Zip:_____
County: _____
Nature of Business:_____

3) Name of Business:_____
Street Address: _____
City/State/Zip:_____
County: _____
Nature of Business:_____

**NAME OF JOINT VENTURE (If applicable):**_____

**OFFICE ADDRESS:**_____

**PRINCIPAL OFFICE:**_____

**OFFICE PHONE:**_____

## EXHIBIT F – JOINT VENTURE DISCLOSURE AFFIDAVIT CONTINUED

Note: Attach additional sheets as required

2. Describe the capital contributions by each joint venturer and accounting thereof. Indicate the percentage make-up for each joint venture partner.

3. Describe the financial controls of the joint venture, e.g., will a separate cost center be established? Which venturer will be responsible for keeping the books? How will the expense therefore be reimbursed? What is the authority of each joint venture to commit or obligate the order?

4. Describe any Ownership, options for Ownership, or loans between the joint ventures. Identify terms thereof.

5. Describe the estimate contract cash flow for each joint venturer.

6. To what extent and by whom will the on-site work be supervised?

7. To what extent and by whom will the administrative office be supervised?

8. Which joint venturer will be responsible for material purchases including the estimated cost thereof? How will the purchase be financed?

9. Which joint venturer will provide equipment? What is the estimated cost thereof? How will the equipment be financed?

10. Describe the experience and business qualifications of each joint venturer.

11. Submit a copy of all joint venture agreements and evidence of authority to do business in the State of Georgia as well as locally, to include all necessary business licenses.

12. Percent of ownership by each joint venture in terms of profit and loss sharing:_____
_____

13. The authority of each joint venturer to commit or obligate the other:_____
_____

14. Number of personnel to be involved in project, their crafts and positions and whether they are employees of the small business enterprise, the majority firm or the joint venture:____
_____

## EXHIBIT F – JOINT VENTURE DISCLOSURE AFFIDAVIT CONTINUED

15. Identification of control and participation in venture; list those individuals who are responsible for day-to-day management and policy decision-maker, including, but not limited to, those with prime responsibility for areas designated below; (use additional sheets if necessary)

| Name | Race | Sex | Financial Decisions | Supervision Field Operation |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

In connection with any work that these firms, as a joint venture, might be authorized to perform in connection with above captioned contract, we each do hereby authorize representatives of the Fulton County Department of Purchasing and Contract Compliance and Departments of Finance, under the direction of the County Manger's Office, to examine, from time to time, the books, records and files to the extent that such relate to this County project.

**WE DO SOLEMNLY DECLARE AND AFFIRM UNDER THE PENALTIES OF PERJURY THAT THE CONTENTS OF THE FOREGOING DOCUMENT ARE TRUE AND CORRECT, AND THAT WE ARE AUTHORIZED, ON BEHALF OF THE ABOVE FIRMS, TO MAKE THIS AFFIDAVIT AND GRANT THE ABOVE PRIVILEGE.**

**FOR:**_____
**(Company)**

**Date:**_____ _____
**(Signature of Affiant)**

_____
**(Printed Name)**

_____
**(Company)**

**Date:**_____ _____
**(Signature of Affiant)**

_____
**(Printed Name)**

**State of**_____**:**

**County of**_____**:**

**On this** _____ **day of** _____**, 20**_____**, before me, appeared**

_____**, the undersigned known to me to be the person described in the foregoing Affidavit and acknowledge that he (she) executed the same in the capacity therein stated and for the purpose therein contained.**

## EXHIBIT G – PRIME CONTRACTOR/SUBCONTRACTOR UTILIZATION REPORT

This report is required to be submitted by the tenth day of each month, with a copy of your payment invoice (schedule of values/payment application) to Contract Compliance. Failure to comply may result in the County commencing proceedings to impose sanctions on the successful bidder, in addition to purchasing any other available legal remedy. Sanctions may include the suspending of any payment or part thereof, termination or cancellation of the contract, and the denial to participate in any future contracts awarded by Fulton County.

| REPORTING PERIOD | | PROJECT NAME: | |
|---|---|---|---|
| FROM: | | PROJECT NUMBER: | |
| TO: | | PROJECT LOCATION: | |

| **PRIME CONTRACTOR** | | Contract Award Date | Contract Award Amount | Change Order Amount | Contract Period | % Complete to Date |
|---|---|---|---|---|---|---|
| Name: | | | | | | |
| Address: | | | | | | |
| Telephone #: | | | | | | |

AMOUNT OF REQUISITION THIS PERIOD:$_____
TOTAL AMOUNT REQUISITION TO DATE:$_____

**SUBCONTRACTOR UTILIZATION** (add additional rows as necessary)

| Name of Sub-contractor | Description of Work | Contract Amount | Amount Paid To Date | Amount Requisition This Period | Contract Period Starting Date | Ending Date |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| TOTALS | | | | | | |

Executed By:_____ _____
(Signature) (Printed Name)

**END OF SECTION**

## INSURANCE AND RISK MANAGEMENT PROVISIONS

It is Fulton County Government's practice to obtain Certificates of Insurance from our Contractors and Vendors. Insurance must be written by a licensed agent in a company licensed to write insurance in the State of Georgia, with an A.M. Best rating of at least A- VI, subject to final approval by Fulton County. Respondents shall submit with the bid/proposal evidence of insurability satisfactory to Fulton County Government as to form and content. Either of the following forms of evidence is acceptable:

- A letter from an insurance carrier stating that upon your firm/company being the successful Bidder/Respondent that a Certificate of Insurance shall be issued in compliance with the Insurance and Risk Management Provisions outlined below.

- A Certificate of Insurance complying with the Insurance and Risk Management Provisions outlined below (Request for Bid/Proposal number and Project Name, Number, and Description must appear on the Certificate of Insurance).

Upon award, the Contractor/Vendor must maintain at their expense, insurance with policy limits equal to or greater than the limits described below. Any and all Insurance Coverage(s) and Bonds required under the terms and conditions of the contract shall be maintained during the entire length of the contract, including any extensions or renewals thereto, and until all work has been completed to the satisfaction of Fulton County Government.

Accordingly the Respondent shall provide a certificate evidencing the following:

1. **WORKERS COMPENSATION/EMPLOYER'S LIABILITY INSURANCE – STATUTORY (In compliance with the Georgia Workers Compensation Acts and any other State or Federal Acts or Provisions in which jurisdiction may be granted)**

| | | | |
|---|---|---|---|
| Employer's Liability Insurance | BY ACCIDENT | EACH ACCIDENT | $1,000,000 |
| Employer's Liability Insurance | BY DISEASE | POLICY LIMIT | $1,000,000 |
| (Aggregate) | BY DISEASE | EACH EMPLOYEE | $1,000,000 |

2. **COMMERCIAL GENERAL LIABILITY INSURANCE (Including contractual Liability Insurance)**

| | | |
|---|---|---|
| Bodily Injury and Property Damage Liability | Each Occurrence | $1,000,000 |
| (Other than Products/Completed Operations) | General Aggregate | $2,000,000 |
| Products\Completed Operation | Aggregate Limit | $2,000,000 |
| Personal and Advertising Injury | Limits | $1,000,000 |
| Fire Damage | Limits | $100,000 |

3. **BUSINESS AUTOMOBILE LIABILITY INSURANCE**

| | | |
|---|---|---|
| Combined Single Limits | Each Occurrence | $1,000,000 |
| (Including operation of non-owned, owned, and hired automobiles). | | |

4. **ELECTRONIC DATA PROCESSING LIABILITY**

| | | |
|---|---|---|
| (Required if computer contractor) | Limits | $1,000,000 |

5. **UMBRELLA LIABILITY**

| | | |
|---|---|---|
| (In excess of above noted coverages) | Each Occurrence | $10,000,000 |

6. **PROFESSIONAL LIABILITY**

| | | |
|---|---|---|
| | Each Occurrence | $5,000,000 |

(To be provided when the Contract includes specified Professional Services, and will be written with all Environmental/Pollution exclusions deleted).

**7. ENVIRONMENTAL/POLLUTION LIABILITY**

| | | |
|---|---|---|
| | Each Occurrence | $2,000,000 |

**8. FIDELITY BOND**

| | | |
|---|---|---|
| (Employee Dishonesty) | Each Occurrence | $100,000 |

**9. BUILDERS RISK:** "All-risk" form of builder's risk insurance providing coverage against loss or damage by fire or other peril on an "all-risk" form, including demolition and increased cost of construction, debris removal and the full replacement cost of the Project foundations and containing an agreed amount endorsement, and, until Final Completion and Acceptance of the Project. Such policy of insurance shall contain at least the following sub-limits of insurance and deductibles:

**Sub-limits:**

| | |
|---|---|
| Property in Transit | $1,000,000 |
| Property in Offsite Storage | $1,000,000 |
| Plans & Blueprints | $25,000 |
| Debris Removal | 25% of Insured Physical Loss |
| Delay in Completion / Soft Cost | $1,000 |

**Deductibles:**

| | |
|---|---|
| Flood and Earthquake | $25,000 |
| Water Damage other than Flood | $100,000 |
| All other Perils | $10,000 |

Owner and Contractor waive all rights against each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to this Section, or other property insurance applicable to the Work, accept such rights as they have to the proceeds of such insurance.

The policy will name Fulton County, The Contractor and Subcontractors of all tiers as Insureds under the policy.

**Certificates of Insurance**

Certificates shall state that the policy or policies shall not expire, be cancelled or altered without at least forty-five (45) days prior written notice to Fulton County Government. Policies and Certificates of Insurance are to list Fulton County Government as an Additional Insured (except for Workers' Compensation) and shall conform to all terms and conditions (including coverage of the indemnification and hold harmless agreement) contained in the Insurance and Risk Management Provisions. The General Liability Additional Insured language should apply to on-going and completed-operations, using ISO form CG 2010 (11/85 version) or equivalent.

If Fulton County Government shall so request, the Respondent, Contractor or Vendor will furnish the County for its inspection and approval such policies of insurance with all endorsements, or confirmed specimens thereof certified by the insurance company to be true and correct copies.

Such certificates and notices **must** identify the "Certificate Holder" as follows:

Fulton County Government - Purchasing and Contract Compliance Department
130 Peachtree Street, S.W.
Suite 1168
Atlanta, Georgia 30303-3459

Certificates **must** list Project Name and Project Number.

It is understood that **Insurance in no way Limits the Liability of the Contractor/Vendor.**

## USE OF PREMISES

Contractor shall confine its apparatus, the storage of materials and the operations of its workers to limits/requirements indicated by law, ordinance, permits and any restrictions of Fulton County Government and shall not unreasonably encumber the premises with its materials.

## PROTECTION OF PROPERTY

Contractor will adequately protect its own work from damage, will protect Fulton County Government's property from damage or loss and will take all necessary precautions during the progress of the work to protect all persons and the property of others from damage or loss.

Contractor shall take all necessary precautions for the safety of employees of the work and shall comply with all applicable provisions of the Federal, State and local safety laws and building codes to prevent accidents or injury to persons on, about, or adjacent to the premises where work is being performed.

Contractor shall erect and properly maintain at all times as required by the conditions and progress of the work, all necessary safeguards for the protection of its employees, Fulton County Government employees and the public and shall post all applicable signage and other warning devices to protect against potential hazards for the work being performed.

## INDEMNIFICATION AND HOLD HARMLESS AGREEMENT

Contractor/Vendor hereby agrees to release, indemnify, defend and hold harmless Fulton County, its Commissioners, officers, employees, subcontractors, successors, assigns and agents, from and against any and all losses (including death), claims, damages, liabilities, costs and expenses (including but not limited to all actions, proceedings, or investigations in respect thereof and any costs of judgments, settlements, court costs, attorney's fees or expenses, regardless of the outcome of any such action, proceeding, or investigation), caused by, relating to, based upon or arising out of any act or omission by Contractor/Vendor, its directors, officers, employees, subcontractors, successors, assigns or agents, or otherwise in connection (directly or indirectly) with its acceptance, or the performance, or nonperformance, of its obligations under these agreements. Such obligations shall not be construed to negate, abridge or otherwise reduce any other rights or obligations of indemnity which would otherwise exist as to any party or person as set forth in this paragraph.

Contractor/Vendor's obligation to protect, defend, indemnify and hold harmless, as set forth hereinabove, shall also include, but is not limited to, any matter arising out of any actual or alleged infringement of any patent, trademark, copyright, or service mark, or other actual or alleged unfair competition disparagement of product or service, or other tort or any type whatsoever, or any actual or alleged violation of trade regulations.

Contractor/Vendor further agrees to protect, defend, indemnify and hold harmless Fulton County, its Commissioners, officers, employees, subcontractors, successors, assigns and agents from and against any and all claims or liability for compensation under the Worker's Compensation Act, Disability Benefits Act, or any other employee benefits act arising out of injuries sustained by any employees of Contractor/Vendor. These indemnities shall not be limited by reason of the listing of any insurance coverage.

***If the bid/quotation involves construction services, the Contractor/Vendor will be responsible fully for any and all damage to the work during the course of construction, until the point of Final Acceptance by Fulton County.***

FULTON COUNTY ACKNOWLEDGES THAT ALL PROVISIONS OF THIS INDEMNITY AGREEMENT MAY NOT BE APPLICABLE TO THE CONTRACTOR/VENDOR'S BUSINESS. TO THE EXTENT THAT CONTRACTOR/VENDOR MAY DEMONSTRATE SUCH NONAPPLICABILITY, FULTON COUNTY MAY NEGOTIATE AMENDMENTS TO THIS AGREEMENT AS THE CIRCUMSTANCES DICTATE.

CONTRACTOR/VENDOR ACKNOWLEDGES HAVING READ, UNDERSTANDING, AND AGREEING TO COMPLY WITH THIS INDEMNIFICATION AND HOLD HARMLESS AGREEMENT, AND THE REPRESENTATIVE OF THE CONTRACTOR/VENDOR IDENTIFIED BELOW IS AUTHORIZED TO SIGN CONTRACTS ON BEHALF OF THE RESPONDING CONTRACTOR/VENDOR.

COMPANY: _____ SIGNATURE: _____

NAME: _____ TITLE: _____

DATE: _____

# OWNER - CONTRACTOR AGREEMENT

## S109 – RIVERSIDE ROAD PUMP STATION UPGRADE
## ITB # 07ITB58420K-RS

Contractor: _____ Project No. _____

Address: _____ Telephone: _____

Contact: _____ Facsimile: _____

THIS AGREEMENT is effective as of the _____ day of _____, 20 , by and between Fulton County, a political subdivision of the State of Georgia (hereinafter called the "County"), and the above named CONTRACTOR in accordance with all provisions of this Construction agreement, consisting of the following Contract Documents:

General Conditions
Bid Form
Scope of Work and Technical Specifications
Drawings and Specifications
Exhibits
Purchasing Forms
Office of Contract Compliance Forms
Risk Management Insurance Provisions Forms

WITNESSETH: That the said Contractor has agreed, and by these presents does agree with the said County, for and in consideration of a Contract Price of _____($_____) and other good and valuable consideration, and under the penalty expressed on Bonds hereto attached, to furnish all equipment, tools, materials, skill, and labor of every description necessary to carry out and complete in good, firm, and substantial, and workmanlike manner, the Work specified, in strict conformity with the Drawings and the Specifications hereinafter set forth, which Drawings and Specifications together with the bid submittals made by the Contractor, General Conditions, Special Provisions, Detailed Specifications, Exhibits, and this Agreement, shall all form essential parts of this Contract. The Work covered by this Contract includes all Work indicated on Plans and Specifications and listed in the Bid entitled:

Project Number: **S109**

**RIVERSIDE ROAD PUMP STATION UPGRADE**

The Contractor shall commence the Work with adequate force and equipment within 10 days from receipt of Notice to Proceed from the County, and shall complete the work within **Five Hundred Forty-eight (548)** calendar days from the Notice to Proceed or the date work begins, whichever comes first. The Contractor shall remain responsible for performing, in accordance with the terms of the contract, all work assigned prior to the expiration of the said calendar days allowed for completion of the work even if the work is not completed until after the expiration of such days.

For each calendar day that any work remains uncompleted after the time allowed for completion of the work, the Contractor shall pay the County the sum of $ 1,000.00 not as a penalty but as liquidated damages, which liquidated damages the County may deduct from any money due the contractor. At the County's convenience and not to it prejudice the County may provide written notice of the commencement of the assessment of liquidated damages.

As full compensation for the faithful performance of this Contract, the County shall pay the Contractor in accordance with the General Conditions and the prices stipulated in the Bid, hereto attached.

It is further mutually agreed between the parties hereto that if, at any time after the execution of this Agreement and the Surety Bonds hereto attached for its faithful performance, the County shall deem the surety or sureties upon such bonds to be unsatisfactory, or, if, for any reason, such bonds cease to be adequate to cover the performance of the Work, the Contractor shall, at his expense, within five days after receipt of notice from the County so to do, furnish an additional bond or bonds in such form and amount, and with such surety or sureties as shall be satisfactory to the County. In such event no further payment to the Contractor shall be deemed to be due under this Agreement until such new or additional security for the faithful performance of the Work shall be furnished in manner and form satisfactory to the County.

The Contractor hereby assumes the entire responsibility and liability for any and all injury to or death of any and all persons, including the Contractor's agents, servants, and employees, and in addition thereto, for any and all damages to property caused by or resulting from or arising out of any act or omission in connection with this contract or the prosecution of work hereunder, whether caused by the Contractor or the Contractor's agents, Servants, or employees, or by any of the Contractor's subcontractors or suppliers, and the Contractor shall indemnify and hold harmless the County, the Construction Manager, or any of their subcontractors from and against any and all loss and/or expense which they or any of them may suffer or pay as a result of claims or suits due to, because of, or arising out of any and all such injuries, deaths and/or damage, irrespective of County or Construction Manager negligence (except that no party shall be indemnified for their own sole negligence). The Contractor, if requested, shall assume and defend at the Contractor's own expense, any suit, action or other legal proceedings arising there from, and the Contractor hereby agrees to satisfy, pay, and cause to be discharged of record any judgment which may be rendered against the County and the Construction Manager arising there from.

In the event of any such loss, expense, damage, or injury, or if any claim or demand for damages as heretofore set forth is made against the County or the Construction Manager, the County may withhold from any payment due or thereafter to become due to the Contractor under the terms of this Contract, an amount sufficient in its judgment to protect and indemnify it and the Construction Manager from any and all claims, expense, loss, damages, or injury; and the County, in its discretion, may require the Contractor to furnish a surety bond satisfactory to the County providing for such protection and indemnity, which bond shall be furnished by the Contractor within five (5) days after written demand has been made therefore. The expense of said Bond shall be borne by the Contractor. **[See General Conditions for similar provisions]**

This Contract constitutes the full agreement between the parties, and the Contractor shall not sublet, assign, transfer, pledge, convey, sell or otherwise dispose of the whole or any part of this Contract or his right, title, or interest therein to any person, firm or corporation without the previous consent of the County in writing. Subject to applicable provisions of law, this Contract shall be in full force and effect as a Contract, from the date on which a fully executed and approved counterpart hereof is delivered to the Contractor and shall remain and continue in full force and effect until after the expiration of any guarantee period and the Contractor and his sureties are finally released by the County.

This agreement was approved by the Fulton County Board of Commissioner on [Insert approval date and item number].

[SIGNATURES NEXT PAGE]

**IN WITNESS THEREOF**, the Parties hereto have caused this Contract to be executed by their duly authorized representatives as attested and witnessed and their corporate seals to be hereunto affixed as of the day and year date first above written.

OWNER:

**FULTON COUNTY, GEORGIA**

John H. Eaves, Commission Chair
Board of Commissioners

ATTEST:

Mark Massey
Clerk to the Commission (Seal)

APPROVED AS TO FORM:

Office of the County Attorney

APPROVED AS TO CONTENT:

Angela Parker
Director, Department of Public Works

CONTRACTOR:

**[Insert Company Name]**

[Insert Name & Title of person authorized to sign contract]

ATTEST:

Secretary/
Assistant Secretary

(Affix Corporate Seal)

**END OF SECTION**

# PERFORMANCE BOND

No contract with Fulton County for work to be done shall be valid for any purpose unless the Contractor provides a Performance Bond with good and sufficient surety payable to, in favor of, and for the protection of Fulton County. The Performance Bond shall be in the amount of 100% of the total contract amount, payable by the terms of the Contract, and shall be written on the following form.

Surety companies executing Bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business as a surety in Georgia.

Attestation for the corporation must be by the corporate officer; for a partnership by another partner; for an individual by a notary with the corporate seal.

## PERFORMANCE BOND

**KNOW ALL MEN BY THESE PRESENTS** that _____
*(Insert name of Contractor)*
(hereinafter called the "Principal") and _____(hereinafter called the
*(Insert name of Surety)*
"Surety"), are held and firmly bound unto **FULTON COUNTY**, a political subdivision of the State of Georgia (hereinafter called the "Owner"), its successors and assigns, in the penal sum of _____*[100% of Contract amount]*, lawful money of the United States of America, for the payment of which the Principal and the Surety bind themselves, their administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

**WHEREAS,** the Principal has entered, or is about to enter, into a certain written contract with the Owner, dated _____, which is incorporated herein by reference in its entirety (hereinafter called the "Contract"), for construction-type services of a project known as RIVERSIDE ROAD PUMP STATION UPGRADE, as more particularly described in the Contract (hereinafter called the "Project");

**NOW, THEREFORE,** the conditions of this obligation are as follows, that if the Principal shall fully and completely perform all the undertakings, covenants, terms, conditions, warranties, and guarantees contained in the Contract, including all modifications, amendments, changes, deletions, additions, and alterations thereto that may hereafter be made, then this obligation shall be void; otherwise it shall remain in full force and effect.

Whenever the Principal shall be, and declared by the Owner to be, in default under the Construction-Type Contract, the Surety shall promptly remedy the default as follows:

1. Complete the Contract in accordance with its terms and conditions; or, at the sole option of the Owner,

2. Obtain a bid or bids for completing the Contract in accordance with its terms and conditions, and upon determination by the Surety and the Owner of the lowest responsible bidder, arrange for a contract between such bidder and Owner and make available as the work progresses (even though there should be a default or 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 price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the penal sum set forth in the first paragraph hereof, as may be adjusted, and the Surety shall make available and pay to the Owner the funds required by this Paragraph prior to the payment of the Owner of the balance of the contract price, or any portion thereof. The term "balance of the contract price," as used in this paragraph, shall mean the total amount payable by the Owner to the Contractor under the Contract, and any amendments thereto, less the amount paid by the Owner to the Contractor; or, at the sole option of the Owner,

3. Allow Owner to complete the work and reimburse the Owner for all reasonable costs incurred in completing the work.

In addition to performing as required in the above paragraphs, the Surety shall indemnify and hold harmless the Owner from any and all losses, liability and damages, claims, judgments, liens, costs and fees of every description, including reasonable attorney's fees, litigation costs and expert witness fees, which the Owner may incur, sustain or suffer by reason of the failure or default on the part of the Principal in the performance of any or all of the terms, provisions, and requirements of the Contract, including any and all amendments and modifications thereto, or

incurred by the Owner in making good any such failure of performance on the part of the Principal.

The Surety shall commence performance of its obligations and undertakings under this Bond promptly and without delay, after written notice from the Owner to the Surety.

The Surety hereby waives notice of any and all modifications, omissions, additions, changes, alterations, extensions of time, changes in payment terms, and any other amendments in or about the Contract, and agrees that the obligations undertaken by this Bond shall not be impaired in any manner by reason of any such modifications, omissions, additions, changes, alterations, extensions of time, change in payment terms, and amendments.

The Surety hereby agrees that this Bond shall be deemed amended automatically and immediately, without formal or separate amendments hereto, upon any amendment to the Contract, so as to bind the Principal and the Surety to the full and faithful performance of the Contract as so amended or modified, and so as to increase the penal sum to the adjusted Contract Price of the Contract.

No right of action shall accrue on this Bond to or for the use of any person, entity or corporation other than the Owner and any other obligee named herein, or their executors, administrators, successors or assigns.

This Bond is intended to comply with O.C.G.A. Section 36-91-1 et seq., and shall be interpreted so; as to comply with; the minimum requirements thereof. However, in the event the express language of this Bond extends protection to; the Owner beyond that contemplated by O.C.G.A. Section 36-91-1 et seq. and O.C.G.A. Section 13-10-1, as amended, or any other statutory law applicable to this Project, then the additional protection shall be enforced in favor of the Owner, whether or not such protection is found in the applicable statutes.

**IN WITNESS WHEREOF** the undersigned have caused this instrument to be executed and their respective corporate seals to be affixed and attested by their duly authorized representatives this _____ day of _____, _____.

_____(SEAL)
(Principal)

By:_____

Attest:

_____
Secretary

_____(SEAL)
(Surety)

By:_____

Attest:

_____
Secretary

_____

(Address of Surety's Home Office)

_____
(Resident Agent of Surety)

**END OF SECTION**

# PAYMENT BOND

No Contract with Fulton County for work to be done shall be valid for any purpose unless the Contractor provides a Payment Bond with good and sufficient surety payable to Fulton County for the use and protection of all sub-contractors and all persons supplying labor, materials, machinery, and equipment in the prosecution of the work provided for in the Contract. The Payment Bond shall be in the amount of 100% of the total contract amount, payable by the terms of the Contract, and shall be written on the following form.

Surety companies executing Bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State of Georgia.

Attestation for the corporation must be by the corporate officer; for a partnership by another partner; for an individual by a notary with the corporate seal.

## PAYMENT BOND

**KNOW ALL MEN BY THESE PRESENTS** that _____
*(Insert name of Contractor)*
(hereinafter called the "Principal") and _____(hereinafter called the
*(Insert name of Surety)*
"Surety"), are held and firmly bound unto **FULTON COUNTY**, a political subdivision of the State of Georgia (hereinafter called the "Owner"), its successors and assigns as obligee, in the penal sum of _____*[100% of Contract amount]*, lawful money of the United States of America, for the payment of which the Principal and the Surety bind themselves, their administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

**WHEREAS,** the Principal has entered, or is about to enter, into a certain written contract with the Owner, dated _____, which is incorporated herein by reference in its entirety (hereinafter called the "Contract"), for construction-type services of a project known as RIVERSIDE ROAD PUMP STATION UPGRADE, as more particularly described in the Contract (hereinafter called the "Project");

**NOW, THEREFORE,** the condition of this obligation is such that if the Principal shall promptly make payment to all persons working on or supplying labor or materials under the Contract, and any amendments thereto, with regard to labor or materials furnished and used in the Project, and with regard to labor or materials furnished but not so used, then this obligation shall be void; but otherwise it shall remain in full force and effect.

1. A "Claimant' shall be defined herein as any subcontractor, person, party, partnership, corporation or the entity furnishing labor, services or materials used, or reasonably required for use, in the performance of the Contract, without regard to whether such labor, services or materials were sold, leased or rented, and without regard to whether such Claimant is or is not in privity of contract with the Principal or any subcontractor performing work on the Project, including, but not limited to, the following labor, services, or materials: water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment directly applicable to the Contract.

2. In the event a Claimant files a lien against the property of the Owner, and the Principal fails or refuses to satisfy or remove it promptly, the Surety shall satisfy or remove the lien promptly upon written notice from the Owner, either by bond or as otherwise provided in the Contract.

3. The Surety hereby waives notice of any and all modifications, omissions, additions, changes, alterations, extensions of time, changes in the payment terms, and any other amendments in or about the Contract and agrees that the obligations undertaken by this Bond shall not be impaired in any manner by reason of any such modifications, omissions, additions, changes, alterations, extensions of time, changes in payment terms, and amendments.

4. The Surety hereby agrees that this Bond shall be deemed amended automatically and immediately, without formal or separate amendments hereto, upon any amendment or modifications to the Contract, so as to bind the Principal and Surety, jointly and severally, to the full payment of any Claimant under the Contract, as amended or modified, provided only that the Surety shall not be liable for more than the penal sum of the Bond, as specified in the first paragraph hereof.

5. This Bond is made for the use and benefit of all persons, firms, and corporations who or which may furnish any materials or perform any labor for or on account of the

construction-type services to be performed or supplied under the Contract, and any amendments thereto, and they and each of them may sue hereon.

6. No action may be maintained on this Bond after one (1) year from the date the last services, labor, or materials were provided under the Contract by the Claimant prosecuting said action.

7. This Bond is intended to comply with O.C.G.A. Section 13-10-1, and shall be interpreted so as to comply with the minimum requirements thereof. However, in the event the express language of this Bond extends protection to the Owner beyond that contemplated by O.C.G.A. Section 13-10-1, or any other statutory law applicable to this Project, then the additional protection shall be enforced in favor of the Owner, whether or not such protection is found in the applicable statutes.

**IN WITNESS WHEREOF** the undersigned have caused this instrument to be executed and their respective corporate seals to be affixed and attested by their duly authorized representatives this _____ day of _____, _____.

_____(SEAL)
(Principal)

By:_____

Attest:

_____
Secretary

_____(SEAL)
(Surety)

By:_____

Attest:

_____
Secretary

_____

(Address of Surety's Home Office)

_____
(Resident Agent of Surety)

**END OF SECTION**

GENERAL CONDITIONS:

00700-1 FAMILIARITY WITH SITE

Execution of this agreement by the Contractor is a representation that the Contractor has visited the site, has become familiar with the local conditions under which the work is to be performed, and has correlated personal observations with the requirements of this agreement.

00700-2 CONTRACT DOCUMENTS

This agreement consists of Owner's invitation for bid, instructions to bidders, bid form, performance bond, payment bond, acknowledgments, the contract, general conditions, special conditions, specifications, plans, drawings, exhibits, addenda, and written change orders.

A. Notice of Award of Contract:

B. Execution of Contract Documents

Upon notification of Award of Contract, the Owner shall furnish the Contractor the conformed copies of Contract Documents for execution by the Contractor and the Contractor's surety.

Within ten (10) days after receipt the Contractor shall return all the documents properly executed by the Contractor and the Contractor's surety. Attached to each document shall be an original power-of-attorney for the person executing the bonds for the surety and certificates of insurance for the required insurance coverage.

After receipt of the documents executed by the Contractor and his surety with the power-of-attorney and certificates of insurance, the Owner shall complete the execution of the documents. Distribution of the completed documents will be made upon completion.

Should the Contractor and/or Surety fail to execute the documents within the time specified; the Owner shall have the right to proceed on the Bid Bond accompanying the bid.

If the Owner fails to execute the documents within the time limit specified, the Contractor shall have the right to withdraw the Contractor's bid without penalty.

Drawings and Specifications:

The Drawings, Specifications, Contract Documents, and all supplemental documents, are considered essential parts of the Contract, and requirements occurring in one are as binding as though occurring in all. They are intended to define, describe and provide for all Work necessary to complete the Project in an acceptable manner, ready for use, occupancy, or operation by the Owner.

In case of conflict between the Drawings and Specifications, the Specifications shall govern. Figure dimensions on Drawings shall govern over scale dimensions, and detailed Drawings shall govern over general Drawings.

In cases where products or quantities are omitted from the Specifications, the description and quantities shown on the Drawings shall govern.

Any ambiguities or need for clarification of the Drawings or Specifications shall be immediately reported to the Construction Manager in writing. Any such ambiguity or need for clarification shall be handled by the Construction Manager in writing. No clarification of the Drawings and Specifications hereunder by the Construction Manager shall entitle the Contractor to any additional monies unless a Change Order has been processed as provided by "Changes in the Contract" hereof.

Any work done by the Contractor following a discovery of such differing site condition or ambiguity or need for clarification in the Contract Drawings and Specifications prior to a written report to the Construction Manager shall not entitle the Contractor to additional monies and shall be done at the Contractor's risk.

The Construction Manager will furnish the Contractor five (5) copies of the Contract Drawings and the Specifications, one copy of which the Contractor shall have available at all times on the Project site.

00700-3 DEFINITIONS

The following terms as used in this agreement are defined as follows to the extent the definitions herein differ or conflict with those in the Instructions for Bidders, Section 00100, the definitions herein shall control.

Change Order - A written order to the Contractor issued by the County pursuant to Fulton County Policy and Procedures 800-6 for changes in the work within the general scope of the contract documents, adjustment of the contract price, extension of the contract time, or reservation of determination of a time extension.

Construction Manager or Engineer shall mean Fulton Construction Management Partners, the County authorized representative for this project.

Contractor shall mean the party of the second part to the Contract Agreement or the authorized and legal representative of such party.

Contract Documents include the Contract Agreement, Contractor's Bid (including all documentation accompanying the Bid and any post-Bid documentation required by the County prior to the Notice of Award), Bonds, all Special Conditions, General Conditions, Supplementary Conditions, Specifications, Drawings and addenda, together with written amendments, change orders, field orders and the Construction Manager's written interpretations and clarifications issued in accordance with the General Conditions on or after the date of the Contract Agreement.

Shop drawing submittals reviewed in accordance with the General Conditions, geotechnical investigations and soils report and drawings of physical conditions in or relating to existing surface structures at or contiguous to the site are not Contract Documents.

Contract Price - The sum specified in the Agreement to be paid to the Contractor in consideration of the Work.

Contract Time shall mean the number of consecutive calendar days as provided in the Contract Agreement for completion of the Work, to be computed from the date of Notice to Proceed.

Owner or County shall mean Fulton County Government, party of the first part to the Contract Agreement, or its authorized and legal representatives.

Day - A calendar day of twenty-four hours lasting from midnight of one day to midnight the next day.

Design Consultant shall mean the firm or corporation responsible for the detailed design drawings and specifications.

Director - Director of the Department of Public Works of Fulton County, Georgia or the designee thereof.

Final Completion shall mean the completion of all work as required in accordance with the terms and conditions of the contract documents.

Liquidated Damages shall mean the amount, stated in the Contract Agreement, which the Contractor agrees to pay to the Owner for each consecutive calendar day beyond the Contract time required to complete the Project or for failing to comply with associated milestones. Liquidated Damages will end upon written notification from the Owner of Final Acceptance of the Project or upon written notification of from the Owner of completion of the milestone.

Notice to Proceed - A written communication issued by the County to the Contractor authorizing it to proceed with the work, establishing the date of commencement and completion of the work, and providing other direction to the Contractor.

Products shall mean materials or equipment permanently incorporated into the work.

Program Manager - Not used in this contract. Delete all references.

Project Manual - The Contract Documents.

Provide shall mean to furnish and install.

Substantial Completion - The date certified by the Construction Manager when all or a part of the work, as established pursuant to General Condition 0700-81, is sufficiently completed in accordance with the requirements of the contract documents so that the identified portion of the work can be utilized for the purposes for which it is intended.

Work or Project - All of the services specified, indicated, shown or contemplated by the contract documents, and furnishing by the Contractor of all materials, equipment, labor, methods, processes, construction and manufacturing materials and equipment, tools, plans, supplies, power, water, transportation and other things necessary to complete such services in accordance with the contract documents to insure a functional and complete facility.

00700-4 CODES

All codes, specifications, and standards referenced in the contract documents shall be the latest editions, amendments and revisions of such referenced standards in effect as of the date of the request for proposals for this contract.

00700-5 REVIEW OF CONTRACT DOCUMENTS

Before making its proposal to the County, and continuously after the execution of the agreement, the Contractor shall carefully study and compare the contract documents and shall at once report to the Construction Manager any error, ambiguity, inconsistency or omission that may be discovered, including any requirement which may be contrary to any law, ordinance, rule, or regulation of any public authority bearing on the performance of the work. By submitting its proposal, the Contractor agrees that the contract documents, along with any supplementary written instructions issued by or through the Construction Manager that have become a part of the contract documents, appear accurate, consistent and complete insofar as can be reasonably determined. If the Contractor has timely reported in writing any error, inconsistency, or omission to the Construction Manager, has properly stopped the affected work until instructed to proceed, and has otherwise followed the instructions of the Construction Manager, the Contractor shall not be liable to the County for any damage resulting from any such error, inconsistency, or omission in the contract documents. The Contractor shall not perform any portion of the work without the contract documents, approved plans, specifications, products and data, or samples for such portion of the work. For purposes of this section “timely” is defined as the time period in which the contractor discovers, or should have discovered, the error, inconsistency, or omission, with the exercise of reasonable diligence.

00700-6 STRICT COMPLIANCE

No observation, inspection, test or approval of the County or Construction Manager shall relieve the Contractor from its obligation to perform the work in strict conformity with the contract documents except as provided in General Condition 00700-48.

00700-7 APPLICABLE LAW

All applicable State laws, County ordinances, codes, and rules and regulations of all authorities having jurisdiction over the construction of the project shall apply to this agreement. The Contractor shall comply with the requirements of any Fulton County program concerning non-discrimination in contracting.. All work performed within the right of way of the Georgia Department of Transportation and any railroad crossing shall be in accordance with Georgia Department of Transportation regulations, policies and procedures and, where applicable, those of any affected railroad. The Contractor shall comply with all laws, ordinances, codes, rules and regulations bearing on the conduct of the work as specified and the Contractor agrees to indemnify and hold harmless the County, its officers, agents and employees, as well as the Construction Manager and the Program Manager against any claim or liability arising from or

based on the violation of any law, ordinance, regulation, order or decree affecting the conduct of the work, whether occasioned by the Contractor, his agents or employees.

00700-8 PERMITS, LICENSES AND BONDS

All permits and licenses necessary for the work shall be secured and paid for by the Contractor. If any permit, license or certificate expires or is revoked, terminated, or suspended as a result of any action on the part of the Contractor, the Contractor shall not be entitled to additional compensation or time. The Contractor shall obtain and keep in force at all times performance and payment bonds payable to Fulton County in penal amounts equal to 100% of the Contract price.

00700-9 TAXES

A. 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 County at all reasonable times for inspection and copying. The Contractor shall apply for any and all tax exemptions which may be applicable and shall timely request from the County such documents and information as may be necessary to obtain such tax exemptions. The County shall have no liability to the Contractor for payment of any tax from which it is exempt.

B. 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.

Acceptance of the project as complete and final payment will not be made by the Owner until the Contractor has fully complied with this requirement.

00700-10 DELINQUENT CONTRACTORS

The County shall not pay any claim, debt, demand or account whatsoever to any person firm or corporation who is in arrears to the County for taxes. The County shall be entitled to a counterclaim, backcharge, and offset for any such debt in the amount of taxes in arrears, and no assignment or transfer of such debt after the taxes become due shall affect the right of the County to offset any taxes owed against said debt.

00700-11 LIEN WAIVERS

The Contractor shall furnish the County with evidence that all persons who have performed work or furnished materials pursuant to this agreement have been paid in full prior to submitting its demand for final payment pursuant to this agreement. A final affidavit, Exhibit A, must be completed, and submitted to comply with requirements of 00700-11. In the event that such evidence is not furnished, the County may retain sufficient sums necessary to meet all lawful claims of such laborers and materialmen. The County assumes no obligation nor in any way undertakes to pay such lawful claims from any funds due or that may become due to the Contractor.

00700-12 MEASUREMENT

All items of work to be paid for per unit of measurement shall be subject to inspection, measurement, and confirmation by the Construction Manager.

00700-13 ASSIGNMENT

The Contractor shall not assign any portion of this agreement or moneys due there from (include factoring of receivables) without the prior written consent of the County. The Contractor shall retain personal control and shall provide personal attention to the fulfillment of its obligations pursuant to this agreement. Any assignment without the express written consent of the County shall render this contract voidable at the sole option of the County.

00700-14 FOREIGN CONTRACTORS

In the event that the Contractor is a foreign corporation, partnership, or sole proprietorship, the Contractor hereby irrevocably appoints the Secretary of State of Georgia as its agent for service of all legal process for the purpose of this contract only.

00700-15 INDEMNIFICATION [there are two indemnification clauses, the other is in the Contract Cover Sheet]

The Contractor hereby assumes the entire responsibility and liability for any and all injury to or death of any and all persons, including the Contractor's agents, servants, and employees, and in addition thereto, for any and all damages to property caused by or resulting from or arising out of any act or omission in connection with this contract or the prosecution of work hereunder, whether caused by the Contractor or the Contractor's agents, servants, or employees, or by any of the Contractor's subcontractors or suppliers, and the Contractor shall indemnify and hold harmless the County, the Construction Manager and the Program Manager, or any of their subcontractors from and against any and all loss and/or expense which they or any of them may suffer or pay as a result of claims or suits due to, because of, or arising out of any and all such injuries, deaths and/or damage, irrespective of County or Construction Manager or Program Manager negligence (except that no party shall be indemnified for their own sole negligence). The Contractor, if requested, shall assume and defend at the Contractor's own expense, any suit, action or other legal proceedings arising there from, and the Contractor hereby agrees to satisfy, pay, and cause to be discharged of record any judgment which may be rendered against the County, the Construction Manager and the Program Manager arising there from.

In the event of any such loss, expense, damage, or injury, or if any claim or demand for damages as heretofore set forth is made against the County or the Construction Manager or the Program Manager, the County may withhold from any payment due or thereafter to become due to the Contractor under the terms of this Contract, an amount sufficient in its judgment to protect and indemnify it and the Construction Manager and the Program Manager from any and all claims, expense, loss, damages, or injury; and the County, in its discretion, may require the Contractor to furnish a surety bond satisfactory to the County providing for such protection and indemnity, which bond shall be furnished by the Contractor within five (5) days after written demand has been made therefore. The expense of said Bond shall be borne by the Contractor.

00700-16 SUPERVISION OF WORK AND COORDINATION WITH OTHERS

The Contractor shall supervise and direct the work using the Contractor's best skill and attention. The Contractor shall be solely responsible for all construction methods and procedures and shall coordinate all portions of the work pursuant to the contract subject to the overall coordination of the Construction Manager. All work pursuant to this agreement shall be performed in a skillful and workmanlike manner.

The County reserves the right to perform work related to the Project with the County's own forces and to award separate contracts in connection with other portions of the project, other work on the site under these or similar conditions of the contract, or work which has been extracted from the Contractor's work by the County.

When separate contracts are awarded for different portions of the project or other work on the site, the term "separate contractor" in the Contract Documents in each case shall mean the contractor who executes each separate County Agreement.

The Contractor shall cooperate with the County and separate contractors in arranging the introduction and storage of materials and equipment and execution of their work, and shall cooperate in coordinating connection of its work with theirs as required by the Contract Documents.

If any part of the Contractor's Work depends for proper execution or results upon the work of the County or any separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Construction Manager any apparent discrepancies or defects in such other work that render it unsuitable for such proper execution and results **within fourteen (14) days** of discovery of such discrepancy or defect. Failure of the Contractor to so report in writing shall constitute an acceptance of the County's or separate contractor's work as fit and proper to receive the Work, except as to any defects which may subsequently become apparent in such work by others.

Any costs caused by defective or untimely work shall be borne by the party responsible therefore.

Should the Contractor wrongfully cause damage to the work or property of the County or to other work or property on the site, including the work of separate contractors, the Contractor shall promptly remedy such damage at the Contractor's expense.

Should the Contractor be caused damage by any other contractor on the Project, by reason of such other contractor's failure to perform properly his contract with the County, no action shall lie against the County or the Construction Manager inasmuch as the parties to this agreement are the only beneficiaries hereof and there are no third party beneficiaries and neither the County nor the Construction Manager shall have liabilities therefore, but the Contractor may assert his claim for damages solely against such other contractor. The Contractor shall not be excused from performance of the contract by reason of any dispute as to damages with any other contractor or third party.

Where the Work of this Contract shall be performed concurrently in the same areas as other construction work, the Contractor shall coordinate with the Construction Manager and the separate contractors in establishing mutually acceptable schedules and procedures that shall permit all jobs to proceed with minimum interference.

If a dispute arises between the Contractor and separate contractors as to their responsibility for cleaning up, the County may clean up and charge the cost thereof to the Contractor or contractors responsible therefore as the County shall determine to be just.

00700-17 ADMINISTRATION OF CONTRACT

The Program Manager and the Construction Manager shall provide administration services as hereinafter described.

For the administration of this Contract, the Construction Manager shall serve as the County's primary representative during design and construction and until final payment to the Contractor is due. The Construction Manager shall advise and consult with the County and the Program Manager. The primary point of contact for the Contractor shall be the Construction Manager. All correspondence from the Contractor to the County shall be forwarded through the Construction Manager. Likewise, all correspondence and instructions to the Contractor shall be forwarded through the Construction Manager.

The Construction Manager will determine in general that the construction is being performed in accordance with design and engineering requirements, and will endeavor to guard the County against defects and deficiencies in the Work.

The Construction Manager will not be responsible for or have control or charge of construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs in connection with the Work, nor will it be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. The Construction Manager will not be responsible for or have control or charge over the acts or omissions of the Contractor, its

engineers, consultants, subcontractors, or any of their agents or employees, or any other persons performing the Work.

Based on the Construction Manager's observations regarding the Contractor's Applications for Payment, the Construction Manager shall determine the amounts owing to the Contractor, in accordance with the payment terms of the Contract, and shall issue Certificates for Payment in such amount to the County.

The Construction Manager shall render interpretations necessary for the proper execution or progress of the Work. Either party to the Contract may make written requests to the Construction Manager for such interpretations.

Claims, disputes and other matters in question between the Contractor and the County relating to the progress of the Work or the interpretation of the Contract Documents shall be referred to the Construction Manager for interpretation.

All interpretations of the Construction Manager shall be consistent with the intent of and reasonably inferable from the Contract Documents and shall be in writing or in graphic form.

Except as otherwise provided in this Contract, the Construction Manager shall issue a decision on any disagreement concerning a question of fact arising under this Contract. The Construction Manager shall reduce the decision to writing and mail or otherwise furnish a copy thereof to the Contractor. The decision of the Construction Manager shall be final and conclusive unless, within thirty (30) days from the date of receipt of such copy, the Contractor files a written appeal with the Director of Public Works and mails or otherwise furnishes the Construction Manager a copy of such appeal. The decision of the Director of Public Works or the Director's duly authorized representative for the determination of such appeals shall be final and conclusive. Such final decision shall not be pleaded in any suit involving a question of fact arising under this Contract, provided such is not fraudulent, capricious, arbitrary, so grossly erroneous as necessarily implying bad faith, or is not supported by substantial evidence. In connection with any appeal proceeding under this Article, the Contractor shall be afforded an opportunity to be heard and to offer evidence in support of Contractor's appeal. Pending any final decision of a dispute hereunder, the Contractor shall proceed diligently with the performance of the Contract as directed by the Construction Manager.

The Construction Manager shall have authority to reject Work which does not conform to the Contract Documents. Whenever, in the Construction Manager's opinion, it is considered necessary or advisable for the implementation of the intent of the Contract Documents, the County shall have authority to require special inspection or testing of the Work whether or not such Work be then fabricated, installed or completed. The Contractor shall pay for such special inspection or testing if the Work so inspected or tested is found not to comply with the requirements of the contract; the County shall pay for special inspection and testing if the Work is found to comply with the contract. Neither the Construction Manager's authority to act under this Subparagraph, nor any decision made by the Construction Manager in good faith either to exercise or not to exercise such authority, shall give rise to any duty or responsibility of the Construction Manager to the Contractor, any subcontractor, any of their agents or employees, or any other person performing any of the Work.

The Contractor shall provide such shop drawings, product data, and samples as may be required by the Construction Manager and/or as required by these Contract Documents.

The Construction Manager shall conduct inspections to determine Substantial Completion and Final Completion, and shall receive and forward to the County for review written warranties and related documents required by the Contract Documents and assembled by the Contractor. The Construction Manager shall approve and issue Certificates for Payment upon compliance with Substantial and Final Completion requirements indicated in General Conditions 00700-81, 00700-82, 00700-84 and 00700-85 of this Agreement.

Except as provided in General Condition 00700-48, the Contractor shall not be relieved from the Contractor's obligations to perform the work in accordance with the contract documents by the

activities or duties of the County or any of its officers, employees, or agents, including inspections, tests or approvals, required or performed pursuant to this agreement.

00700-18 RESPONSIBILITY FOR ACTS OF EMPLOYEES

The Contractor shall employ only competent and skilled personnel. The Contractor shall, upon demand from the Construction Manager, immediately remove any superintendent, foreman or workman whom the Construction Manager may consider incompetent or undesirable.

The Contractor shall be responsible to the County for the acts and omissions of the Contractor's employees, subcontractors, and agents as well as any other persons performing work pursuant to this agreement for the Contractor.

00700-19 LABOR, MATERIALS, SUPPLIES, AND EQUIPMENT

Unless otherwise provided in this agreement, the Contractor shall make all arrangements with necessary support agencies and utility companies, provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for the execution and completion of the work.

00700-20 DISCIPLINE ON WORK SITE

The Contractor shall enforce strict discipline and good order among its employees and subcontractors at all times during the performance of the work, to include compliance with the Fulton County Drug Free Work Place Policy. The Contractor shall not employ any subcontractor who is not skilled in the task assigned to it. The Construction Manager may, by written notice, require the Contractor to remove from the work any subcontractor or employee deemed by the Construction Manager to be incompetent.

00700-21 HOURS OF OPERATION

All work at the construction site shall be performed during regular business hours of the Fulton County government, except upon the Construction Manager's prior written consent to other work hours. It is further understood that the Contractor's construction schedule is based on a normal 40 hours, five day work week, less Fulton County-recognized holidays. Contractors work schedule shall not violate Fulton County Noise Ordinance by working hours inconsistent with the Fulton County Noise Ordinance. The County's current noise ordinance or other applicable ordinance shall govern. If the Contractor desires to work in excess of this limit, the Contractor shall submit a written request to the Construction Manager, a minimum of five days prior to the desired work date. The Contractor shall be responsible for any additional expenses incurred by the Owner as a result of the extended work hours, including resident inspection overtime. The cost associated with resident inspector overtime shall be deducted form the Contractor monthly payment request.

00700-22 FAMILIARITY WITH WORK CONDITIONS

The Contractor shall take all steps necessary to ascertain the nature and location of the work and the general and local conditions which may affect the work or the cost thereof. The Contractor's failure to fully acquaint itself with the conditions which may affect the work, including, but not limited to conditions relating to transportation, handling, storage of materials, availability of utilities, labor, water, roads, weather, topographic and subsurface conditions, other separate contracts to be entered into by the County relating to the project which may affect the work of the Contractor, applicable provisions of law, and the character and availability of equipment and facilities necessary prior to and during the performance of the work shall not relieve the Contractor of its responsibilities pursuant to this agreement and shall not constitute a basis for an equitable adjustment of the contract terms. The County reserves the right to perform with its own forces or to contract with other entities for other portions of the project work, in which case the Contractor's responsibility to assure its familiarity with work conditions hereunder shall include all coordination with such other contractors and the County necessary to insure that there is no interference between contractors as will delay or hinder any contractor in its prosecution of work on the project. The County assumes no responsibility for any understandings or representations

concerning conditions of the work made by any of its officers, agents, or employees prior to the execution of this agreement.

00700-23 RIGHT OF ENTRY

The County reserves the right to enter the site of the work by such agent, including the Construction Manager, as it may elect for the purpose of inspecting the work or installing such collateral work as the County may desire. The Contractor shall provide safe facilities for such access so that the County and its agents may perform their functions.

00700-24 NOTICES

Any notice, order, instruction, claim or other written communication required pursuant to this agreement shall be deemed to have been delivered or received as follows:

Upon personal delivery to the Contractor, its authorized representative, or the Construction Manager on behalf of the County. Personal delivery may be accomplished by in-person hand delivery or bona fide overnight express service.

Three days after depositing in the United States mail a certified letter addressed to the Contractor or the Construction Manager for the County. For purposes of mailed notices, the County's mailing address shall be 141 Pryor Street, 6th Floor, Atlanta, Georgia 30303, or as the County shall have otherwise notified the Contractor. The Contractor's mailing address shall be the address stated in its proposal or as it shall have most recently notified the Construction Manager in writing.

00700-25 SAFETY

A. SAFETY, HEALTH AND LOSS PREVENTION

The Contractor shall be responsible for implementing a comprehensive project-specific safety, health and loss prevention program and employee substance abuse program for this project. All Sub-Contractors must either implement their own program or follow the Contractor's safety, health and loss prevention program and employee substance abuse program.

The Contractor's safety, health and loss prevention program and employee substance abuse program must meet or exceed all governmental regulations (OSHA, EPA, DOT, State, local), and any other specific Fulton County requirements

B. COUNTY'S SAFETY, HEALTH, AND LOSS PREVENTION PROCESS GUIDELINES AND REQUIREMENTS

The County and its agents reserve the right, but assume no duty, to establish and enforce safety, health, and loss prevention guidelines and to make the appropriate changes in the guidelines, for the protection of persons and property and to review the efficiency of all protective measures taken by the Contractor. The Contractor shall comply with all safety, health, and loss prevention process guidelines and requirements and changes made by the County or its agent(s). The issuance of any such guidelines or changes by the County or its agent(s) shall not relieve the Contractor of its duties and responsibilities under this Agreement, and the County or its agent(s) shall not thereby assume, nor be deemed to have assumed, any such duties or responsibilities of the Contractor.

C. COMPLIANCE OF WORK, EQUIPMENT, AND PROCEDURES WITH ALL APPLICABLE LAWS and REGULATIONS

All Work, whether performed by the Contractor or its Sub-Contractors of any tier, or anyone directly or indirectly employed by any of them, and all equipment, appliances, machinery, materials, tools and like items incorporated or used in the Work, shall be in compliance with and conform to:

1. All applicable laws, ordinances, rules, regulations and orders of any public, quasi-public or other governmental authority relating to the safety of persons and their protection against injury, specifically including, but in no event limited to, the Federal Occupational Safety and Health Act of 1970, as amended, and all rules and regulations now or hereafter in effect pursuant to said Act.

2. All rules, regulations, and requirements of the County or its agent(s) and its insurance carriers relating there to. In the event of a conflict or differing requirements the more stringent shall govern.

D. PROTECTION OF THE WORK

1. The Contractor shall, throughout the performance of the Work, maintain adequate and continuous protection of all Work and temporary facilities against loss or damage from whatever cause, shall protect the property of the County and third parties from loss or damage from whatever cause arising out of the performance of the Work, and shall comply with the requirements of the County or its agent(s) and its insurance carriers, and with all applicable laws, codes, rules and regulations, (as same may be amended) with respect to the prevention of loss or damage to property as a result of fire or other hazards.

2. The County or its agent(s) may, but shall not be required to, make periodic inspections of the Project work area. In such event, however, the Contractor shall not be relieved of its aforesaid responsibilities and the County or its agent(s) shall not assume, nor shall it be deemed to have assumed, any responsibility otherwise imposed upon the assurance of Contractor by this Agreement.

E. SAFETY EQUIPMENT

1. The Contractor shall provide to each worker on the Project work area the proper safety equipment for the duties being performed by that worker and will not permit any worker on the Project work area who fails or refuses to use the same. The County or its agent shall have the right, but not the obligation, to order the removal of a worker from the Project work site for his/her failure to comply with safe practices or substance abuse policies.

F. EMERGENCIES

1. In any emergency affecting the safety of persons or property, or in the event of a claimed violation of any federal or state safety or health law or regulation, arising out of or in any way connected with the Work or its performance, the Contractor shall act immediately to prevent threatened damage, injury or loss and to remedy said violation. Failing such action the County or its agent(s) may immediately take whatever steps it deems necessary including, but not limited to, suspending the Work as provided in this Agreement.

2. The County or its agent(s) may offset any and all costs or expenses of whatever nature, including attorneys' fees, paid or incurred by the County or its agent(s) (whether such fees are for in-house counsel or counsel retained by the County or its agent), in taking the steps authorized by Section 00700-25(G) (1) above against any sums then or thereafter due to the Contractor. The Contractor shall defend, indemnify and hold the County, its officers, agents, and employees harmless against any and all costs or expenses caused by or arising from the exercise by the County of its authority to act in an emergency as set out herein. If the Contractor shall be entitled to any additional compensation or extension of time change order on account of emergency work not due to the fault or neglect of the Contractor or its Sub-Contractors, such additional compensation or extension of time shall be determined in accordance with General Condition 00700-52 and General Condition 00700-87 of this Agreement.

G. SUSPENSION OF THE WORK

1. Should, in the judgment of the County or its agent(s), the Contractor or any Sub-Contractor fail to provide a safe and healthy work place, the County or its agent shall have the right, but not the obligation, to suspend work in the unsafe areas until deficiencies are corrected. All costs of any nature (including, without limitation, overtime pay, liquidated damages or other costs arising out of delays) resulting from the suspension, by whomsoever incurred, shall be borne by the Contractor.

2. Should the Contractor or any Sub-Contractor fail to provide a safe and healthy work place after being formally notified in writing by the County or its agents of such non-compliance, the contract may be terminated following the termination provision of the contract.

H. CONTRACTOR'S INDEMNITY OF THE COUNTY FOR CONTRACTOR'S NON-COMPLIANCE WITH SAFETY PROGRAM

1. The Contractor recognizes that it has sole responsibility to assure its Safety Program is implemented and to assure its construction services are safely provided. The Contractor shall indemnify, defend and hold the County and its agents harmless, from and against any and all liability (whether public or private), penalties (contractual or otherwise), losses, damages, costs, attorneys' fees, expenses, causes of action, claims or judgments resulting, either in whole or in part, from any failure of the Contractor, its Sub-Contractors of any tier or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, to comply with the safety requirements of the contract. The Contractor shall not be relieved of its responsibilities under the safety requirements of the Contract should the County or its agent(s) act or fail to act pursuant to its rights hereunder.

2. The Contractor shall not raise as a defense to its obligation to indemnify under this Subparagraph I any failure of those indemnified hereunder to assure Contractor operates safely, it being understood and agreed that no such failure shall relieve the Contractor from its obligation to assure safe operations or from its obligation to so indemnify. The Contractor also hereby waives any rights it may have to seek contribution, either directly or indirectly, from those indemnified hereunder.

3. In any and all claims against those indemnified hereunder by any employee of the Contractor, any Sub-Contractor of any tier or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under this Subparagraph I shall not be limited in any way as to the amount or type of damages, compensation or benefits payable by or for the Contractor or any Sub-Contractor of any tier under any workers' compensation act, disability benefit or other employee benefit acts.

## 00700-26 BLASTING AND EXCAVATION

The Contractor acknowledges that it is fully aware of the contents and requirements of O.C.G.A. § 25-9-1 through 25-9-12 concerning blasting and excavation near underground gas pipes and facilities and shall fully comply therewith.

## 00700-27 HIGH VOLTAGE LINES

The Contractor acknowledges that it is fully aware of the contents and requirements O.C.G.A. § 46-3-30 through 46-3-39 concerning safeguards against contact with high voltage lines, and the Contractor shall fully comply with said provisions.

00700-28 SCAFFOLDING AND STAGING

The Contractor acknowledges that it is the person responsible for employing and directing others to perform labor within the meaning of O.C.G.A. § 34-1-1 and agrees to comply with said provisions.

00700-29 CLEAN-UP

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.

00700-30 PROTECTION OF WORK

The Contractor shall be responsible for maintenance and protection of the work, which shall include any County-furnished supplies, material, equipment, until final completion of this agreement and acceptance of the work as defined herein. Any portion of the work suffering injury, damage or loss shall be considered defective and shall be corrected or replaced by the Contractor without additional cost to the County.

00700-31 REJECTED WORK

The Contractor shall promptly remove from the project all work rejected by the Construction Manager for failure to comply with the contract documents and the Contractor shall promptly replace and re-execute the work in accordance with the contract documents and without expense to the County. The Contractor shall also bear the expense of making good all work of other Contractors destroyed or damaged by such removal or replacement.

00700-32 DEFECTIVE WORK

If the Contractor defaults or neglects to carry out any portion of the work in accordance with the contract documents, and fails within three days after receipt of written notice from the Construction Manager to commence and continue correction of such default or neglect with diligence and promptness, the County may, after three days following receipt by the Contractor of an additional written notice and without prejudice to any other remedy the County may have, make good such deficiencies and complete all or any portion of any work through such means as the County may select, including the use of a separate Contractor. In such case, an appropriate change order shall be issued deducting from the payments then or thereafter due the Contractor the cost of correcting such deficiencies. In the event the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the County on demand.

The County may, at its option, accept defective or nonconforming work instead of requiring its removal or correction. In such case, a change order shall be issued reducing the price due the contractor to the extent appropriate and equitable. Such contract price adjustment shall be effected whether or not final payment has been made.

00700-33 WARRANTY OF NEW MATERIALS

The Contractor warrants to the County that all materials and equipment furnished under this contract will be new unless otherwise specified, and the Contractor further warrants that all work will be of good quality, free from faults and defects, and in conformance with the contract documents. The warranty set forth in this paragraph shall survive final acceptance of the work.

00700-34 CONTRACTOR'S WARRANTY OF THE WORK

If within one year after the date of issuance of the certificate of final payment pursuant to General Condition 84, or within such longer period of time as may be prescribed by law or by the term of any applicable special warranty required by the contract documents, any of the work is found to be defective or not in accordance with the contract documents, the Contractor shall correct such work promptly after receipt of written notice from the Construction Manager to do so. This obligation shall survive both final payment for the work and termination of the contract.

00700-35 ASSIGNMENT OF MANUFACTURERS' WARRANTIES

Without limiting the responsibility or liability of the Contractor pursuant to this agreement, all warranties given by manufacturers on materials or equipment incorporated in the work are hereby assigned by the Contractor to the County. If requested, the Contractor shall execute formal assignments of said manufacturer's warranties to the County. All such warranties shall be directly enforceable by the County.

00700-36 WARRANTIES IMPLIED BY LAW

The warranties contained in this agreement, as well as those warranties implied by law, shall be deemed cumulative and shall not be deemed alternative or exclusive. No one or more of the warranties contained herein shall be deemed to alter or limit any other.

00700-37 STOP WORK ORDERS

In the event that the Contractor fails to correct defective work as required by the contract documents or fails to carry out the work in accordance with contract documents, the Construction Manager, in writing, may order the Contractor to stop work until the cause for such order has been eliminated. This right of the County to stop work shall not give rise to any duty on the part of the County or the Construction Manager to execute this right for the benefit of the Contractor or for any other person or entity.

00700-38 TERMINATION FOR CAUSE

If the Contractor is adjudged bankrupt, makes a general assignment for the benefit of creditors, suffers the appointment of a receiver on account of its insolvency, fails to supply sufficient properly skilled workers or materials, fails to make prompt payment to subcontractors or materialmen, disregards laws, ordinances, rules, regulations, or orders of any public authority having jurisdiction, fails to diligently prosecute the work, or is otherwise guilty of a material violation of this agreement and fails within seven days after receipt of written notice to commence and continue correction of such default, neglect, or violation with diligence and promptness, the County may, after seven days following receipt by the Contractor of an additional written notice and without prejudice to any other remedy the County may have, terminate the employment of the Contractor and take possession of the site as well as all materials, equipment, tools, construction equipment and machinery thereon. The County may finish the work by whatever methods the County deems expedient. In such case, 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 the cost of completing the work, such excess shall be paid to the Contractor. If such costs exceed the unpaid balance, the Contractor shall pay the difference to the County on demand. This obligation for payment shall survive the termination of the contract. Termination of this agreement pursuant to this paragraph may result in disqualification of the Contractor from bidding on future County contracts.

00700-39 TERMINATION FOR CONVENIENCE

The County may, at any time upon written notice to the Contractor, terminate the whole or any portion of the work for the convenience of the County. The effective data of the terminations shall be provided in the written notice. Said termination shall be without prejudice to any right or remedy of the County provided herein. In addition, in the event this agreement has been terminated due to the default of the Contractor, and if it is later determined that the Contractor was not in default pursuant to the provisions of this agreement at the time of termination, then such termination shall be considered a termination for convenience pursuant to this paragraph.

00700-40 TERMINATION FOR CONVENIENCE - PAYMENT

If the Contract is terminated for convenience by the Owner as provided in this article, Contractor will be paid compensation for those services actually performed as approved by the Owner or his representative. Partially completed tasks will be compensated for based on a signed statement of completion prepared by the Project Manager and submitted to the Contractor which shall itemize each task element and briefly state what work has been completed and what work remains to be

done. Contractor shall also be paid for reasonable costs for the orderly filing and closing of the project.

00700-41 TERMINATION FOR CONVENIENCE - PAYMENT LIMITATIONS

Except for normal spoilage, and except to the extent that the County shall have otherwise expressly assumed the risk of loss, there shall be excluded from the amounts payable to the Contractor the fair value, as determined by the Construction Manager, of property which is destroyed, lost, stolen or damaged so as to become undeliverable to the County or to another buyer.

00700-42 COST TO CURE

If the County terminates for cause the whole or any part of the work pursuant to this agreement, then the County may procure upon such terms and in such manner as the Construction Manager may deem appropriate, supplies or services similar to those so terminated, and the Contractor shall be liable to the County for any excess costs for such similar supplies or services. The Contractor shall continue the performance of this agreement to the extent not terminated hereunder.

00700-43 ATTORNEY'S FEES

Should the Contractor default pursuant to any of the provisions of this agreement, the Contractor and its surety shall pay to the County such reasonable attorney's fees as the County may expend as a result thereof and all costs, expenses, and filing fees incidental thereto.

00700-44 CONTRACTOR'S RESPONSIBILITIES UPON TERMINATION

After receipt of a notice of termination from the County, and except as otherwise directed by the Construction Manager, the Contractor shall:

1. Stop work under the contract on the date and to the extent specified in the notice of termination;
2. Place no further orders or subcontracts for materials, services or facilities, except as may be necessary for completion of such portion of the work under the agreement as is not terminated;
3. Terminate all orders and subcontracts to the extent that they relate to the performance of work terminated by the notice of termination;
4. Assign to the County in the manner, at the times, and to the extent directed by the Construction Manager, all of the rights, title and interest of the Contractor under the orders and subcontracts so terminated, in which case the County shall have the right, at its discretion, to settle or pay any and all claims arising out of the termination of such orders or subcontracts;
5. Settle all outstanding liabilities and all claims arising out of such termination of orders and subcontracts with the approval or ratification of the Construction Manager, to the extent the Construction Manager may require, which approval or ratification shall be final for all purposes;
6. Transfer title and deliver to the entity or entities designated by the Construction Manager, in the manner, at the times, and to the extent, if any, directed by the Construction Manager, and to the extent specifically produced or specifically acquired by the Contractor for the performance of such portion of the work as has been terminated:
    a. The fabricated or un-fabricated parts, work, and progress, partially completed supplies, and equipment, materials, parts, tools, dyes, jigs, and other fixtures, completed work, supplies, and other material produced as a part of or acquired in connection with the performance of the work terminated by the notice of termination; and

b. The completed or partially completed plans, drawings, information, and other property to the work.

7. Use its best efforts to sell in the manner, at the times, to the extent, and at the prices directed or authorized by the Construction Manager, any property described in Section 6 of this paragraph, provided, however, that the Contractor shall not be required to extend credit to any buyer and further provided that the proceeds of any such transfer or disposition shall be applied in reduction of any payments to be made by the County to the Contractor pursuant to this agreement.

8. Complete performance of such part of the work as shall not have been terminated by the notice of termination; and

9. Take such action as may be necessary, or as the Construction Manager may direct, for the protection and preservation of the property related to the agreement which is in the possession of the Contractor and in which the County has or may acquire an interest.

00700-45 RECORDS

The Contractor shall preserve and make available to the County all of its records, books, documents and other evidence bearing on the costs and expenses of the Contractor and any subcontractor pursuant to this agreement upon three days advance notice to the Contractor.

00700-46 DEDUCTIONS

In arriving at any amount due the Contractor pursuant to the terms of this agreement, there shall be deducted all liquidated damages, advance payments made to the Contractor applicable to the termination portion of the contract, the amount of any claim which the County may have against the Contractor, the amount determined

By the Construction Manager to be necessary to protect the County against loss due to outstanding potential liens or claims, and the agreed price of any materials acquired or sold by the Contractor and not otherwise recovered by or credited to the County.

00700-47 REIMBURSEMENT OF THE COUNTY

In the event of termination, the Contractor shall refund to the County any amount paid by the County to the Contractor in excess of the costs properly reimbursable to the Contractor.

00700-48 SUSPENSION, INTERRUPTION, DELAY, DAMAGES

The Contractor shall be entitled to only those damages and that relief from termination by the County as specifically set forth in this agreement. The Construction Manager may issue a written order requiring the Contractor to suspend, delay or interrupt all or any part of the work for such period of time as the County may determine to be appropriate for the convenience of the County. If the performance of the work is interrupted for an unreasonable period of time by an act of the County or any of its officers, agents, employees, contractors, or consultants in the administration of this agreement, an equitable adjustment shall be made for any increase in the Contractor's costs of performance and any increase in the time required for performance of the work necessarily caused by the unreasonable suspension, delay, or interruption. Any equitable adjustment shall be reduced to writing and shall constitute a modification to this agreement. In no event, however, shall an equitable adjustment be made to the extent that performance of this agreement would have been suspended, delayed or interrupted by any other cause, including the fault or negligence of the Contractor. No claim for an equitable adjustment pursuant to this paragraph shall be permitted before the Contractor shall have notified the Construction Manager in writing of the act or failure to act involved, and no claim shall be allowed unless asserted in writing to the Construction Manager within ten days after the termination of such suspension, delay or interruption.

00700-49 COMMENCEMENT AND DURATION OF WORK

The County may issue a Notice to Proceed at any time within 120 days following execution of the contract by the County. The Contractor shall commence work pursuant to this agreement within ten days of mailing or delivery of written notice to proceed. The Contractor shall diligently prosecute the work to completion within the time specified therefore in the Agreement. The capacity of the Contractor's construction and manufacturing equipment and plan, sequence and method of operation and forces employed, including management and supervisory personnel, shall be such as to insure completion of the work within the time specified in the Agreement. The Contractor and County hereby agree that the contract time for completion of the work is reasonable taking into consideration the average climatic conditions prevailing in the locality of the work and anticipated work schedules of other contractors whose activities are in conjunction with or may affect the work under this contract.

00700-50 TIME OF THE ESSENCE

All time limits stated in this agreement are of the essence of this contract.

00700-51 IMPACT DAMAGES

Except as specifically provided pursuant to a stop work order or change order, the Contractor shall not be entitled to payment or compensation of any kind from the County for direct or indirect or impact damages including, but not limited to, costs of acceleration arising because of delay, disruption, interference or hindrance from any cause whatsoever whether such delay, disruption, interference or hindrance is reasonable or unreasonable, foreseeable or unforeseeable, or avoidable, provided, however, that this provision shall not preclude the recovery of damages by the Contractor for hindrances or delays due solely to fraud or bad faith on the part of the County, its agents, or employees. The Contractor shall be entitled only to extensions in the time required for performance of the work as specifically provided in the contract.

00700-52 DELAY

The Contractor may be entitled to an extension of the contract time, but not an increase in the contract price or damages, for delays arising from unforeseeable causes beyond the control and without the fault or negligence of the Contractor or its subcontractors for labor strikes, acts of God, acts of the public enemy, acts of the state, federal or local government in its sovereign capacity, by acts of another separate contractor, or by an act or neglect of the County.

00700-53 INCLEMENT WEATHER

The Contractor shall not be entitled to an extension of the contract time due to normal inclement weather. Unless the Contractor can substantiate to the satisfaction of the Construction Manager that there was greater than normal inclement weather and that such greater than normal inclement weather actually delayed the work, the Contractor shall not be entitled to an extension of time therefore. The following shall be considered the normal inclement weather days for each month listed, and extensions of time shall be granted in increments of not less than one half day only for inclement weather in excess of the days set out.

| | |
|---|---|
| January | 10 days |
| February | 10 days |
| March | 7 days |
| April | 6 days |
| May | 4 days |
| June | 3 days |
| July | 4 days |
| August | 2 days |
| September | 2 days |
| October | 3 days |

November 6 days
December 9 days

00700-54 DELAY - NOTICE AND CLAIM

The Contractor shall not receive an extension of time unless a Notice of Delay is filed with the Construction Manager within ten days of the first instance of such delay, disruption, interference or hindrance and a written Statement of the Claim is filed with the Construction Manager within 20 days of the first such instance. In the event that the Contractor fails to comply with this provision, it waives any claim which it may have for an extension of time pursuant to this agreement.

00700-55 STATEMENT OF CLAIM - CONTENTS

The Statement of Claim referenced in Article 00700-54 shall include specific information concerning the nature of the delay, the date of commencement of the delay, the construction activities affected by the delay, the person or organization responsible for the delay, the anticipated extent of the delay, and any recommended action to avoid or minimize the delay.

00700-56 WORK BEHIND SCHEDULE, REMEDY BY CONTRACTOR

If the work actually in place falls behind the currently updated and approved schedule, and it becomes apparent from the current schedule that work will not be completed within the contract time, the Contractor agrees that it will, as necessary, or as directed by the Construction Manager, take action at no additional cost to the County to improve the progress of the work, including increasing manpower, increasing the number of working hours per shift or shifts per working day, increasing the amount of equipment at the site, and any other measure reasonably required to complete the work in a timely fashion.

00700-57 DILIGENCE

The Contractor's failure to substantially comply with the requirements of the preceding paragraph may be grounds for determination by the County that the Contractor is failing to prosecute the work with such diligence as will insure its completion within the time specified. In such event, the County shall have the right to furnish, from its own forces or by contract, such additional labor and materials as may be required to comply with the schedule after 48 hours written notice to the Contractor, and the Contractor shall be liable for such costs incurred by the County.

00700-58 SET-OFFS

Any monies due to the Contractor pursuant to the preceding paragraph of this agreement may be deducted by the County against monies due from the County to the Contractor.

00700-59 REMEDIES CUMULATIVE

The remedies of the County under Articles 00700-56, 00700-57, and 00700-58 are in addition to and without prejudice to all of the rights and remedies of the County at law, in equity, or contained in this agreement.

00700-60 TITLE TO MATERIALS

No materials or supplies shall be purchased by the Contractor or by any Subcontractor subject to any chattel mortgage or under a conditional sales contract or other agreement by which any interest is retained by the seller. The Contractor hereby warrants that it has good and marketable title to all materials and supplies used by it in the work, and the Contractor further warrants that all materials and supplies shall be free from all liens, claims, or encumbrances at the time of incorporation in the work.

00700-61 INSPECTION OF MATERIALS

All materials and equipment used in the construction of the project shall be subject to adequate inspection and testing in accordance with accepted standards and in accordance with the

requirements of the contract documents. Additional tests performed after the rejection of materials or equipment shall be at the Contractor's expense.

00700-62 CONSTRUCTION MANAGER'S PRESENCE DURING TESTING

All tests performed by the Contractor shall be witnessed by the Construction Manager unless the requirement therefore is waived in writing. The Construction Manager may perform additional tests on materials previously tested by the Contractor, and the Contractor shall furnish samples for this purpose as requested.

00700-63 MATERIALS INCORPORATED IN WORK

The Contractor shall furnish all materials and equipment to be incorporated in the work. All such materials or equipment shall be new and of the highest quality available. Manufactured materials and equipment shall be obtained from sources which are currently manufacturing such materials, except as otherwise specifically approved by the Construction Manager.

00700-64 STORAGE OF MATERIALS

Materials and equipment to be incorporated in the work shall be stored in such a manner as to preserve their quality and fitness for the work and to facilitate inspection.

00700-65 PAYROLL REPORTS

The Contractor may be required to furnish payroll reports to the Construction Manager as required by the Owner Controlled Insurance Program.

00700-66 CONTRACTORS' REPRESENTATIVE

Before beginning work, the Contractor shall notify the Construction Manager in writing of one person within its organization who shall have complete authority to supervise the work, receive orders from the Construction Manager, and represent the Contractor in all matters arising pursuant to this agreement. The Contractor shall not remove its representative without first designating in writing a new representative. The Contractor's representative shall normally be present at or about the site of work while the work is in progress. When neither the Contractor nor its representative is present at the work site, the superintendent, foreman, or other of the Contractor' employee in charge of the work shall be an authorized representative of the Contractor.

00700-67 SPECIALTY SUB-CONTRACTORS

The Contractor may utilize the services of specialty subcontractors on those parts of the project which, under normal contracting practices, are performed by specialty subcontractors. The Contractor shall not award more than seventy-five percent of the work to subcontractors.

00700-68 INSPECTION BY THE CONSTRUCTION MANAGER

All work pursuant to this agreement shall be subject to inspection by the Construction Manager for conformity with contract drawings and specifications. The Contractor shall give the Construction Manager reasonable advance notice of operations requiring special inspection of a portion of the work.

00700-69 WORK COVERED PRIOR TO CONSTRUCTION MANAGER'S INSPECTION

In the event that work is covered or completed without the approval of the Construction Manager, and such approval is required by the specifications or required in advance by the Construction Manager, the Contractor shall bear all costs involved in inspection notwithstanding conformance of such portion of the work to the contract drawings and specifications.

00700-70 SCHEDULING OF THE WORK

The work of this contract shall be planned, scheduled, executed, and reported as required by the Contract Documents.

00700-71 PROGRESS ESTIMATES

The Contractor shall prepare a written report for the Construction Manager's approval, on County forms, of the total value of work performed and materials and equipment obtained to the date of submission. Such a report must accompany each request for a progress payment and is subject to review and approval by the Construction Manager. Approval of a progress estimate or tendering of a progress payment shall not be considered an approval or acceptance of any work performed, and all estimates and payments shall be subject to correction in subsequent estimates. Progress payments shall be made for all completed activities and for materials suitably stored on-site.

00700-72 PROGRESS PAYMENTS

Upon approval of each monthly estimate of work performed and materials furnished, the Construction Manager shall approve payment to the Contractor for the estimated value of such work, materials, and equipment, less the amount of all prior payments and any liquidated damages. The Contractor will be paid 100 percent, less retainage, of the cost of materials received and properly stored on-site but not incorporated into the work. Payments for materials or equipment stored on the site shall be conditioned upon submission by the Contractor of bills of sale to establish the County's title to such materials or equipment. The Contractor's request for payment shall provide sufficient detail as to the work completed or materials purchased for which payment is requested to permit meaningful review by the Construction Manager.

00700-73 TIME OF PAYMENT

The Contractor will be paid within 45 days following receipt of an approved Progress Estimate. The Contractor expressly agrees that the payment provisions within this Contract shall supersede the rates of interest, payment periods, and contract and subcontract terms provided for under the Georgia Prompt Pay Act, O.C.G.A. §13-11-1 et seq., and that the rates of interest, payment periods, and contract and subcontract terms provided for under the Prompt Pay Act shall have no application to this Contract. The County shall not be liable for any late payment interest or penalty.

00700-74 RETAINAGE

The County shall retain from each progress payment ten percent of the estimated value of the work performed until the progress payments, including retainage, total 50 percent of the contract price. If a contract includes two or more projects or assignments that have been separately priced and have separate budgets, and the performances of such projects or assignments are not related to or dependent upon the performance of any other, the 50 per cent limit shall be based upon the price for each individual project or assignment. Thereafter, no further retainage shall be withheld so long as the Contractor is making satisfactory progress to insure completion of the work within the time specified therefore. The County may reinstate the ten percent retainage in the event the Construction Manager determines that the Contractor is not making satisfactory progress to complete the work within the time specified in this agreement or in the event that the Construction Manager provides a specific cause for such withholding. The County may also withhold retainage upon substantial completion of the work as provided in O.C.G.A. §13-10-81(c). Interest may be paid upon the retainage in accordance with Georgia law.

00700-75 PAYMENT OF SUBCONTRACTORS

The Contractor shall promptly pay each subcontractor upon the receipt of payment from the County. Such payment shall be made from the amount paid to the Contractor pursuant to the subcontractor's work. The Contractor shall also maintain the records of the percentage retained from payments to the Contractor pursuant to such subcontractor's work. The Contractor shall procure agreements from each subcontractor requiring each subcontractor to pay their subcontractors, agents and employees in a similar manner. The County reserves the right to inquire of any subcontractor, supplier, materialmen, or subconsultant, the status of any indebtedness of the Contractor. The County further reserves the right to require the Contractor to designate on each instrument of payment exceeding $400.00 to subcontractors, suppliers,

materialmen, and subconsultants that such payment is on account of the work under this Contract.

00700-76 COUNTY'S RESPONSIBILITIES TO SUBCONTRACTORS

Neither the County nor the Construction Manager shall have any obligation to pay any subcontractor except as otherwise required by law.

00700-77 PROGRESS PAYMENTS - ACCEPTANCE OF WORK

Certification of progress payments, as well as the actual payment thereof, shall not constitute the County's acceptance of work performed pursuant to this agreement.

00700-78 PAYMENTS IN TRUST

All sums paid to the Contractor pursuant to this agreement are hereby declared to constitute trust funds in the hands of the contractor to be applied first to the payment of claims of subcontractors, laborers, and suppliers arising out of the work, to claims for utilities furnished and taxes imposed, and to the payment of premiums on surety and other bonds and on insurance for any other application.

00700-79 JOINT PAYMENTS

The County reserves the right to issue any progress payment or final payment by check jointly to the Contractor and any subcontractor or supplier.

00700-80 RIGHT TO WITHHOLD PAYMENT

The Construction Manager may decline to approve payment and may withhold payment in whole or in part to the extent reasonable and necessary to protect the County against loss due to defective work, probable or actual third party claims, the Contractor's failure to pay subcontractors or materialmen, reasonable evidence that the work will not be completed within the contract time or contract price or damage to the County or any other contractor on the project.

00700-81 CERTIFICATE OF SUBSTANTIAL COMPLETION

Upon the Contractor's submission of a request for a certificate of Substantial Completion, the Construction Manager shall inspect the work and determine whether the work is Substantially Complete. If the work is Substantially Complete, the Construction Manager shall issue a certificate of Substantial Completion of the work which shall establish the date of Substantial Completion, shall state the responsibilities of the County and the Contractor for security, maintenance, heat, utilities, damage to the work and insurance, and shall fix the time within which the Contractor shall complete the items submitted by the Contractor as requiring correction or further work. The certificate of substantial completion of the work shall be submitted to the County and the Contractor for their written acceptance of the responsibilities assigned to them pursuant to such certificate.

If in the sole opinion of the Construction Manager, the work is not substantially complete, the Construction Manager shall notify the Contractor of such, in writing, and outline requirements to be met to achieve Substantial Completion.

00700-82 PAYMENT UPON SUBSTANTIAL COMPLETION

Upon Substantial Completion of the work and upon application by the Contractor and approval by the Construction Manager, the County shall make payment reflecting 100% work completed, less value of work remaining as determined by Construction Manager and any authorized retainage.

00700-83 COMMENCEMENT OF WARRANTIES

Warranties required by this agreement shall commence on the date of final completion of the project as determined under Article 00700-84 unless otherwise provided in the certificate of Substantial Completion.

00700-84 FINAL PAYMENT - WAIVER OF CLAIMS, DISPUTE OF FINAL PAYMENT

The acceptance of the Substantial Completion payment shall constitute a waiver of all claims by the Contractor except those previously made in writing and identified by the Contractor as unsettled at the time of application for payment at Substantial Completion and except for the retainage sums due at final acceptance. Following the Construction Manager's issuance of the certificate of Substantial Completion and the Contractor's completion of the work pursuant to this agreement, the Contractor shall forward to the Construction Manager a written notice that the work is ready for final inspection and acceptance. If after inspection the Construction Manager certifies that the work is complete and issues written notification of such to the Contractor, the Contractor shall forward to the Construction Manager a final application for payment. The Construction Manager shall issue a certificate for payment, which shall approve final payment to the Contractor and shall establish the date of final completion.

In the event the Contractor timely disputes the amount of the final payment, the amount due the Contractor shall be deemed by the Contractor and the County to be an unliquidated sum and no interest shall accrue or be payable on the sum finally determined to be due to the Contractor for any period prior to final determination of such sum, whether such determination be by agreement of the Contractor and the County or by final judgment of the proper court in the event of litigation between the County and the Contractor. The Contractor specifically waives and renounces any and all rights it may have under O.C.G.A. §13-6-13 and agrees that in the event suit is brought by the Contractor against the County for any sum claimed by the Contractor under the Contract or for any extra or additional work, no interest shall be awarded on any sum found to be due from the County to the Contractor in the final judgment entered in such suit. All final judgments shall draw interest at the legal rate, as specified by law.

00700-85 DOCUMENTATION OF COMPLETION OF WORK

Neither the final payment nor the remaining retainage shall become due until the Contractor submits the following documents to the Construction Manager:

a. An affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the work have been paid other otherwise satisfied;

b. The surety's consent to final payment; and

c. Any other data reasonably required by the County or Construction Manager establishing payment or satisfaction of all such obligations, including releases, waivers of liens, and documents of satisfaction of debts.

In the event that a subcontractor refuses to furnish a release or waiver as required by the County or Construction Manager, the Contractor may furnish a bond satisfactory to the County to indemnify the County against such loss. In the event that any lien or indebtedness remains unsatisfied after all payments are made, the contractor shall refund to the County all moneys that the County may become compelled to pay in discharging such lien or other indebtedness, including all costs and reasonable attorney's fees.

00700-86 GOVERNING LAW

Each and every provision of this agreement shall be construed in accordance with and governed by Georgia law. The parties acknowledge that this contract is executed in Fulton County, Georgia and that the contract is to be performed in Fulton County, Georgia. Each party hereby consents to the Fulton Superior Court's sole jurisdiction over any dispute which arises as a result of the execution or performance of this agreement, and each party hereby waives any and all objections to venue in the Fulton Superior Court.

00700-87 CHANGES IN THE WORK

A. CHANGE ORDERS

1. A Change Order is a written order to the Contractor signed to show the approval and the authorization of the County, issued after execution of the Contract,

authorizing a change in the Work and/or an adjustment in the Contract Sum or the Contract Time. Change Orders shall be written using forms designated by the County with Contractor providing supporting documentation as required by the Construction Manager. The Contract Sum and the Contract Time may be changed only by approved Change Order pursuant to Fulton County Procedure 800-6. The amount payable by the Change Order is payment in full for all direct and indirect costs incurred and related to the work under said Change Order, including but not limited to delays, imports, acceleration, disruption and extended overhead. A Change Order signed by the Contractor indicates the Contractor's agreement therewith, including the adjustment in either or both of the Contract Sum or the Contract Time.

2. The County, without invalidating the Contract, may order changes in the Work within the general scope of the Contract as defined herein. The time allowed for performance of the work and the contract price to be paid to the Contractor may be adjusted accordingly.

3. The cost or credit to the County resulting from a change in the Work shall be determined in one or more of the following ways:

   a. By mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

   b. By unit prices stated in the Contract Documents or subsequently agreed upon;

   c. By cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

   d. By the method provided in Subparagraph A4 below.

4. If none of the methods set forth in Subparagraphs 3a, 3b, or 3c above is agreed upon, the Contractor, provided a written order signed by the Construction Manager is received, shall promptly proceed with the Work involved. The cost of such Work shall then be determined by the Construction Manager on basis of the reasonable expenditures and savings of those performing the Work attributable to the change. The cost of the change shall include only the items listed in Subparagraph 5a below, and in the case of either a decrease or an increase in the Contract Sum, an allowance for overhead and profit in accordance with the schedules set forth in Subparagraphs 5b and 6 below shall be applied to the cost or credit.

   a. In such case, and also under Subparagraph 3a above, the Contractor shall keep and present, in such form as the Construction Manager may prescribe, an itemized accounting of all actual costs expended, together with appropriate supporting data for inclusion in a Change Order.

   b. All hourly rate charges shall b submitted to the Construction Manager for prior review and approval. All hourly rate charges shall be properly supported as required by the Construction Manager with certified payrolls, or their acceptable equivalent. When authorized to proceed for a given change and actual expenditures have been made prior to execution of a Change Order for the entire change, such actual expenditures may be summarized monthly, and if approved, incorporated into a Change Order. When both additions and credits covering related Work or substitutions are involved in any one change, the allowance for overhead and profit shall be figured on the basis of the net increase or decrease, if any, with respect to that change.

5. In Subparagraphs 3 and 4 above, the items included in "Cost and "Overhead" shall be based on the following schedule:

a. Unless otherwise provided in the Contract Documents, "Cost" shall be limited to the following: cost of materials incorporated into the Work, including sales tax and cost of delivery; cost of direct labor (labor cost may include a pro rata share of foreman's account of the change) including social security, old age and unemployment insurance, and fringe benefits required by agreement or custom; workers' or workmen's compensation insurance; rental value of equipment and machinery; costs for preparing Shop Drawings.

b. Unless otherwise provided in the Contract Documents, "Overhead" shall include the following: bond and insurance premiums including increase and decreases from change in the Work, supervision, superintendence, construction parking, wages of timekeepers, watchmen and clerks, small tools, consumable supplies, expendables, incidentals, general office expense, the cost of additional reproduction for the Contractor's subcontractors beyond that agreed upon in the Contract Documents, construction parking, any additional costs of craft supervision by the Contractor's or subcontractors' superintendents, and overhead charges which would be customary and expended regardless of the change in the Work due to other overlapping activities which are included as part of the original Contract, and all other expenses not included in "Cost" above.

c. In the event that a change is issued by the County which would require the expenditure of substantial amounts of special supervision (beyond the foreman level) by the Contractor, the Contractor may, at the sole direction of the Construction Manager, be allowed to incorporate these charges into the agreement cost for the change.

6. In Subparagraphs 3 and 4 above, the allowance for overhead and profit combined, included in the total cost or credit to the County, shall be based on the following schedule:

a. For the Contractor, for any work performed by the Contractor's own forces, <u>ten (10) percent</u> of the cost.

b. For the Contractor, for any work performed by a Contractor's subcontractor, five (5) percent of the amount due the subcontractor.

c. For each subcontractor or sub-subcontractor involved, for any work performed by that subcontractor's or sub-subcontractor's own forces, ten (10) percent of the cost.

d. For each subcontractor, for work performed by a sub-subcontractor, five (5) percent of the amount due to the sub-subcontractor.

e. Cost to which overhead and profit is to be applied shall be determined in accordance with Subparagraph 5 above unless modified otherwise.

7. In order to facilitate checking of quotations for extras or credits, all proposals or bids, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs, including labor cost, materials and subcontracts. Labor and materials shall be itemized in the manner defined in Subparagraph 4 above. Where major cost items are subcontracts, they shall be itemized also. <u>In no case shall a change be approved without such itemization</u>.

8. No payment shall be made for any changes to the contract that are not included in a fully executed Change Order.

B. CONCEALED, UNKNOWN AND DIFFERING CONDITIONS

1. Should concealed conditions be encountered in the performance of the Work below the surface of the ground, or should concealed or unknown conditions in an existing structure be at variance with the conditions indicated by the Contract Documents, or should unknown physical conditions below the surface of the ground or concealed or unknown conditions in an existing structure 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, be encountered, the Contract Sum and Contract Time shall be equitably adjusted by Change Order upon request by either party made **within twenty (20) days after the first observance** of the conditions. No such request for equitable adjustment shall be valid unless the Contractor complies with this (20) days notice and Subparagraph C.1. below.

2. The Contractor shall promptly, and before such conditions are disturbed, notify the Construction Manager in writing of any claim of concealed, unknown or differing conditions pursuant to this paragraph. The Construction Manager shall authorize the Engineer to investigate the conditions, and if it is found that such conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performance of any part of the Work under this Contract, whether or not changed as a result of such conditions, an equitable adjustment shall be recommended to the Construction Manager.

3. No claim of the Contractor under this clause shall be allowed unless the Contractor has given the notice required in (a) above, prior to disturbing the condition.

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

5. Any materially differing site condition as between what is shown on the Drawings and Specifications and actually found on site shall be immediately reported to the Construction Manager in writing prior to the commencement of Work at the site. Failure of the Contractor to notify the Construction Manager in writing of the differing site condition prior to performance of Work at the site shall constitute a waiver of any claim for additional monies. Any Change Order necessitated by the differing site condition shall be processed as provided under "Changes in the Contract".

C. REQUESTS FOR ADDITIONAL COST

1. If the Contractor wishes to request an increase in the Contract Sum, the Contractor shall give the Construction Manager written notice thereof within twenty (20) days after the occurrence of the event, or identification of the conditions, giving rise to such request. This notice shall be give by the Contractor before proceeding to execute the Work, except in an emergency endangering life or property in which case the Contractor shall proceed in accordance with Article 00700-25 and Subparagraph A.4 above. No such request shall be valid unless so made within the twenty (20) days specified above. If the County and the Contractor cannot agree on the amount of the adjustment in the Contract Sum, it shall be determined by the Construction Manager. Any change in the Contract Sum resulting from such claim shall be documented by Change Order.

2. If the Contractor claims that addition cost is involved because of, but not limited to (1) any written interpretation pursuant to General Condition 00700-17 of this Agreement, (2) any order by the County to stop the Work pursuant to Articles 00700-25 and 00700-37 of this Agreement where the Contractor was not at fault, or any such order by the Construction Manager as the County’s agent, or (3) any written order for a minor change in the Work issued pursuant to Paragraph D

below, the Contractor shall submit a request for an increase in the Contract Sum as provided in Subparagraph C.1 above. No such claim shall be valid unless the Contractor complies with Subparagraph C.1 above and approved by the County pursuant to Change Order Policy 800-6.

D. MINOR CHANGES IN THE WORK

The Construction Manager may order minor changes in the Work not involving an adjustment in the Contract Price, extension of the time allowed for performance of the work and not inconsistent with the intent of the Contract Documents. Such changes shall be effected by a written Change Directive issued by the Construction Manager, and shall be binding on the County and the Contractor. The Contractor shall carry out such written orders promptly.

E. BONDS

If any change order results in an increase in the contract price, the contractor shall increase the penal sum of the performance and payment bonds to equal the increased price.

00700-88 DISAGREEMENT WITH ORDERS FOR CHANGE

Contractor's written acceptance of a Change Order or other order for changes shall constitute his final and binding agreement to the provisions thereof and a waiver of all claims in connection therewith, whether direct or consequential in nature. Should Contractor disagree with any order for changes, he may submit a notice of potential claim to the Construction Manager, at such time as the order is set forth in the form of a Change Order. Disagreement with the provisions of an order for changes shall not relieve Contractor of his obligation under Article 00700-87 of this Agreement.

00700-89 NO WAIVER OF REMEDIES

Exercise by the County of any remedy is not exclusive of any other remedy available to County and shall not constitute a waiver of any such other remedies. Failure of the County to exercise any remedy, including breach of contract remedies, shall not preclude the County from exercising such remedies in similar circumstances in the future.

00700-90 LAND AND RIGHTS-OF-WAY

The owner will provide, as indicated in the Contract Documents and prior to Notice to Proceed, the lands upon which the work is to be done, right-of-way for access thereto, and such other lands which are designated for the use of the Contractor. The Contractor shall confine the Contractor’s work and all associated activities to the easements and other areas designated for the Contractor’s use. The Contractor shall comply with any limits on construction methods and practices which may be required by easement agreements. If, due to some unforeseen reason, the necessary easements are not obtained, the Contractor shall receive an equitable extension of contract time dependent upon the effect on the critical path of the project schedule or the County may terminate the Contract for its convenience.

00700-91 COORDINATION WITH STATE DEPARTMENT OF TRANSPORTATION

No clearing or grading shall be completed by Contractor within the State Department of Transportation (DOT) area under construction. The Contractor must coordinate his construction scheduling with DOT.

If the Contractor begins work before DOT’s completion date, he must obtain the approval of DOT before starting work in the area. The state DOT has the right to stop the Contractor’s work the DOT area.

The Contractor shall receive no additional compensation or damages resulting from delay or work stoppage from DOT actions or scheduling.

Contractor shall obtain DOT drawings of the DOT, project area for verification of road geometry, storm drains, etc. from Georgia Department of Transportation or Fulton County. The Contractor is responsible for obtaining any pertinent DOT revisions.

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## EXHIBIT A

## FINAL AFFIDAVIT

TO FULTON COUNTY, GEORGIA

I, _____, hereby certify that all suppliers of materials, equipment and service, subcontractors, mechanic, and laborers employed by _____ or any of his subcontractors in connection with the design and/or construction of _____ at Fulton County have been paid and satisfied in full as of _____, 200___, and that there are no outstanding obligations or claims of any kind for the payment of which Fulton County on the above-named project might be liable, or subject to, in any lawful proceeding at law or in equity.

_____

Signature

_____

Title

Personally appeared before me this _____ day of _____, 200_____. _____, who under Oath deposes and says that he is _____of the firm of _____, that he has read the above statement and that to the best of his knowledge and belief same is an exact true statement.

_____

Notary Public

_____

My Commission expires

END OF SECTION

# SECTION 01010

# SUMMARY OF WORK

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. The Work to be done under this Contract and in accordance with these Specifications consists of furnishing all equipment, superintendence, labor, skill, material, and all other items necessary for the construction of the Riverside Road Pump Station Upgrade, including but not limited to, all civil, mechanical, electrical, instrumentation, structural, and architectural work and all appurtenant work, complete, tested, and ready for operation, including temporary facilities as required, all in conformance with the Contract Documents.

The Contractor shall perform all work required for such construction in accordance with the Contract Documents and subject to the terms and conditions of the Contract, complete and ready for use.

B. The principal features of the Work to be performed under this Contract includes installing six new 19 mgd non-clog vertical dry pit pumps, replacing discharge piping and valves, installing three new channel grinders, a new wet well mixing system, a new wet scrubber and carbon adsorption odor control system, new standby power generator sets, new pump station SCADA system, electrical and HVAC upgrades, yard piping; sitework including ornamental fencing, and landscaping; demolition of existing facilities including screenings room, existing bar screens and existing vertical non-clog pumps; and other appurtenant work.

C. The Riverside Road Pump Station must remain operational during this construction project. The following requirements affect the Sequence of Construction for the Contractor in performance of the Work. Additional requirements of the Sequence of Construction are indicated on the Drawings.

1. The pump station has two wet wells. Only one wet well will be allowed out of service at a time.

2. The pump station has three screening channels. Only one screening channel will be allowed out of service at a time.

3. The existing SCADA system for the pump station must remain in service until the new SCADA system is installed, tested, and fully operational.

4. The existing odor control system for the pump station must remain in service until the new odor control system is installed, tested, and fully operational.

5. One force main must be operational at all times.

6. Coordination with Georgia Power is required to maintain electric service.

D. The foregoing descriptions shall not be construed as a complete description of all Work required.

1.02 CONTRACT DOCUMENTS

A. The Work to be done is shown on the set of Drawings entitled "Riverside Road Pump Station Upgrade" and dated August 2007. The numbers and titles of all Drawings appear on the index sheet of the Drawings, Drawing G1 – Index of Drawings. All drawings so enumerated shall be considered an integral part of the Contract Documents as defined herein.

B. Certain Document Sections refer to Divisions of the Contract Specifications. Sections are each individually numbered portions of the Specifications (numerically) such as 08110, 13182, 15206, etc. The term Division is used as a convenience term meaning all Sections within a numerical grouping. Division 16 would thus include Sections 16000 through 16903.

C. Where references in the Contract Documents are made to Contractors for specific disciplines of work (i.e. Electrical Contractor, etc.), these references shall be interpreted to be the single prime Contractor when the project is bid or awarded as a single prime contract.

1.03 GENERAL ARRANGEMENT

A. Drawings indicate the extent and general arrangement of the work. If any departures from the Drawings are deemed necessary by the Contractor to accommodate the materials and equipment he proposes to furnish, details of such departures and reasons therefore shall be submitted as soon as practicable to the Engineer for approval. No such departures shall be made without the prior written approval of the Engineer. Approved changes shall be made without additional cost to the Owner for this work or related work under other Contracts of the Project.

B. The specific equipment proposed for use by the Contractor on the project may require changes, in structures, auxiliary equipment, piping, electrical, mechanical, controls or other work to provide a complete satisfactory operating installation. The Contractor shall submit to the Engineer, for approval, all necessary Drawings and details showing such changes to verify conformance with the overall project structural and architectural requirements and overall project operating performance. The Bid Price shall include all costs in connection with the preparation of new drawings and details and all changes to construction work to accommodate the proposed equipment, including increases in the costs of other Contracts.

1.04 CONSTRUCTION PERMITS, EASEMENTS AND ENCROACHMENTS

A. The Owner shall obtain or cause to be obtained all permanent easements as shown on the Drawings. The Contractor shall obtain all temporary construction easements. The Owner shall further obtain or cause to be obtained a right-of-way encroachment agreement from GDOT. The Contractor shall verify that these agreements have been obtained and shall comply with the conditions set forth in each agreement.

B. The Contractor shall obtain, keep current and pay all fees for any necessary construction permits from those authorities, agencies, or municipalities having jurisdiction over land

areas, utilities, or structures which are located within the Contract limits and which will be occupied, encountered, used, or temporarily interrupted by the Contractor's operations unless otherwise stated. Record copies of all permits shall be furnished to the Engineer.

C. When construction permits are accompanied by regulations or requirements issued by a particular authority, agency or municipality, it shall be the Contractor's responsibility to familiarize himself and comply with such regulations or requirements as they apply to his operations on this Project.

D. The Contractor shall provide any required Performance and Indemnity Bond(s) and any additional specific insurance coverage required of the Owner by the Encroachment Agreement(s) in accordance with the Encroachment Agreement(s) between the Owner and the Georgia Department of Transportation - Division of Highways. The Contractor shall fully comply with all of the requirements of the Owner included in the Encroachment Agreement(s).

E. The following permits have been obtained:

1. Land Disturbance Permit from City of Roswell

2. Building Permit: Plans have been submitted and comments addressed. Contractor will need to pay fee to obtain final permit.

1.05 ADDITIONAL ENGINEERING SERVICES

A. In the event that the Engineer is required to provide additional engineering services as a result of substitution of materials or equipment which are not "or equal" by the Contractor, or changes by the Contractor in dimension, weight, power requirements, etc., of the equipment and accessories furnished, or if the Engineer is required to examine and evaluate any changes proposed by the Contractor for the convenience of the Contractor, then the Engineer's charges in connection with such additional services shall be charged to the Contractor by the Owner.

B. Structural design shown on the Contract Drawings is based upon typical weights for major items of equipment as indicated on the Contract Drawings and specified. If the equipment furnished exceeds the weights of said equipment, the Contractor shall assume the responsibility for all costs of redesign and for any construction changes required to accommodate the equipment furnished, including the Engineer's expenses in connection therewith.

C. In the event that the Engineer is required to provide additional engineering services as a result of Contractor's errors, omissions, or failure to conform to the requirements of the Contract Documents, or if the Engineer is required to examine and evaluate any changes proposed by the Contractor solely for the convenience of the Contractor, then the Engineer's charges in connection with such additional services shall be charged to the Contractor by the Owner.

1.06 ADDITIONAL OWNER'S EXPENSES

A. In the event the Work of this Contract is not completed within the time set forth in the Contract or within the time to which such completion may have been extended in accordance with the Contract Documents, the additional engineering or inspection

charges incurred by the Owner may be charged to the Contractor and deducted from the monies due him. Extra work or supplemental Contract work added to the original Contract, as well as extenuating circumstances beyond the control of the Contractor, will be given due consideration by the Owner before assessing engineering and inspection charges against the Contractor.

B. Unless otherwise specifically permitted, the normal time of work under this Contract is limited to 8 hours per day, Monday through Friday. Work beyond these hours will result in additional expense to the Owner. Any expenses and/or damages, including the cost of the Engineer's on site personnel, arising from the Contractor's operations beyond the hours and days specified above shall be borne by the Contractor.

C. Charges assessed to the Contractor for additional engineering and inspection costs will be determined based on actual hours charged to the job by the Engineer. Daily rates will depend on the number and classifications of employees involved, but in no case shall such charges exceed $800 per day for field personnel and $1,000 per day for engineering personnel, based on an eight hour workday.

D. Charges for additional Owner's expenses shall be in addition to any liquidated damages assessed in accordance with the Contract.

1.07 TIME OF WORK

A. The normal time of work for this Contract is limited to 40 hours per week and shall generally be between the hours of 7:00 a.m. and 6:00 p.m., Monday through Friday. The Contractor may elect to work beyond these hours or on weekends provided that all costs incurred by the Owner for additional engineering shall be borne by the Contractor and provided that the Contractor obtains written permission from the Owner a minimum of 24 hours in advance of working beyond the time of work specified herein.

1. The Owner shall deduct the cost of additional engineering costs from monies due the Contractor.

B. If it shall become imperative to perform work at night, the Owner and Engineer shall be informed a reasonable time in advance of the beginning of such work. Temporary lighting and all other necessary facilities for performing and inspecting the work shall be provided and maintained by the Contractor.

C. Unless otherwise specifically permitted, all work that would be subject to damage shall be stopped during inclement, stormy or freezing weather. Only such work as will not suffer injury to workmanship or materials will be permitted. Contractor shall carefully protect his work against damage or injury from the weather, and when work is permitted during freezing weather, he shall provide and maintain approved facilities for heating the materials and for protecting the finished work.

1.08 SUBSURFACE DATA

A. Subsurface data is limited to the boring logs included as Appendix A to the Contract Documents. In making this data available, the Owner makes no guarantee, either expressed or implied, as to their accuracy or to the accuracy of any interpretation thereof.

B. The Bidder must interpret such subsurface data according to his own judgment and acknowledge that he is not relying upon the same as accurately describing the subsurface conditions which may be found to exist.

1. The test boring logs present factual information of the subsurface conditions at the specific test boring locations only. The Bidder should not consider, or conclude, that the subsurface conditions will be the same throughout the project area.

C. The Bidder further acknowledges that he assumes all risks contingent upon the nature of the sub-surface conditions to be actually encountered by him in performing the work covered by the Contract, even though such actual conditions may result in the Bidder performing more or less work than he originally anticipated.

1.09 SURVEYS AND LAYOUT

A. All work under this Contract shall be constructed in accordance with the lines and grades shown on the Drawings or as directed by the Engineer. Elevation of existing ground and appurtenances are believed to be reasonably correct but are not guaranteed to be absolute and therefore are presented only as an approximation. Any error or apparent discrepancy in the data shown or omissions of data required for accurately accomplishing the stake out survey shall be referred immediately to the Engineer for interpretation or correction.

B. All survey work for construction control purposes shall be made by the Contractor at his expense. The Contractor shall provide a Licensed Surveyor as Chief of Party, competently qualified men, all necessary instruments, stakes, and other material to perform the work.

C. Contractor shall establish all baselines for the location of the principal component parts of the work together with a suitable number of bench marks and batter boards adjacent to the work. Based upon the information provided by the Contract Drawings, the Contractor shall develop and make all detail surveys necessary for construction, including slope stakes, batter boards, stakes for all working points, lines and elevations.

D. Contractor shall have the responsibility to carefully preserve the bench marks, reference points and stakes, and in the case of destruction thereof by the Contractor or resulting from his negligence, the Contractor shall be charged with the expense and damage resulting therefrom and shall be responsible for any mistakes that may be caused by the unnecessary loss or disturbance of such bench marks, reference points and stakes.

E. Existing or new control points, property markers and monuments that will be or are destroyed during the normal causes of construction shall be reestablished by the Contractor and all reference ties recorded therefore shall be furnished to the Engineer. All computations necessary to establish the exact position of the work shall be made and preserved by the Contractor.

F. The Engineer may check all or any portion of the work and the Contractor shall afford all necessary assistance to the Engineer in carrying out such checks. Any necessary corrections to the work shall be immediately made by the Contractor. Such checking by the Engineer shall not relieve the Contractor of any responsibilities for the accuracy or completeness of his work.

G. At completion of the work, the Contractor shall furnish Record Drawings indicating the final layout of all structures, roads, all structures, existing bench marks, etc. The Record Drawings shall indicate all critical elevations of piping, structures, finish grades, etc.

1.10 FIRE PROTECTION

A. Contractor shall take all necessary precautions to prevent fires at or adjacent to the work, buildings, etc., and shall provide adequate facilities for extinguishing fires which do occur. Burning, if permitted in Division 2, shall be limited to areas approved by the Engineer and Owner and properly controlled by the Contractor.

B. When fire or explosion hazards are created in the vicinity of the work as a result of the locations of fuel tanks, or similar hazardous utilities or devices, the Contractor shall immediately alert the local Fire Marshal, the Engineer, and the Owner of such tank or device. The Contractor shall exercise all safety precautions and shall comply with all instructions issued by the Fire Marshal and shall cooperate with the Owner of the tank or device to prevent the occurrence of fire or explosion.

1.11 CHEMICALS

A. All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, or reactant of other classification, must show approval of either the EPA or USDA. Use of all such chemicals and disposal of residues shall be in strict conformance with all applicable rules and regulations.

1.12 FIRST AID FACILITIES AND ACCIDENTS

A. First Aid Facilities

1. The Contractor shall provide at the site such equipment and facilities as are necessary to supply first aid to any of his personnel who may be injured in connection with the work.

B. Accidents

1. The Contractor shall promptly report, in writing, to the Engineer and Owner all accidents whatsoever out of, or in connection with, the performance of the work, whether on or adjacent to the site, which cause death, personal injury or property damage, giving full details and statements of witnesses.

2. If death, serious injuries, or serious damages are caused, the accident shall be reported immediately by telephone or messenger to both the Owner and the Engineer.

3. If any claim is made by anyone against the Contractor or a Subcontractor on account of any accidents, the Contractor shall promptly report the facts, in writing, to the Engineer and Owner, giving full details of the claim.

1.13 ULTIMATE DISPOSITION OF CLAIMS BY ONE CONTRACTOR ARISING FROM ALLEGED DAMAGE BY ANOTHER CONTRACTOR

A. During the progress of the work, other Contractors may be engaged in performing other work or may be awarded other Contracts for additional work on this project. In that event, the Contractor shall coordinate the work to be done hereunder with the work of such other Contractors and the Contractor shall fully cooperate with such other Contractors and carefully fit its own work to that provided under other Contracts as may be directed by the Engineer. The Contractor shall not commit or permit any act which will interfere with the performance of work by any other Contractor.

B. If the Engineer shall determine that the Contractor is failing to coordinate his work with the work of the other Contractors as the Engineer directed, then the Owner shall have the right to withhold any payments otherwise due hereunder until the Contractor completely complies with the Engineer's directions.

C. If the Contractor notifies the Engineer in writing that another Contractor is failing to coordinate his work with the work of this Contract as directed, the Engineer will promptly investigate the charge. If the Engineer finds it to be true, he will promptly issue such directions to the other Contractor with respect thereto as the situation may require. The Owner, the Engineer, nor any of their agents shall not, however, be liable for any damages suffered by the Contractor by reason of the other Contractor's failure to promptly comply with the directions so issued by the Engineer, or by reason of another Contractor's default in performance, it being understood that the Owner does not guarantee the responsibility or continued efficiency of any Contractor.

D. The Contractor shall indemnify and hold the Owner and the Engineer harmless from any and all claims of judgments for damages and from costs and expenses to which the Owner may be subjected or which it may suffer or incur by reason of the Contractor's failure to comply with the Engineer's directions promptly.

E. Should the Contractor sustain any damage through any act or omission of any other Contractor having a Contract with the Owner for the performance of work upon the site or of work which may be necessary to be performed for the proper execution of the work to be performed hereunder, or through any act or omission of a Subcontractor of such Contract, the Contractor shall have no claim against the Owner or the Engineer for such damage, but shall have a right to recover such damage from the other Contractor under the provision similar to the following provisions which have been or will be inserted in the Contracts with such other Contractors.

F. Should any other Contractor having or who shall hereafter have a Contract with the Owner for the performance of work upon the site sustain any damage through any act or omission of the Contractor hereunder or through any act or omission of any Subcontractor of the Contractor, the Contractor agrees to reimburse such other Contractor for all such damages and to defend at his own expense any suit based upon such claim and if any judgment or claims against the Owner shall be allowed, the Contractor shall pay or satisfy such judgment or claim and pay all costs and expenses in connection therewith and shall indemnify and hold the Owner harmless from all such claims.

G. The Owner's right to indemnification hereunder shall in no way be diminished, waived or discharged, by its recourse to assessment of liquidated damages as provided in the Contract, or by the exercise of any other remedy provided for by Contract Documents or by law.

1.14 BLASTING AND EXPLOSIVES

A. No blasting is allowed on this project.

1.15 LIMITS OF WORK AREA

A. The Contractor shall confine his construction operations within the Contract limits shown on the Drawings and/or property lines and/or fence lines. Contractor shall maintain a fenced perimeter around the construction site as shown on the Drawings. Storage of equipment and materials, or erection and use of sheds outside of the Contract limits, if such areas are the property of the Owner, shall be used only with the Owner's approval. Such storage or temporary structures, even within the Contract's limits, shall be confined to the Owner's property and shall not be placed on properties designated as easements or rights-of-way unless specifically permitted elsewhere in the Contract Documents.

B. Portions of the site are located in the 100-year flood plain. Contractor shall plan accordingly and shall ensure that all equipment is stored outside of the 100-year flood plain.

1.16 WEATHER CONDITIONS

A. No work shall be done when the weather is unsuitable. The Contractor shall take necessary precautions (in the event of impending storms) to protect all work, materials, or equipment from damage or deterioration due to floods, driving rain, or wind, and snow storms. The Owner reserves the right, through the opinion of the Engineer, to order that additional protection measures over and beyond those proposed by the Contractor, be taken to safeguard all components of the Project. The Contractor shall not claim any compensation for such precautionary measures so ordered, nor claim any compensation from the Owner for damage to the work from weather elements.

B. The mixing and placing of concrete or pavement courses, the laying of masonry, and installation of sewers and water mains shall be stopped during rainstorms, if ordered by the Engineer; and all freshly placed work shall be protected by canvas or other suitable covering in such manner as to prevent running water from coming in contact with it. Sufficient coverings shall be provided and kept ready at hand for this purpose. The limitations and requirements for mixing and placing concrete, or laying of masonry, in cold weather shall be as described elsewhere in these Specifications.

1.17 PERIODIC CLEANUP: BASIC SITE RESTORATION

A. During construction, the Contractor shall regularly remove from the site of the work all accumulated debris and surplus materials of any kind which result from his operations. Unused equipment and tools shall be stored at the Contractor's yard or base of operations for the Project.

B. When the work involves installation of sewers, drains, water mains, manholes, underground structures, or other disturbance of existing features in or across streets, rights-of-way, easements, or private property, the Contractor shall (as the work progresses) promptly backfill, compact, grade, and otherwise restore the disturbed area to the basic condition which will permit resumption of pedestrian or vehicular traffic and any other critical activity or functions consistent with the original use of the land. The requirements for temporary paving of streets, walks, and driveways are specified

elsewhere. Unsightly mounds of earth, large stones, boulders, and debris shall be removed so that the site presents a neat appearance.

C. The Contractor shall perform the cleanup work on a regular basis and as frequently as ordered by the Engineer. Basic site restoration in a particular area shall be accomplished immediately following the installation or completion of the required facilities in that area. Furthermore, such work shall also be accomplished, when ordered by the Engineer, if partially completed facilities must remain incomplete for some time period due to unforeseen circumstances.

D. Upon failure of the Contractor to perform periodic cleanup and basic restoration of the site to the Engineer's satisfaction, the Owner may, upon five (5) days prior written notice to the Contractor, without prejudice to any other rights or remedies of the Owner, cause such work for which the Contractor is responsible to be accomplished to the extent deemed necessary by the Engineer, and all costs resulting therefrom shall be charged to the Contractor and deducted from the amounts of money that may be due him.

1.18 USE OF FACILITIES BEFORE COMPLETION

A. The Owner reserves the right to enter and use any portion of the constructed facilities before final completion of the whole work to be done under this Contract. However, only those portions of the facilities which have been completed to the Engineer's satisfaction, as evidenced by his issuing a Certificate of Substantial Completion covering that part of the work, shall be placed in service.

B. It shall be the Owner's responsibility to prevent premature connections to or use of any portion of the installed facilities by private or public parties, persons or groups of persons, before the Engineer issues his Certificate of Substantial Completion covering that portion of the work to be placed in service.

C. Consistent with the approved progress schedule, the Contractor shall cooperate with the Owner, his agents, and the Engineer to accelerate completion of those facilities, or portions thereof, which have been designated for early use by the Owner.

1.19 CONSTRUCTION VIDEO

A. The Contractor shall video the entire project site including all concrete and asphalt pavements, curb and gutter, fencing to remain, structures to be demolished, and existing structures that are to be modified. The original video shall be turned over to the Engineer prior to beginning construction activities. The video shall be recorded on a DVD. The video shall clearly identify existing site and structural conditions prior to construction.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

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# SECTION 01025

# MEASUREMENT AND PAYMENT

## PART 1 – GENERAL

### 1.01 THE REQUIREMENT

A. The following subsections describe the measurement and payment for Work to be done under the items listed in the Bid Schedule of the Bid Form. Each unit or lump sum price stated in the Bid Schedule shall constitute full compensation for each item of Work completed. The Contractor shall provide all labor, materials, tools, equipment, and services required to complete the Work, as specified and shown in the Contract Documents.

B. Payment for the various items in the Bid Schedule, as further specified herein, shall include all compensation to be received by the Contractor for furnishing all tools, equipment, supplies, and manufactured articles, and for all labor, operations, taxes, materials, commissions, transportation and handling, bonds, permit fees, insurance, overhead and profit, and incidentals appurtenant to the items of Work being described, as necessary to complete the various items of the Work all in accordance with the requirements of the Contract Documents, including all appurtenances thereto, and including all costs of compliance with the regulations of public agencies having jurisdiction, including Safety and Health Requirements of the Occupational Safety and Health Administration of the U.S. Department of Labor (OSHA). Such compensation shall also include payment for any loss or damages arising directly or indirectly from the Work.

C. The Contractor's attention is called to the fact that the quotations for the various items of Work are intended to establish a total price for completing the Work in its entirety. Should the Contractor feel that the cost for any item of Work has not been established by the Bid Items of the Bid Schedule or this Section, he shall include the cost for that Work in some other applicable Bid Item, so that his proposal for the Project does reflect his total price for completing the Work in its entirety.

### 1.02 PAYMENT ITEMS

A. The Contractor shall submit a Preliminary Progress Schedule for review as specified in Section 01300, Submittals, and Section 01310, Progress Schedules. The Preliminary Progress Schedule shall include a Detailed Cost Breakdown and Schedule of Values for the Work for the purpose of making progress payments during the construction period. The Contractor shall not submit a Progress Payment Request until the Preliminary Progress Schedule has been approved.

### 1.03 ITEMS OF THE BID FORM

A. Bid Item No. 1.1 – Generator Five-year Maintenance Contract: Bid Item No. 1.1 includes all preventative maintenance services, materials, labor, and repairs for the two engine-generator sets for a period of Five (5) years. Measurement for Bid Item No. 1.1 shall be by lump sum.

B. Bid Item No. 1.2 – Pump Station Upgrade: Bid Item No. 1.2 includes furnishing all materials, equipment, and labor required to complete the Riverside Road Pump Station Upgrade and make it ready for occupation/operation, and includes, but is not limited to: building systems, concrete, masonry, structural steel, metal fabrications and systems, equipment, plumbing, HVAC, earthwork, site work, traffic control, stormwater conveyance, utility relocation, paving, fencing, piping, fittings, valves, and all other work necessary for a complete and fully functioning system, as specified and shown on the Contract Documents whether specifically mentioned or implied, except for Work specifically included for payment under any other bid item. Measurement for Bid Item No. 1.2 shall be by lump sum.

C. Bid Item No. 2.1 – Silt Fencing: Bid Item No. 2.1 includes all materials, equipment, and labor required to furnish, install, maintain, and remove silt fencing. Measurement for Bid Item No. 2.1 shall be per linear foot length of silt fencing. Both Type "A" and "C" fencing shall be paid for at the same unit price bid per linear foot. Double rows of fencing shall have double the length of a single strand of fencing. Payment shall be made according to the unit price bid on the Bid Form, which shall constitute full payment to provide silt fencing as specified and shown in the Contract Documents or as directed by the Engineer prior to or during construction. No additional payment shall be made for reinstalling fencing.

D. Bid Item No. 2.2 – Temporary Mulching: Bid Item No. 2.2 includes all materials, equipment, and labor required to furnish, install, and maintain temporary mulching. Measurement for Bid Item No. 2.2 shall be per acre of ground mulched. Payment shall be made according to the unit price bid on the Bid Form, which shall constitute full payment to provide temporary mulching as specified and shown in the Contract Documents or as directed by the Engineer prior to or during construction.

E. Bid Item No. 2.3 – Temporary Grassing: Bid Item No. 2.3 includes all materials, equipment, and labor required to furnish, install, and maintain temporary grassing. Measurement for Bid Item No. 2.3 shall be per acre of ground grassed. Payment shall be made according to the unit price bid on the Bid Form, which shall constitute full payment to provide temporary grassing as specified and shown in the Contract Documents or as directed by the Engineer prior to or during construction.

F. Bid Item No. 2.4 – Permanent Grassing: Bid Item No. 2.4 includes all materials, equipment, and labor required to furnish, install, and maintain permanent grassing. Measurement for Bid Item No. 2.4 shall be per acre of ground grassed. Payment shall be made according to the unit price bid on the Bid Form, which shall constitute full payment to provide permanent grassing after final grading as specified and shown in the Contract Documents or as directed by the Engineer prior to or during construction.

G. Bid Item No. 2.5 – Stone Check Dam: Bid Item No. 2.5 includes all materials, equipment, and labor required to furnish, install, maintain, and remove temporary stone check dams. Measurement for Bid Item No. 2.5 shall be per each stone check dam installed. Payment shall be made according to the unit price bid on the Bid Form, which shall constitute full payment to provide stone check dams as specified and shown in the Contract Documents or as directed by the Engineer prior to or during construction.

H. Bid Item No. 2.6 – Wet Well Cleaning: Bid Item No. 2.6 includes all materials, equipment, and labor required to remove accumulated grit and scum from the wet wells. Measurement for Bid Item No. 2.6 shall be per each yard of debris removed. Payment shall be made according to the unit price bid on the Bid Form, which shall constitute full payment to

provide wet well cleaning as specified and shown in the Contract Documents or as directed by the Engineer prior to or during construction.

I. Bid Item 3.1 - Testing Allowance: Bid Item 3.1 is an Owner-controlled allowance to pay for miscellaneous construction materials testing services.

J. Bid Item 3.2 – Elevator Repair Allowance: Bid Item 3.2 is an Owner-controlled allowance to pay for repairs to the elevators as defined in Specification Section 14200.

K. Bid Item 3.3 – Un-foreseen Utility Conflict Allowance: Bid Item 3.3 is an Owner-controlled allowance to pay for the replacement of any utilities that are encountered during the course of the work that are not shown on the Drawings. This Bid Item may also be used to pay for utilities that are shown, but are actually located in areas that conflict with the proposed Work.

L. Bid Item 3.4 – Owner Directed Work Allowance: Bid Item 3.4 is an Owner-controlled allowance to pay for additional work that is not shown on the Drawings or defined by the Technical Specification Sections, but is determined, during the course of construction, by the Owner/Engineer, to be necessary for Project Completion.

M. Allowance Bid Items (Bid Items 3.1, 3.2, 3.3, & 3.4): The items of work listed as an Allowance Bid Item may, or may not, be completed as part of this project. These Bid Items have been included to facilitate payment for changes and/or alterations that may be required to complete the work. The actual work, as defined by the Contract Documents, Technical Specifications, and the project Drawings, are described in other bid items.

The value of the Allowance Bid Items shall be included in the Base Bid Total and shall also used for bonding purposes.

Inclusion of the Allowance Bid Items in the Bid Form shall not be construed as an obligation on the part of the Owner to compensate the Contractor for these items unless they are actually elected by the OWNER to be incorporated into the Work. An appropriate Change Order will be issued for work covered by Allowance Bid Items, as recommended by the Engineer, to reflect actual amounts due the Contractor for Work actually completed and the Contract Amount will be correspondingly adjusted. At the conclusion of the Project, a duly executed Change Order will deduct the value of any remaining Allowance Bid Items from the Contract Amount for items that have not been incorporated into the Work.

1.04 SUBMITTALS

A. Submit applications for payment to Engineer at the times stipulated in the Agreement.

B. Number: Five copies of each application.

C. When the Engineer finds the application properly completed and correct, he shall transmit a Certificate of Payment to Owner, with a copy to Contractor.

1.05 APPLICATIONS FOR PAYMENT

A. Submit applications for payment to Engineer in accordance with the schedule of values established by Section 01310, Progress Schedules.

B. Submit applications typed or electronically using form issued by Owner, with itemized data typed or electronically duplicated on 8 1/2-inch by 11-inch white paper.

C. Application Form:

1. Fill in required information, including that for Change Orders executed prior to the date of submittal application.

2. Fill in summary of dollar values to agree with the respective totals indicated on the continuation sheets.

3. Execute certification with the signature of a responsible officer of the Contractor's firm on all certificates.

4. Submit five signed originals.

D. Continuation Sheets:

1. Fill in total list of all scheduled component items of Work, with item number and the scheduled dollar value for each item.

2. Fill in the dollar value in each column for each scheduled line item when work has been performed or products stored.

3. List each Change Order executed prior to the date of submission at the end of the continuation sheets.

a. List by Change Order number and description, as for an original component item of work.

E. When Owner or Engineer requires substantiating data, Contractor shall submit suitable information with a cover letter identifying:

1. Project.

2. Application number and date.

3. Detailed list of enclosures.

4. For stored products:

a. Item number and identification as shown on application.

b. Description of specific material.

F. Submit one copy of data and cover letter for each copy of application.

G. Fixed Asset Report

1. To be included with each month's pay application is a Fixed Asset Report, which is used to officially document the installed inventory of equipment, certain material items, the structure itself. The report is to be developed in a MS Excel spreadsheet format and will include components of each facility constructed, added, expanded, etc., on the plant. As work is completed the report will expand, being a cumulative summary of the installed plant.

2. The format and content of the report is as follow:

   a. The report is to be sorted by Area and Structure number in ascending order.

   b. Column 1- Labeled "Location"- Identifies the location of the inventory included for that area of the facility. For this project, Location shall be designated as "Riverside Road Pump Station".

   c. Column 2- Labeled "Description"- Identifies the specific item being documented. This is to include the structure/facility/building itself and all equipment items within the structure/facility/building or area (e.g. heating and ventilation equipment, backwash air scour blowers, etc.) and all tagged/numbered/discretely identified items or components (e.g. valves, pumps, power panels, etc.).

   d. Column 3- Labeled "Manufacturer"- Identifies the manufacturer of the specific item.

   e. Column 4- Labeled "Model No."- Identifies the model number of the specific item.

   f. Column 5- Labeled "Serial No."- Identifies the serial number of the specific item.

   g. Column 6- Labeled "Cost"- Identifies the installed cost of the specific item. The cost of the item is to include all direct, indirect, and overhead cost associated with delivering the constructed product.

3. At the conclusion of the project, the cumulative total of cost reported under the Fixed Asset Report will be the total contract value of the work.

4. The report is to be submitted in both printed and electronic format. Electronic format shall be provided on CD.

H. Sales Tax Report

1. To be included with each month's pay application is a Sales Tax Report, which is used to officially document the Georgia Sales Tax expended in the procurement of treatment equipment. All equipment purchased for installation within the plant will be documented within this report and will be accounted for by item cost and sales tax paid to the State of Georgia. The report is to be developed in a MS Excel spreadsheet format and will include each equipment item purchased, into which facility it is installed, the cost of the individual equipment item/component/system, and the corresponding tax paid on the individual equipment item/component/system.

As work is completed or equipment received, the report will be expanded, being a cumulative summary of the treatment equipment installed within the plant.

2. The format and content of the report is as follow:

   a. The report is to be sorted by Area and Structure number in ascending order.

   b. Column 1- Labeled “Location”- Identifies the location of the inventory included for that area of the facility. For this project, Location shall be designated as “Dewatering Building”.

   c. Column 2- Labeled “Description”- Identifies the specific item being documented. This is to include the structure/facility/building itself and all equipment items within the structure/facility/building or area (e.g. heating and ventilation equipment, backwash air scour blowers, etc.), all system components (e.g. transformers, VFD, motor control centers, etc.) and all tagged/numbered/discretely identified items or components (e.g. valves, pumps, power panels, etc.).

   d. Column 2- Labeled “Manufacturer”- Identifies the manufacturer of the specific item.

   e. Column 3- Labeled “Date of Sale”- Identifies the date the invoice for the particular equipment item/component/system was paid.

   f. Column 5- Labeled “Item Cost”- Identifies the actual cost of the specific item prior to the application of sales tax.

   g. Column 6- Labeled “Sales Tax Paid”- Identifies the actual Georgia Sales Tax paid for the specific item.

3. Each Structure and Area is to have a subtotal line wherein the individual items are summed to develop a Structure/Area value, and the Area subtotals are summed to establish a total Georgia Sales Tax value paid for the plant.

4. The monthly reports shall be accompanied by certified copies of invoices showing the items costs and taxes paid and a copy of the checks used for payment.

5. The report is to be submitted in both printed and electronic format. Electronic format shall be provided on CD.

## 1.06 PAYMENTS

A. Failure to submit schedule and plans:

   1. Progress payments will be withheld if updated schedules are not submitted in accordance with the contract documents.

   2. Progress payments will be withheld if proof of Record Document monthly updates is not submitted.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

- END OF SECTION-

# SECTION 01040

# COORDINATION

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. The Contractor shall allow the Owner or his agents, and other project Contractors or their agents, to enter upon the work for the purpose of constructing, operating, maintaining, removing, repairing, altering, or replacing such pipes, sewers, conduits, manholes, wires, poles, or other structures and appliances which may be required to be installed at or in the work. The Contractor shall cooperate with all aforesaid parties and shall allow reasonable provisions for the prosecution of any other work by the Owner, or others, to be done in connection with his work, or in connection with normal use of the facilities.

B. Each Contractor shall cooperate fully with the Owner, the Engineer, and all other Contractors employed on the work, to effect proper coordination and progress to complete the project on schedule and in proper sequence. Insofar as possible, decisions of all kinds required from the Engineer shall be anticipated by the Contractor to provide ample time for inspection, or the preparation of instructions.

C. Each Contractor shall assume full responsibility for the correlation of all parts of his work with that of other Contractors. Each Contractor's superintendent shall correlate all work with other Contractors in the laying out of work. Each Contractor shall lay out his own work in accordance with the Drawings, Specifications, and instructions of latest issue and with due regard to the work of other Contractors.

D. Periodic coordinating conferences shall be held per Section 01200, Project Meetings, of these Contract Documents.

## PART 2 -- PRODUCTS

(NOT USED)

## PART 3 -- EXECUTION

(NOT USED)

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SECTION 01070

ABBREVIATIONS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The following is a partial list of typical abbreviations which may be used in the Specifications, and the organizations to which they refer:

| | | |
|---|---|---|
| AASHTO | - | American Association of State Highway and Transportation Officials |
| ACI | - | American Concrete Institute |
| ACIFS | - | American Cast Iron Flange Standards |
| AFBMA | - | Anti-Friction Bearing Manufacturer's Association |
| AGA | - | American Gas Association |
| AGMA | - | American Gear Manufacturers Association |
| AIA | - | American Institute of Architects |
| AISC | - | American Institute of Steel Construction |
| AISI | - | American Iron and Steel Institute |
| ANSI | - | American National Standard Institute |
| API | - | American Petroleum Institute |
| ASCE | - | American Society of Civil Engineers |
| ASHRAE | - | American Society of Heating, Refrigeration, and Air Conditioning Engineers |
| ASME | - | American Society of Mechanical Engineers |
| ASTM | - | American Society for Testing and Materials |
| AWS | - | American Welding Society |
| AWWA- | American Water Works Association | |
| CEMA | - | Conveyor Equipment Manufacturer's Association |
| CRSI | - | Concrete Reinforcing Steel Institute |
| DIPRA | - | Ductile Iron Pipe Research Association |
| Fed Spec | - | Federal Specifications |
| GDOT | - | Georgia Department of Transportation |
| IEEE | - | Institute of Electrical and Electronic Engineers |
| IPCEA | - | Insulated Power Cable Engineers Association |
| ISO | - | Insurance Services Offices |
| NBS | - | National Bureau of Standards |
| NEC | - | National Electric Code |
| NEMA | - | National Electrical Manufacturers Association |
| OSHA | - | Occupational Safety and Health Act |
| PCI | - | Precast Concrete Institute |
| UL | - | Underwriters Laboratories, Inc. |
| USGS | - | United States Geological Survey |

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

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# SECTION 01090

# REFERENCE STANDARDS

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Wherever reference is made to any published standards, codes, or standard specifications, it shall mean the latest standard code, specification, or tentative specification of the technical society, organization, or body referred to, which is in effect at the date of invitation for Bids.

B. All materials, products, and procedures used or incorporated in the work shall be in strict conformance with applicable codes, regulations, specifications, and standards.

C. A partial listing of codes, regulations, specifications, and standards includes the following:

Air Conditioning and Refrigeration Institute (ARI)

Air Diffusion Council (ADC)

Air Moving and Conditioning Association (AMCA)

The Aluminum Association (AA)

American Architectural Manufacturers Association (AAMA)

American Concrete Institute (ACI)

American Gear Manufacturers Association (AGMA)

American Hot Dip Galvanizers Association (AHDGA)

American Institute of Steel Construction, Inc. (AISC)

American Iron and Steel Institute (AISI)

American National Standards Institute (ANSI)

American Society of Civil Engineers (ASCE)

American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE)

American Society of Mechanical Engineers (ASME)

American Society for Testing and Materials (ASTM)

American Standards Association (ASA)

American Water Works Association (AWWA)

American Welding Society (AWS)

American Wood-Preserver's Association (AWPA)

Anti-Friction Bearing Manufacturers Association (AFBMA)

Building Officials and Code Administrators (BOCA)

Consumer Product Safety Commission (CPSC)

Factory Mutual (FM)

Federal Specifications

Instrument Society of America (ISA)

Institute of Electrical and Electronics Engineers (IEEE)

National and Local Fire Codes

Lightning Protection Institute (LPI)

National Electrical Code (NEC)

National Electrical Manufacturer's Association (NEMA)

National Electrical Safety Code (NESC)

National Electrical Testing Association (NETA)

National Fire Protection Association (NFiPA)

Regulations and Standards of the Occupational Safety and Health Act (OSHA)

Southern Building Code Congress International, Inc. (SBCCI)

Sheet Metal & Air Conditioning Contractors National Association (SMACCNA)

Standard Building Code

Standard Mechanical Code

Standard Plumbing Code

Uniform Building Code (UBC)

Underwriters Laboratories Inc. (UL)

D. Contractor shall, when required, furnish evidence satisfactory to the Engineer that materials and methods are in accordance with such standards where so specified.

E. In the event any questions arise as to the application of these standards or codes, copies shall be supplied on-site by the Contractor.

PART 2 -- PRODUCTS

(NOT USED)

PART 3 -- EXECUTION

(NOT USED)

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# SECTION 01200

# PROJECT MEETINGS

## PART 1 -- GENERAL

### 1.01 PRE-BID MEETING

A. A pre-bid meeting will be held at the time and place to be designated in the Instructions to Bidders.

B. The Engineer will be available to discuss the project and answer pertinent questions. No oral interpretation will be made as to the meaning of the Documents. Interpretation, if deemed necessary by the Engineer, will be in the form of an Addendum to the Contract Documents.

### 1.02 PRECONSTRUCTION MEETING

A. A preconstruction meeting will be held after Award of Contract, but prior to starting work at the site. Preconstruction meeting shall include a scheduled visit to the project site by all attendees.

B. Attendance:

1. Owner
2. Engineer
3. Contractor
4. Major subcontractors
5. Safety representative
6. Representatives of governmental or other regulatory agencies.

C. Minimum Agenda:

1. Tentative construction schedule
2. Critical work sequencing
3. Designation of responsible personnel
4. Processing of Field Decisions and Change Orders
5. Adequacy of distribution of Contract Documents
6. Submittal of Shop Drawings and samples

7. Procedures for maintaining record documents

8. Use of site and Owner's requirements

9. Major equipment deliveries and priorities

10. Safety and first aid procedures

11. Security procedures

12. Housekeeping procedures

13. Processing of Partial Payment Requests

14. General regard for community relations

1.03 PROGRESS MEETING

A. Progress meetings will be held monthly at a location chosen by the Owner during the performance of the work of this Contract. Additional meetings may be called as progress of work dictates.

B. Engineer will preside at meetings and record minutes of proceedings and decisions. Engineer will distribute copies of minutes to participants.

C. Attendance:

1. Engineer

2. Contractor

3. Subcontractors, only with Engineer’s approval or request, as pertinent to the agenda

D. Minimum Agenda:

1. Review and approve minutes of previous meetings.

2. Review progress of Work since last meeting.

3. Review proposed 30-60 day construction schedule.

4. Note and identify problems which impede planned progress.

5. Develop corrective measures and procedures to regain planned schedule.

6. Revise construction schedule as indicated and plan progress during next work period.

7. Maintaining of quality and work standards.

8. Complete other current business.

9. Schedule next progress meeting.

PART 2 -- PRODUCTS

(NOT USED)

PART 3 -- EXECUTION

(NOT USED)

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# SECTION 01300

# SUBMITTALS

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Progress Schedule

1. Within thirty (30) days after issuance of the Notice to Proceed, the Contractor shall prepare and submit five (5) copies of his proposed progress schedule to the Engineer for review and approval in accordance with Section 01310, Progress Schedules.

2. If so required, the schedule shall be revised until it is approved by the Engineer.

3. Schedule shall be updated monthly, depicting progress to the last day of the month and five (5) copies submitted to the Engineer not later than the fifth day of the month with the application for progress payment.

4. Schedule shall be prepared in the form of a horizontal bar chart showing in detail the proposed sequence of the work and identifying construction activities for each structure and for each portion of work.

5. Schedule shall be time scaled, identifying the first day of each week, with the estimated date starting and completion of each stage of the work in order to complete the Project within the Contract time.

6. Updated schedule shall show all changes since the previous submittal.

7. All revisions to the schedule must have the prior approval of the Engineer.

B. Equipment and Material Orders Schedule

1. Contractor shall prepare and submit five (5) copies of his schedule of principal items of equipment and materials to be purchased to the Engineer for review and approval.

2. If so required, the schedule shall be revised until it is approved by the Engineer.

3. Schedule shall be updated monthly and five (5) copies submitted to the Engineer not later than the fifth day of every month with the application for progress payment.

4. The updated schedule shall be based on the Progress Schedule developed under the requirements of Article 1.01, Paragraph A of this Section and Section 01310, Progress Schedules.

5. Schedule shall be in tabular form with appropriate spaces to insert the following information for principal items of equipment and materials:

a. Dates on which Shop Drawings are requested and received from the manufacturer.

b. Dates on which certification is received from the manufacturer and transmitted to the Engineer.

c. Dates on which Shop Drawings are submitted to the Engineer and returned by the Engineer for revision.

d. Dates on which Shop Drawings are revised by manufacturer and resubmitted to the Engineer.

e. Date on which Shop Drawings are returned by Engineer annotated either "Furnish as Submitted" or "Furnish as Corrected".

f. Date on which accepted Shop Drawings are transmitted to manufacturer.

g. Date of manufacturer's scheduled delivery.

h. Date on which delivery is actually made.

C. Working Drawings

1. Within thirty (30) days after the Notice to Proceed, each prime Contractor shall prepare and submit five (5) copies of his preliminary schedule of Working Drawing submittals to the Engineer for review and approval. If so required, the schedule shall be revised until it is approved by the Engineer.

2. Working Drawings include, but are not limited to, Shop Drawings, layout drawings in plan and elevation, installation drawings, elementary wiring diagrams, interconnecting wiring diagrams, manufacturer's data, etc. Contractor shall be responsible for securing all of the information, details, dimensions, Drawings, etc., necessary to prepare the Working Drawings required and necessary under this Contract and to fulfill all other requirements of his Contract. Contractor shall secure such information, details, Drawings, etc., from all possible sources including the Drawings, Working Drawings prepared by subcontractors, Engineers, suppliers, etc.

3. Working Drawings shall accurately and clearly present the following:

a. All working and installation dimensions.

b. Arrangement and sectional views.

c. Units of equipment in the proposed positions for installation, details of required attachments and connections, and dimensioned locations between units and in relation to the structures.

d. Necessary details and information for making connections between the various trades including, but not limited to, power supplies and interconnecting wiring between units, accessories, appurtenances, etc.

4. In the event that the Engineer is required to provide additional engineering services as a result of a substitution of materials or equipment by the Contractor, the additional services will be provided in accordance with Section 01010, Summary of Work, and will be covered in supplementary or revised Drawings which will be issued to the Contractor. All changes indicated that are necessary to accommodate the equipment and appurtenances shall be incorporated into the Working Drawings submitted to the Engineer.

5. Working Drawings specifically prepared for this Project shall be on mylar or other approved reproducible material sheets of the same size as the Drawings. Working Drawings shall conform to recognized drafting standards and be neat, legible, and drawn to a large enough scale to show in detail the required information.

6. The Drawings are used for engineering and general arrangement purposes only and are not to be used for Working Drawings.

7. Shop Drawings

    a. Contractor shall submit for review by the Engineer and Owner Shop Drawings for all fabricated work and for all manufactured items required to be furnished by the Contract Documents.

    b. Structural and all other layout Drawings prepared specifically for the Project shall have a plan scale of not less than 1/4-inch = 1 foot.

    c. Where manufacturer's publications in the form of catalogs, brochures, illustrations or other data sheets are submitted in lieu of prepared Shop Drawings, such submittals shall specifically indicate the item for which approval is requested. Identification of items shall be made in ink, and submittals showing only general information are not acceptable.

8. Layout and Installation Drawings

    a. Contractor shall prepare and submit for review by the Engineer layout and installation drawings for all pipes, valves, fittings, sewers, drains, heating and ventilation ducts, all electrical, heating, ventilating and other conduits, plumbing lines, electrical cable trays, lighting fixture layouts, and circuiting, instrumentation, interconnection wiring diagrams, communications, power supply, alarm circuits, etc., under this Contract. The final dimensions, elevation, location, etc., of pipe, valves, fittings, sewers, ducts, conduits, electrical cable trays, equipment, etc., may depend upon the dimensions of equipment and valves to be furnished by the Contractor.

    b. Layout and installation drawings are required for both interior and exterior piping, valves, fittings, sewers, drains, heating and ventilation ducts, conduits, plumbing lines, electrical cable trays, etc.

    c. Layout and installation Drawings shall show connections to structures, equipment, sleeves, valves, fittings, etc.

d. Drawings shall show the location and type of all supports, hangers, foundations, etc., and the required clearances to operate valves, equipment, etc.

e. The Drawings for pipes, ducts, conduits, etc., shall show all 3-inch and larger electrical conduits and pressure piping, electrical cable trays, heating and ventilation ducts or pipes, structure, manholes or any other feature within four (4) feet (measured as the clear dimension) from the pipe duct, conduit, etc., for which the profile is drawn.

9. Contractor Responsibilities

a. All submittals from subcontractors, manufacturers or suppliers shall be sent directly to the Contractor for checking. Contractor shall thoroughly check all Drawings for accuracy and conformance to the intent of the Contract Documents. Drawings found to be inaccurate or otherwise in error shall be returned to the subcontractors, manufacturers, or suppliers by the Contractor for correction before submitting them to the Engineer.

b. All submittals shall be bound, dated, properly labeled and consecutively numbered. Information on the label shall indicate Specification Section, Drawing number, subcontractor's, manufacturer's or supplier's name and the name or type of item the submittal covers. Each part of a submittal shall be marked and tabulated.

c. Working Drawings shall be submitted as a single complete package including all associated drawings relating to a complete assembly of the various parts necessary for a complete unit or system.

d. Shop Drawings shall be submitted as a single complete package for any operating system and shall include all items of equipment and any mechanical units involved or necessary for the functioning of such system. Where applicable, the submittal shall include elementary wiring diagrams showing circuit functioning and necessary interconnection wiring diagrams for construction.

e. ALL SUBMITTALS SHALL BE THOROUGHLY CHECKED BY THE CONTRACTOR FOR ACCURACY AND CONFORMANCE TO THE INTENT OF THE CONTRACT DOCUMENTS BEFORE BEING SUBMITTED TO THE ENGINEER AND/OR OWNER AND SHALL BEAR THE CONTRACTOR'S STAMP OF APPROVAL CERTIFYING THAT THEY HAVE BEEN SO CHECKED. SUBMITTALS WITHOUT THE CONTRACTOR'S STAMP OF APPROVAL WILL NOT BE REVIEWED BY THE ENGINEER AND/OR OWNER AND WILL BE RETURNED TO THE CONTRACTOR.

f. If the submittals contain any departures from the Contract Documents, specific mention thereof shall be made in the Contractor's letter of transmittal. Otherwise, the review of such submittals shall not constitute approval of the departure.

g. No materials or equipment shall be ordered, fabricated or shipped or any work performed until the Engineer returns to the Contractor the submittals,

herein required, annotated either "Furnish as Submitted" or "Furnish as Corrected".

h. Where errors, deviations, and/or omissions are discovered at a later date in any of the submittals, the Engineer's prior review of the submittals does not relieve the Contractor of the responsibility for correcting all errors, deviations, and/or omissions.

10. Procedure for Review

a. Submittals shall be transmitted in sufficient time to allow the Engineer at least thirty (30) working days for review and processing.

b. Contractor shall transmit one (1) reproducible transparency and two (2) prints of each submittal to the Engineer for review for all Drawings greater than 11 inches by 17 inches in size, as well as seven (7) copies of all other material.

c. Submittal shall be accompanied by a letter of transmittal, in duplicate, containing date, project title, Contractor's name, number and titles of submittals, notification of departures and any other pertinent data to facilitate review.

d. Submittals will be annotated by the Engineer in one of the following ways:

"Furnish as Submitted" - no exceptions are taken

"Furnish as Corrected" - minor corrections are noted and shall be made.

"Revise and Resubmit" - major corrections are noted and a resubmittal is required.

"Rejected" - Based on the information submitted, the submission is not in conformance with the Contract Documents. The deviations from the Contract Documents are too numerous to list and a completely revised submission of the proposed equipment or a submission of other equipment is required.

e. If a submittal is satisfactory to the Engineer, the Engineer will annotate the submittal "Furnish as Submitted" or "Furnish as Corrected", and transmit three (3) copies to the Contractor. If reproducible transparencies are submitted, the Engineer will retain the copies and return the reproducible transparencies to the Contractor.

f. If a resubmittal is required, the Engineer will annotate the submittal "Revise and Resubmit" and transmit three (3) copies to the Contractor for appropriate action. If reproducible transparencies are submitted, the Engineer will retain the copies and return the reproducible transparencies to the Contractor.

g. Contractor shall revise and resubmit submittals as required by the Engineer until submittals are acceptable to the Engineer. It is understood by the

Contractor that Owner may charge the Contractor the Engineer's charges for review in the event a submittal is not approved (either "Furnish as Submitted" or "Furnish as Corrected") by the third submittal for a system or piece of equipment. These charges shall be for all costs associated with engineering review, meetings with the Contractor or manufacturer, etc., commencing with the fourth submittal of a system or type of equipment submitted for a particular Specification Section.

h. Acceptance of a Working Drawing by the Engineer will constitute acceptance of the subject matter for which the Drawing was submitted and not for any other structure, material, equipment or appurtenances indicated or shown.

11. Engineer's Review

a. Engineer's review of the Contractor's submittals shall in no way relieve the Contractor of any of his responsibilities under the Contract. An acceptance of a submittal shall be interpreted to mean that the Engineer has no specific objections to the submitted material, subject to conformance with the Contract Drawings and Specifications.

b. Engineer's review will be confined to general arrangement and compliance with the Contract Drawings and Specifications only, and will not be for the purpose of checking dimensions, weights, clearances, fittings, tolerances, interferences, coordination of trades, etc.

12. Owner's Review

a. Owner shall identify submittals that the Owner intends to review during the submittal review process.

b. Owner's review of the Contractor's submittals shall in no way relieve the Contractor of any of his responsibilities under the Contract. Review comments made by the Owner shall not be seen or interpreted as a departure from the Contract Documents.

13. Record Working Drawings

a. Prior to final payment, the Contractor shall furnish the Engineer two (2) complete sets of all accepted Working Drawings, including Shop Drawings, for equipment, piping, electrical work, heating system, ventilating system, air conditioning system, instrumentation system, plumbing system, structural, interconnection wiring diagrams, etc.

b. Manufacturer's publications, submitted in lieu of prepared Shop Drawings, will not be required in reproducible form. However, four (4) sets of such material shall be furnished by the Contractor to the Engineer.

c. Working Drawings furnished shall be corrected to include any departures from previously accepted Drawings.

D. Operation and Maintenance Manuals

1. Two (2) preliminary copies of Operation and Maintenance Manuals, prepared specifically for this Project, shall be furnished for each item of equipment furnished under this Contract in accordance with Section 01730, Operation and Maintenance Manuals. The preliminary manuals shall be provided to the Engineer not less than 60 days prior to the start-up of the respective equipment.

2. The preliminary manuals shall be reviewed by the Engineer prior to the Contractor submitting final copies for distribution to the Owner. Following review of the preliminary copies of the Operation and Maintenance Manuals, one (1) copy will be returned to the Contractor with required revisions noted, or the acceptance of the Engineer noted.

3. Following the Engineer's review of the preliminary manuals, the Contractor shall submit five (5) copies of the final Operation and Maintenance Manuals to the Engineer. The manuals shall reflect the required revisions noted during the Engineer's review of the preliminary documents. Failure of the final manuals to reflect the required revisions noted by the Engineer during a review of the Preliminary documents will result in the manuals being returned to the Contractor. Acceptable final Operation and Maintenance Manuals shall be provided not less than two weeks prior to equipment start-up.

E. Certified Shop Test Reports

1. Each piece of equipment for which pressure, head, capacity, rating, efficiency, performance, function or special requirements are specified or implied shall be tested in the shop of the manufacturer in a manner which shall conclusively prove that its characteristics comply fully with the requirements of the Contract Documents and applicable test codes and standards. Contractor shall keep the Engineer advised of the scheduling of shop tests so that the Engineer may arrange for the witnessing or inspection at the proper time and place.

2. The Contractor shall secure from the manufacturers seven (7) copies of the actual test data, the interpreted results and a complete description of the testing facilities and testing setup, all accompanied by a certificate of authenticity sworn to by a responsible official of the manufacturing company and notarized. These reports shall be forwarded to the Engineer for review.

3. Both during the field performance test for and during the start-up of each piece of equipment, Contractor shall provide two (2) copies of the certified shop test reports (including test curves if applicable) for the equipment being tested at that time to the Owner.

4. In the event any equipment fails to meet the test requirements, the manufacturer shall make all necessary changes, adjustments or replacements and the tests shall be repeated, at no additional cost to the Owner or Engineer, until the equipment test requirements are acceptable to the Engineer.

5. No equipment shall be shipped to the Project until the Engineer notifies the Contractor, in writing, that the shop test reports are acceptable.

F. Samples

1. Contractor shall furnish for review all samples as required by the Contract Documents or requested by the Engineer.

2. Samples shall be of sufficient size or quantity to clearly illustrate the quality, type, range of color, finish or texture and shall be properly labeled to show the nature of the material, trade name of manufacturer and location of the work where the material represented by the sample will be used.

3. Samples shall be checked by the Contractor for conformance to the Contract Documents before being submitted to the Engineer and shall bear the Contractor's stamp of approval certifying that they have been so checked. Transportation charges on samples submitted to the Engineer shall be prepaid by the Contractor.

4. Engineer's review will be for compliance with the Contract Documents and his comments will be transmitted to the Contractor with reasonable promptness.

5. Accepted samples will establish the standards by which the completed work will be judged.

G. Construction Photographs

1. The General Contractor shall engage a competent photographer to take photographs at the locations and at such stages of the construction as directed by the Engineer. Camera used for construction photographs shall be digital, and photographs taken shall have a minimum resolution of 5.0 megapixels.

2. Provide the equivalent of 36 different exposures per month for the duration of the Contract time. When directed by the Engineer, frequency of photographs may be increased to weekly sessions provided that the equivalent number of exposures is not exceeded. Engineer may waive requirements for photographs during inactive construction periods in favor of increased photographs during active construction sequences.

3. Submittal Requirements

   a. A digital file in .jpg format for each photograph required by Section 1.01(G) shall be submitted to the Engineer and Owner within thirty (30) days of the date taken. The name of the digital file shall include the date taken and a brief description of the contents of the photograph.

H. Asset Management Report

1. The Contractor shall submit an Asset Management Report to the Engineer prior to substantial completion. The report shall be in Microsoft Excel format in order to facilitate data transport into the Owner’s Computerized Maintenance Management System (CMMS). All significant assets shall be included in the report, including, but not limited to the following:

   a. Pumps
   b. Motors

c. Venturi Mixers
d. Variable Frequency Drives
e. Grinders
f. Valves
g. Electric Valve Actuators
h. HVAC Units
i. Fans
j. Switchgear
k. Transformers
l. Control Panels
m. Motor Control Centers
n. Starters
o. Generators
p. Programmable Logic Controllers
q. Workstations
r. Sensors
s. Analyzers
t. Transmitters

2. The Asset Management Report shall be formatted as follows:

| Asset No. | Description | Manufacturer | Model No. | Serial No. | Current Value |
|---|---|---|---|---|---|
| - | - | - | - | - | - |

3. In addition to the above data to be provided for all assets, columns shall be added as necessary for additional data, including:

a. Pumps: flow (GPM), FLA, RPM, temp. rating, vibration, voltage rating
b. Motors: FLA, RPM, temp. rating, vibration, voltage rating
c. Variable Frequency Drives: temp. rating, voltage rating
d. HVAC units: flow (CFM), FLA, RPM, temp. rating, voltage rating
e. Transformers: temp. rating
f. Motor Control Centers: temp. rating
g. Starters: amps, temp. rating, voltage rating
h. Generators: FLA, RPM, temp. rating, voltage rating

PART 2 -- PRODUCTS

(NOT USED)

PART 3 -- EXECUTION

(NOT USED)

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# SECTION 01310

# PROGRESS SCHEDULES

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. The Contractor's approach to prosecution of the Work shall be disclosed to the Engineer by submission of computerized, cost-and-resource loaded CPM Progress Schedules as required in this Section. These requirements are in addition to, and not in limitation of, those imposed elsewhere in the Specifications.

B. A Pay Activity, as opposed to a CPM Activity, is an Activity used to simplify cost-loading of the Progress Schedule. When used, Pay Activities shall be loaded with the cost of Work that is included, at no cost, in related (generally, concurrent) CPM Activities. Pay Activities shall not control the rate of progress; however, their start and finish dates shall be consistent with those of their related CPM Activities to ensure accurate Early Date and Late Date payment plots. References to CPM (Critical Path Method) shall be CPM standards consistent with this Section.

### 1.02 PROGRESS SCHEDULE SUBMITTALS

A. Progress Schedule Submittals shall include a disk with the Contractor's files, a narrative and seven (7) copies of the following reports, schedules, and plots, all in formats, sorts, and sequences acceptable to the Engineer.

1. Detailed Cost Breakdown
2. Activity Reports
3. Equipment and Material Order Schedule
4. Schedule of Values
5. Short Term Schedule
6. Logic Diagram
7. Resource Plots

B. The Contractor shall uniquely identify each Progress Schedule Submittal. Resubmissions shall be identified by reusing the corresponding Submittal number and the letter A, B, etc., and shall fully address all the Engineer's Comments and objections.

C. No Progress Schedule review by the Engineer shall relieve the Contractor from the responsibility to: (1) comply with the Contract Times and any sequences of Work indicated in or required by the Contract Documents, and (2) complete omitted Work within the Contract Times. Nor will any such Progress Schedule review by the Engineer lead to approval of, or

consent to, any variation from the Contract Documents, except as the Engineer may otherwise approve or consent to individual variations by means of specific, separate notations in writing.

D. The Contractor shall submit the Preliminary Progress Schedule as stated in the Instruction to Bidders. This shall constitute the Rev. 0 Progress Schedule and shall meet all the submittal requirements specified herein.

E. Once the Rev. 0 Progress Schedule is approved, it shall become the Rev. 0 Record Schedule or As-Planned Schedule, and shall be used for Progress Payment submittals until the Record Schedule is revised by subsequent Progress Schedules.

F. The Contractor shall not submit Progress Payments Requests until the Rev. 0 Progress Schedule is approved.

G. The Contractor shall submit monthly Progress Schedule revisions (Rev.1, Rev. 2, etc.) with each monthly Progress Payment Request. Updated Progress Schedules shall be submitted a minimum of 7 days in advance of each construction progress meeting along with a detailed 30 day look ahead schedule.

H. Each monthly Progress Schedule shall be intended to document those agreements reached between the Owner and the Contractor concerning the Progress Schedule by incorporating revisions in activities, logic ties, and so forth, agreed to by the Owner upon completion of the Engineer's review of any preceding Proposal Schedule submittals made by the Contractor.

I. The Contractor shall submit Proposal Schedules, which shall support proposals or claims for changes in Contract Price or Contract Time, schedule recovery plans and other Contractor-initiated Progress Schedule adjustments. A Proposal Schedule Submittal shall include all the reports, schedules, plots, etc. specified for a Progress Schedule Submittal.

1.03 DELAY PROVISIONS

A. The Contractor shall promptly take appropriate action to recover schedule whenever the Contractor anticipates, or any Progress Schedule Submittal demonstrates, and required CPM Activity to slip, due to acts or omissions within the control of the Contractor, by fifteen (15) or more days beyond any Target Time or Contract Time. If the Contractor is not responsible for such schedule slippage, the Contractor shall give prompt written notice of a delay justifying a Contract Time extension, and follow such notice by taking prompt appropriate action nonetheless, if so directed by the Engineer.

1. If schedule recovery is required, the Contractor shall enclose with the next Progress Schedule Submittal a schedule recovery plan consisting of (1) a narrative describing the cause of schedule slippage and the actions taken to recover schedule within the shortest reasonable time, and (2) a Proposal Schedule with the corresponding revisions in Activities and logic ties and other adjustments. Appropriate schedule recovery actions may include assignment of additional labor, subcontractors or construction equipment; Work during other than normal working hours; resequencing of the Work; expediting of Submittals and deliveries; and any combination of any of these or other similar actions. Activity shortening and overlapping shall be explained as to their basis (and be supported by increases in resources).

2. If the Contractor believes that an increase in Contract Time is justified, any such extension in Contract Time and associated increase in Contract Price will not be

evaluated, unless the following requisites are met: (1) the Contractor, using the procedures in this Section, demonstrates that conditions justifying extensions in Contract Time or increases in Contract Price, or both, have arisen, and (2) the Contractor's analysis is verifiable by an independent, objective evaluation by the Engineer, using the electronic files and data furnished by the Contractor.

B. The Contractor's failure, refusal, or neglect to take appropriate schedule recovery action or, in the alternative, give written notice of a delay, and, in either case, to follow up with a timely Proposal Schedule shall be reasonable evidence that the Contractor is not prosecuting the Work with due diligence. Any such Contractor failure, refusal, or neglect shall give sufficient basis to the Owner, with the Engineer's advice, to elect any of the following: (1) demand adequate, written assurance of due performance, (2) withhold liquidated damages, and (3) in the Owner's sole discretion, direct alternate schedule recovery actions.

C. Once the As-Planned Schedule is established, the Engineer will select Progress Points. Progress Points will be assigned Target Times using the Late Dates in the Rev. 0 Record Schedule (As-Planned Schedule). As the Record Schedule is revised, Target Times shall be revised to reflect the Late Dates. Target Times shall be interim, Contractor-imposed deadlines; however, Target Times shall not be Contract Times.

D. In the event the Engineer is unable to approve any Progress Schedule Revision, both the Engineer and Contractor shall be required to use the Rev. 0 Record Schedule and Rev. 0 Target Times, and not any disputed Record Schedule, to resolve issues affecting Contract Time and Contract Price, as follows: (1) The As-Planned Schedule will be updated through several Progress Payment closing dates, and (2) actual dates for the Progress Points shall be compared with the Rev. 0 Target Times, and any slippage, by trade or equivalent Contract phase, shall be correspondingly explained.

1. Any such updating of the As-Planned Schedule through a closing date (1) shall purposely exclude all Contractor-initiated revisions affecting Work after the closing date, even if such revisions were incorporated into any Revision Submittal, but (2) shall include adjustments in Activities and logic tie changes covering changes and delays that were consented to by the Owner before the closing date. Adjustments in Activities and logic ties for Contractor-initiated revisions (including schedule recovery plans) shall be incorporated only in the update for the period when the Work reflected by those Contractor-initiated revisions actually took place.

## 1.04 PROGRESS SCHEDULE SOFTWARE

A. The Progress Schedule software shall be current version of Primavera Project Planner® that runs on IBM PC compatible equipment and is capable of: (1) processing and plotting the required Progress Schedule information, and (2) creating data bases accessible by other software.

## 1.05 MEASUREMENT AND PAYMENT

A. The Contractor represents to have included in the Contract Price all costs for Work under this Section. Payment for Work performed under this Section will be made as part of those payments made on in-progress and completed Detailed Cost Breakdown pay items, or using the Earned Values for Progress Schedule Submittal pay items, if any such pay items are established.

PART 2 -- PRODUCTS

2.01 PROGRESS SCHEDULE; NARRATIVE

A. The Progress Schedule shall detail CPM Activities and logic ties to the extent required to show the Contractor's overall approach to the Work.

B. The Progress Schedule shall clearly define the prosecution of the Work from Notice to Proceed to Final Acceptance by using separate CPM Activities for, but not limited to: construction/installation; permitting (by the Contractor and Owner); submittal preparation; submittal review and return; submittal resubmissions and submittal re-reviews, as advisable; deliveries to the site or storage; Owner-furnished items; interfaces with other work (other contractors, public utilities, etc.); testing and Punch List; Owner training; and start-up.

C. CPM Activity durations shall equate to the days required to complete the associated work. Activities shall not combine: (a) separate items of Unit Price or lump sum work; (b) distinct classes of work (e.g., CSI Divisions or equivalent); (c) work in separate areas, structures or facilities and, if requested by the Engineer, work in separate locations or elevations within an area, structure or facility; or (d) rough-in and finish work.

D. Installation CPM Activities shall last from fifteen (15) to forty-five (45) days, unless a shorter duration results from the rules in Article 2.01, Paragraph C. Unless longer review times are specified in other Specifications, Submittal review CPM Activities also shall last a minimum of fifteen (15) working days as determined by the Engineer. Submittal, delivery, and start-up CPM Activities may combine materials and equipment in the same class of work, based on the detail of related installation CPM Activities.

E. Activities shall be assigned consistent descriptions, codes, and sort codes. Sort code schemes shall: be subject to the Engineer's prior consent; indicate whether the Contractor (or a subcontractor or Supplier), Engineer, or Owner the lead; distinguish CPM Activities from pay Activities; and group Activities by unit price, area, change, Submittals, deliveries and other such schemes. Constraint dates shall be explained as to bases.

F. The narrative shall list the CPM Activities on each Critical Path and compare Early and Late Dates for CPM Activities designating Contract Times and Target Times. The narrative shall also recap progress and days gained or lost vs. the current Record Schedule, describe changes in resources to be used on remaining Work and identify delays, their extent and causes. The narrative shall also itemize changes in Activities, logic ties and DCB pay items by each change, recovery plan and Contractor-initiated revision.

2.02 REPORTS; SCHEDULES; PLOTS

A. Activity Reports shall include CPM Activity code, description, duration, calendar, Early and Late Dates (calendar dates), Total Float, labor manhours, and sort codes. The Late Finish Date (or the Early Start Date) of any CPM Activity highlighting a Contract Time (or commencement of all or any part of the Work) shall equal the corresponding Contract Time (or Contract date). In addition, for precedence-based Progress Schedules, Activity Reports shall show, for each CPM Activity, all preceding and succeeding logic ties (lead/lag and lead times) or attach a separate report combining such Activity and logic tie data.

B. Equipment and Material Order Schedule shall include the following information for principal items of equipment and materials:

1. Dates on which Shop Drawings are requested and received from the manufacturer.

2. Dates on which certification is received from the manufacturer and transmitted to the Engineer.

3. Dates on which Shop Drawings are submitted to the Engineer and returned by the Engineer for revision.

4. Dates on which Shop Drawings are revised by manufacturer and resubmitted to the Engineer.

5. Date on which Shop Drawings are returned by Engineer annotated either "Furnish as Submitted" or "Furnish as Corrected".

6. Date on which accepted Shop Drawings are transmitted to manufacturer.

7. Date of manufacturer's scheduled shop test.

8. Date of manufacturer's scheduled delivery.

9. Date on which delivery is actually made.

C. The Detailed Cost Breakdown (DCB) shall divide the Work into pay items by significant Sections of the Specifications within areas, structures, and facilities, or vice versa. If requested by the Engineer in writing, there shall be separate DCB reports for self-performed Work and the Work of each Subcontractor.

1. The Schedule of Values (SOV) shall subdivide the DCB into CPM and Pay Activities (max $50k per line item), sequenced by Activity codes, and shall tabulate for each Activity: code, description, Values for labor, Subcontract and/or materials and equipment costs; Activity Values; percent complete; and Earned Values. Delivery and Submittal review Activities, where appropriate, shall be cost-loaded if the Contractor intends to request payment for stored materials and for approved equipment Shop Drawings, respectively.

2. Pay Activities or the features of the software shall be used to ensure that any total CPM Activity Value or, if appropriate, that any Activity labor, Subcontract, etc. Values roll up to only one DCB pay item. Once the Rev. 0 DCB and SOV are approved, the Contractor shall not modify any DCB pay item or Activity Value, unless otherwise authorized by the Engineer in writing.

D. Short-Term Schedules shall subdivide CPM Activities into detailed tasks and cover the prior two (2) weeks and the next four (4) weeks. Each installation task shall be cross-referenced to a CPM Activity and shall not combine the Work for more than one crew. Submittals shall segregate preparation from review and shall not combine items furnished by separate Suppliers.

E. Logic Diagrams shall be arrow or precedence and, once the Engineer has designated time-scales, shall be plotted on a time- scaled calendar, on 24-inch x 36-inch sheets. Logic

Diagrams shall identify the Contract Times and Critical Path(s). CPM Activities shall be shown on the Early Dates, and Total Floats shall be noted beside the CPM Activities. Logic connectors, whether on the same sheet or not, shall identify predecessors and successors.

F. Resource Plots shall graph monthly (or weekly, if chosen by the Engineer) and cumulative payments and manpower, using current Early Dates and Late Dates and, when requested by the Engineer, comparing As-Planned Schedule and current Early Dates. The specific trades shall be chosen by the Engineer.

## PART 3 -- EXECUTION

(NOT USED)

- END OF SECTION -

# SECTION 01400

# QUALITY CONTROL

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Testing Laboratory Services

1. Laboratory testing and checking required by the Specifications, including the cost of transporting all samples and test specimens, shall be provided and paid for by the Owner unless otherwise indicated in the Specifications.

2. Materials to be tested include, but are not necessarily limited to the following: cement, concrete aggregate, concrete, bituminous paving materials, structural and reinforcing steel, waterproofing, select backfill, crushed stone or gravel and sand.

3. Tests required by the Owner shall not relieve the Contractor from the responsibility of supplying test results and certificates from manufacturers or suppliers to demonstrate conformance with the Specifications.

4. Procedure

   a. The Contractor shall plan and conduct his operations to permit taking of field samples and test specimens, as required, and to allow adequate time for laboratory tests.

   b. The collection, field preparation and storage of field samples and test specimens shall be as directed by the Engineer with the cooperation of the Contractor.

5. Significance of Tests

   a. Test results shall be binding on both the Contractor and the Owner, and shall be considered irrefutable evidence of compliance or noncompliance with the Specification requirements, unless supplementary testing shall prove, to the satisfaction of the Owner, that the initial samples were not representative of actual conditions.

6. Supplementary and Other Testing

   a. Nothing shall restrict the Contractor from conducting tests he may require. Should the Contractor at any time request the Owner to consider such test results, the test reports shall be certified by an independent testing laboratory acceptable to the Owner. Testing of this nature shall be conducted at the Contractor's expense.

## 1.02 WATERTIGHTNESS OF STRUCTURES

A. It is the intent of these Specifications that all concrete work, sealing work around built-in items and penetrations be performed as required to insure that groundwater, surface water, and water or liquids in tanks, channels and containers will not intrude into any equipment rooms, pipe galleries, habitable areas or other generally dry areas.

B. The required watertightness shall be achieved by quality concrete construction and proper sealing of all joints and penetrations.

C. Each unit shall be tested separately and the leakage tests shall be made prior to backfilling and before equipment is installed. Raw water may be used in testing of any item or system not forming a part of the potable water supply.

D. The General Contractor shall provide at his own expense all labor, material, temporary bulkheads, pumps, water measuring devices, etc., necessary to perform the required tests.

E. Built-In Items and Penetrations

1. All pipe sleeves, built-in items and penetrations shall be sealed as detailed and as required to insure a continuous watertight seal.

2. Penetration through built-up roofing areas shall be made prior to application of the built-up roofing utilizing suitable sleeves and flashings as required.

   If roofing surfaces are penetrated after roofing has been applied, the waterproofing integrity shall be restored.

F. Structures

1. All water holding structures shall be tested for leakage by the General Contractor.

2. Each structure shall be filled with water to overflowing or such other level as directed by the Engineer for a period of not less than 24 hours. All sleeves and other openings shall be temporarily plugged during the test period.

3. Exterior surfaces shall be examined for leakage, especially at joints. Leakage will be considered to be within allowable limits when there is no visible sign of leakage and the water surface does not drop more than 1/2-inch during 24 hours. A slight dampness on exterior walls will not be considered as leakage. If the leakage exceeds the allowable limit, the work shall be corrected by methods approved by the Engineer.

4. Upon completion of the necessary remedial work, the leakage test shall be repeated until it is successfully passed.

G. Notification by Engineer

If any leaks, in excess of the specified amount, are not remedied by the General Contractor within four (4) weeks of notification by the Engineer, regardless of whether the cause of these leaks is or is not determined, the Engineer shall have the authority to have these

leaks repaired by others. The cost of repairs, by others, shall be deducted from monies due or to become due to the General Contractor.

1.03 FIELD TESTING OF EQUIPMENT

A. All equipment shall be set, aligned and assembled in conformance with the manufacturer's drawings and instructions.

B. Field test equipment in accordance with Section 11000-Equipment General Provisions.

1.04 IMPERFECT WORK, EQUIPMENT, OR MATERIALS

A. Any defective or imperfect work, equipment, or materials furnished by the Contractor which is discovered before the final acceptance of the work, as established by the Certificate of Substantial Completion, or during the subsequent guarantee period, shall be removed immediately even though it may have been overlooked by the Engineer and estimated for payment. Any equipment or materials condemned or rejected by the Engineer shall be tagged as such and shall be immediately removed from the site. Satisfactory work or materials shall be substituted for that rejected.

B. The Engineer may order tests of imperfect or damaged work, equipment, or materials to determine the required functional capability for possible acceptance, if there is no other reason for rejection. The cost of such tests shall be borne by the Contractor; and the nature, tester, extent and supervision of the tests will be as determined by the Engineer. If the results of the tests indicate that the required functional capability of the work, equipment, or material was not impaired, consistent with the final general appearance of same, the work, equipment, or materials may be deemed acceptable. If the results of such tests reveal that the required functional capability of the questionable work, equipment, or materials has been impaired, then such work, equipment, or materials shall be deemed imperfect and shall be replaced. The Contractor may elect to replace the imperfect work, equipment, or material in lieu of performing the tests.

1.05 INSPECTION AND TESTS

A. The Contractor shall allow the Engineer ample time and opportunity for testing materials and equipment to be used in the work. He shall advise the Engineer promptly upon placing orders for material and equipment so that arrangements may be made, if desired, for inspection before shipment from the place of manufacture. The Contractor shall at all times furnish the Engineer and his representatives, facilities including labor, and allow proper time for inspecting and testing materials, equipment, and workmanship. The Contractor must anticipate possible delays that may be caused in the execution of his work due to the necessity of materials and equipment being inspected and accepted for use. The Contractor shall furnish, at his own expense, all samples of materials required by the Engineer for testing, and shall make his own arrangements for providing water, electric power, or fuel for the various inspections and tests of structures and equipment.

B. The Contractor shall furnish the services of representatives of the manufacturers of certain equipment, as prescribed in other Sections of the Specifications. The Contractor shall also place his orders for such equipment on the basis that, after the equipment has been tested prior to final acceptance of the work, the manufacturer will furnish the Owner with certified statements that the equipment has been installed properly and is ready to be placed in

functional operation. Tests and analyses required of equipment shall be paid for by the Contractor, unless specified otherwise in the Section which covers a particular piece of equipment.

C. Where other tests or analyses are specifically required in other Sections of these Specifications, the cost thereof shall be borne by the party (Owner or Contractor) so designated in such Sections. The Owner will bear the cost of all tests, inspections, or investigations undertaken by the order of the Engineer for the purpose of determining conformance with the Contract Documents if such tests, inspection, or investigations are not specifically required by the Contract Documents, and if conformance is ascertained thereby. Whenever nonconformance is determined by the Engineer as a result of such tests, inspections, or investigations, the Contractor shall bear the full cost thereof or shall reimburse the Owner for said cost. In this connection, the cost of any additional tests and investigations, which are ordered by the Engineer to ascertain subsequent conformance with the Contract Documents, shall be borne by the Contractor.

PART 2 -- PRODUCTS

(NOT USED)

PART 3 -- EXECUTION

(NOT USED)

- END OF SECTION -

# SECTION 01505

# MOBILIZATION

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Mobilization shall include the obtaining of all permits, moving equipment onto the site, furnishing and erecting temporary buildings and other construction facilities, providing utility services, fees, insurance, and bonds, all as required for the proper performance and completion of the Work. Mobilization shall include the following principal items:

1. Moving on to the site all of Contractor's equipment, materials, tools, etc. required for first month operations.

2. Clearing and installation of all temporary roads to access the site.

3. Installing temporary construction power, wiring, and lighting facilities.

4. Providing construction water supply.

5. Providing on-site sanitary facilities and potable water facilities.

6. Arranging for and erection of Contractor's work and storage area.

7. Obtaining all required permits and licenses.

8. Having all OSHA required notices and establishment of safety programs.

9. Having the Contractor's superintendent at the job site full time.

10. Submitting initial submittals.

11. All special scheduling necessary to complete the Work in an orderly manner, as dictated by right-of-way acquisition.

12. Moving materials, equipment, tools, and labor throughout the project site due to space restrictions.

### 1.02 PAYMENT FOR MOBILIZATION

A. The Contractor's attention is directed to the condition that no payment for mobilization, or any part thereof will be approved for payment under the Contract until all mobilization items listed above have been completed as specified.

B. As soon a practicable after receipt of the Notice to Proceed, the Contractor shall submit a breakdown to the Engineer for approval, which shall show the estimated value of each major component of mobilization.

C. The lump sum price for mobilization is limited to 5% of the total Contract amount. Any amount that exceeds 5% of the total Contract amount is to be included with other items of work.

D. Partial payment for mobilization shall be made in accordance with the schedule listed below:

| Percent of Original Contract Amount Earned | Allowable Percent of Lump Sum Price for Mobilization |
|---|---|
| 5 | 25 |
| 25 | 50 |
| 50 | 75 |
| 75 | 90 |
| 100 | 100 |

E. Partial payment for bonds, insurance, and permit fees is not subject to the above limitations.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

- END OF SECTION -

# SECTION 01510

# TEMPORARY UTILITIES

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. The Contractor shall provide temporary light and power, heating, water service, and sanitary facilities for his operations and for the construction operations of any subcontractors of this Project at the site. The temporary services shall be provided for use throughout the construction period. Contractor shall furnish, install, and maintain all temporary services required to perform the Work in a safe and satisfactory manner.

B. The Contractor shall coordinate and install all temporary services in accordance with the requirements of the utility companies having jurisdiction and as required by applicable codes and regulations.

C. At the completion of the work, or when the temporary services are no longer required, the temporary services shall be removed and the facilities shall be restored to their original conditions.

D. All costs in connection with the temporary services including, but not limited to, installation, utility company service charges, maintenance, relocation, and removal shall be borne by the Contractor at no additional cost to the Owner.

E. Some temporary facilities that may be required may be indicated on the Drawings; however, the Drawings do not necessarily show any or all of the temporary facilities that the Contractor shall ultimately use to complete the work.

F. The Contractor shall provide equipment for temporary services that is adequate for the performance of the Work under this Contract within the time specified. All equipment shall be kept in satisfactory operating condition, shall be capable of safely and efficiently performing the required Work, and shall be subject to review by the Owner at any time within the duration of the Contract. All Work hereunder shall conform to the applicable requirements of the OSHA Standards for Construction.

G. Temporary Light and Power

1. The temporary general lighting and small power requirements shall be serviced by 120/240 V, 1 phase, 3 wire temporary systems furnished and installed by the Contractor. This service shall be furnished complete with main disconnect, overcurrent protection, meter outlet, branch circuit breakers, and wiring as required; including branch circuit breakers and wiring as required for furnishing temporary power to the Contractor's service connections, all in accordance with the requirements of the servicing power company and applicable standards and codes. The meter for the temporary 120/240 V service for construction purposes shall be registered in the name of the Contractor and all energy charges for furnishing this temporary electric power shall be borne by the Contractor. Any subcontractor with a need for power other than the 120/240 V, 1 phase, 3 wire shall provide such power

at his own expense. All temporary connections for light and power shall be subject to review by the Engineer and a representative of the servicing power company.

2. The Contractor shall make all necessary arrangements and shall pay for all permits, inspections, and power company charges for all temporary service installations. All temporary systems shall comply with and meet the approval of the local authorities having jurisdiction. All temporary electrical systems shall consist of wiring, switches, necessary insulated supports, poles, fixtures, sockets, receptacles, lamps, guards, cutouts, and fuses as required to complete such installations. The Contractor shall furnish lamps and fuses for all temporary systems furnished by him and shall replace broken and burned out lamps, blown fuses, damaged wiring, and as required to maintain these systems in adequate and safe operating condition.

   When it is necessary during the progress of construction that a temporary electrical facility installed under this Division interferes with construction operations, the Contractor shall relocate the temporary electrical facilities to maintain temporary power as required at no additional cost to the Owner. The Contractor shall be responsible at all times for any damage or injury to equipment, materials, or personnel caused by improperly protected or installed temporary installations and equipment.

3. Any subcontractors doing the work at the site shall be permitted to connect into the temporary general lighting system small hand tools, such as drills, hammers, and grinders, provided that:

   a. Equipment and tools are suitable for 120 V, single phase, 60 Hz operation and operating input does not exceed 1,500 volt-amperes.

   b. Tools are connected to outlets of the system with only one (1) unit connected to a single outlet.

   c. In case of overloading of circuits, the Contractor shall restrict use of equipment and tools as required for correct loading.

4. The Contractor shall keep the temporary general lighting and power systems energized fifteen (15) minutes before the time that the earliest trade starts in the morning and de-energized fifteen (15) minutes after the time the latest trade stops. This applies to all weekdays, Monday through Friday, inclusive, which are established as regular working days.

   Any subcontractor requiring temporary light and power before or after the hours set forth hereinbefore, or on a Saturday, Sunday, or holiday, shall pay for the additional cost of keeping the system energized and repaired. If more than one subcontractor is involved, the charges shall be prorated, such amounts to be determined from the meter readings or other acceptable means previously agreed upon by the subcontractors involved. If it is necessary for any subcontractor or his employees to be in any structure after regular working hours and the temporary general lighting system is not required for illumination, that subcontractor shall provide such illumination required by means of flashlights, electric lanterns, or other devices not requiring use of electricity from the temporary general lighting system.

5. Each subcontractor requiring additional power and lighting other than that specified herein (including power for temporary heating equipment to be provided by the Contractor) shall furnish his own service complete with all fuses, cutouts, wiring, and other material and equipment necessary for a complete system between the service point and the additional power consumers and shall install his own metering equipment in accordance with the requirements of the servicing power company.

6. Unless otherwise permitted by the Engineer, circuits separate from lighting circuits shall be used for all power purposes.

7. All wiring for temporary light and power shall be properly installed and maintained and shall be securely fastened in place. All electrical facilities shall conform to the requirements of Subpart K of the OSHA Safety and Health Standards for Construction.

8. The temporary general lighting system shall be installed progressively in structures as the various areas are enclosed or as lighting becomes necessary because of partial enclosure. Lighting intensities shall be not less than 10 foot candles.

9. The Contractor shall provide a separate temporary night lighting circuit for construction security. This system shall be energized at the end of each normal working day and de-energized at the start of each normal working day by the Contractor. The system is to be left energized over Saturdays, Sundays, and all holidays. Lighting intensities shall be not less than 2 foot candles.

10. Electrical welders provided by each trade used in the erection and fabrication of the buildings, structures, and equipment shall be provided with an independent grounding cable connected directly to the structure on which the weld is being made rather than adjacent conduit piping, etc.

    Electricians and other tradesmen necessary for the required connections and operation of welding equipment and generator, standby generators and similar equipment shall be furnished by the Contractor. All costs for such labor and equipment shall be borne by the Contractor.

11. Upon completion of the work, but prior to acceptance by the Owner, the Contractor shall remove all temporary services, security lighting systems, temporary general lighting systems and all temporary electrical work from the premises at his expense.

H. Temporary Heating

1. Building heating for the existing pump station structures shall be kept in service for the entire construction period. Additional temporary heating shall be provided as required to maintain facilities under construction adequately heated.

2. The Contractor shall provide temporary heating, ventilation coverings, and enclosures necessary to properly protect all work and materials against damage by dampness and cold, to dry out the work, and to facilitate work in all structures.

3. The equipment, fuel, materials, operating personnel, and methods used shall be at all times satisfactory and adequate to maintain critical installation temperatures and ventilation for all work in those areas where the same is required.

4. After any structure is enclosed, the minimum temperature to be maintained is 55 degrees Fahrenheit, unless otherwise specified, where work is actually being performed.

5. Before and during the application of interior finishing, painting, etc., the Contractor shall provide sufficient heat to maintain a temperature of not less than 65 degrees Fahrenheit.

6. Any work damaged by dampness or insufficient or abnormal heating shall be replaced by the Contractor at no additional cost to the Owner.

I. Temporary Sanitary Service

1. Adequate and clean sanitary conveniences, in sufficient numbers, for the use of all persons employed on the work and properly screened from public observation, shall be provided and maintained at suitable locations by the Contractor, all as prescribed by State Labor Regulations and local codes, regulations, and ordinances. The contents of same shall be removed and disposed of in a manner consistent with local and state codes, regulations, and ordinances as the occasion requires. The Contractor shall rigorously prohibit the committing of nuisances within, on, or about the work. Sanitary facilities shall be situated in an acceptable location and shall be removed from the site when no longer required.

J. Temporary Water

1. The Contractor shall provide temporary water service for construction purposes, sanitary facilities, fire protection, testing, and cleaning. The Contractor shall make all arrangements for and pay for connections to the potable water at the work site.

   Potable water shall be available at cost from the Owner for the Work. The Contractor shall install an Owner supplied water meter and shall pay the Owner for all charges for potable water used under this Contract. Water service requirements shall be discussed during the Pre-Bid Conference. The Contractor shall provide and pay for all piping, fittings, adapters, valving, and appurtenances required to make the connection to the existing water piping.

2. The Contractor shall supply potable water for his employees either by portable containers or drinking fountains.

3. An adequate number of hose bibbs, hoses, and watertight barrels shall be provided for the distribution of water.

4. Water service shall be protected from freezing and the service shall be extended and relocated as necessary to meet temporary water requirements.

5. The Contractor shall not make connection to, or draw water from, any fire hydrant or pipeline without first obtaining permission of the authority having jurisdiction over the use of said fire hydrant or pipeline and from the Owner. For each such connection made, the Contractor shall first attach to the fire hydrant or pipeline a valve and a meter, if required by the said authority, of a size and type acceptable to said authority and agency.

6. Removal of Water Connections: Before final acceptance of the Work, all temporary water connections and piping installed by the Contractor shall be entirely removed, and all affected improvements shall be restored to their original condition, or better, to the satisfaction of the Engineer, the Owner, and to the agency owning the affected utility.

7. Fire Protection: The construction and all other parts of the Work shall be connected to the Contractor's water supply system and shall be adequately protected against damage by fire. Hose connections and hose, water casks, chemical equipment, or other sufficient means shall be provided for fighting fires in the temporary structures and other portions of the Work, and responsible persons shall be designated and instructed in the operation of such fire apparatus so as to prevent or minimize the hazard of fire. The Contractor's fire protection program shall conform to the requirements of Subpart F of the OSHA Standards for Construction and all local Fire Department Requirements.

K. Temporary Ventilation

1. Building ventilating for the existing pump station structures shall be kept in service for the entire construction period. Additional temporary ventilation shall be provided as required to maintain facilities under construction adequately vented.

2. The Contractor shall provide and maintain adequate ventilation for a safe working environment in confined spaces. The Contractor shall follow the applicable requirements of the OSHA Standards for Construction and NIOSH Publications for working in confined spaces. In addition, forced air ventilation shall be provided for the curing of installed materials, humidity control, and the prevention of hazardous accumulations of dust, gases, or vapors.

## PART 2 -- PRODUCTS

(NOT USED)

## PART 3 -- EXECUTION

(NOT USED)

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# SECTION 01520

# MAINTENANCE OF UTILITY OPERATIONS DURING CONSTRUCTION

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. The existing facility will be maintained in continuous operation by the Owner during the entire construction period of all Contracts as hereinafter specified. The intent of this section is to outline the minimum requirements necessary to provide pumping of the wastewater throughout the construction period.

B. Work under each Contract shall be scheduled and conducted by each Contractor so as not to impede any pumping operation. In performing the work shown and specified, the Contractor shall plan and schedule his work to meet the facility operating requirements, and the constraints and construction requirements as outlined in this Section. No spilling of raw wastewater shall be allowed. The Contractor shall pay all civil penalties, costs, assessments, etc., associated with any spill of raw wastewater associated with the Contractor's work.

C. The Contractor shall be responsible for coordinating the general construction and electrical, HVAC and plumbing construction schedules and for ensuring that permanent or temporary power is available for all existing, proposed, and temporary facilities that are required to be on line at any given time.

D. The Contractor has the option of providing additional temporary facilities that can eliminate a constraint, provided it is done without cost to the Owner and provided that all requirements of these Specifications are fulfilled. Work not specifically covered in the following paragraphs may, in general, be done at any time during the contract period, subject to the operating requirements and constraints and construction requirements outlined hereinafter. All references to days in this Section shall be consecutive calendar days.

### 1.02 GENERAL CONSTRAINTS

A. The Contractor shall schedule the Work so that the facility is maintained in continuous operation. All pumping operations shall be maintained in continuous operation during the construction period except during approved interruptions. All short-term system or partial systems shutdowns and diversions shall be approved by the Engineer. Long-term shutdowns and diversions shall conform to the requirements hereinafter specified and shall be minimized by the Contractor as much as possible. If in the judgement of the Engineer a requested shutdown is not required for the Contractor to perform the Work, the Contractor shall utilize approved alternative methods to accomplish the Work. All shutdowns shall be coordinated with and scheduled at times suitable to the Owner. Shutdowns shall not begin until all required materials are on hand and ready for installation. Each shutdown period shall commence at a time approved by the Owner, and the Contractor shall proceed with the Work continuously, start to finish, until the Work is completed and normal facility operation is restored. If the Contractor completes all required Work before the specified

shutdown period has ended, the Owner may immediately place the existing system back into service.

B. The Contractor shall schedule short-term and extended shutdowns in advance and shall present all desired shutdowns in the 30 and 60-day schedules at the progress meetings (see Section 01200, Project Meetings). Shutdowns shall be fully coordinated with the Owner at least 48 hours before the scheduled shutdown. Owner personnel shall operate Owner's facilities involved in the short-term and extended shutdowns and diversions.

C. Short term shutdowns in pumping will be allowed for tie-ins to existing pipelines, installation of temporary bulkheads, etc. All such shutdowns shall be scheduled for week-end low-flow periods and shall be limited to less than two (2) hours depending on incoming flow rate and storage volume in the collection and treatment system. The Contractor shall provide appropriate diversion facilities to be approved by the Owner, and at no additional cost to the Owner, when the facility cannot be shut down for a sufficient long time to accomplish the required work. The Contractor may be allowed additional time for short-term interruptions if he can demonstrate to the Owner and Engineer that the collection system will not surcharge or overflow during the requested shutdown period. Duration of short-term interruptions allowed will depend on incoming wastewater flow rate and prevention of any discharge of raw wastewater from the collection system. The schedule and duration of short-term shutdowns shall be at the discretion of the Owner.

D. Any temporary work, facilities, roads, walks, protection of existing structures, piping, blind flanges, valves, equipment, etc. that may be required within the Contractor's work limits to maintain continuous and dependable facility operation shall be furnished by the Contractor at the direction of the Engineer at no extra cost to the Owner.

E. The Owner shall have the authority to order Work stopped or prohibited that would, in his opinion, unreasonably result in interrupting the necessary functions of the facility operations.

F. If the Contractor impairs performance or operation of the facility as a result of not complying with specified provisions for maintaining facility operations, then the Contractor shall immediately make all repairs or replacements and do all work necessary to restore the facility to operation to the satisfaction of the Engineer. Such work shall progress continuously to completion on a 24-hours per day, seven work days per week basis.

G. The Contractor shall provide the services of emergency repair crews on call 24-hours per day.

1.03 GENERAL OPERATING REQUIREMENTS, CONSTRAINTS, AND CONSTRUCTION REQUIREMENTS

A. Access to Site, Roadways, and Parking Areas

1. An unobstructed traffic route into the site shall be maintained at all times for the Owner's operations personnel and maintenance equipment. Parking for personal vehicles of construction personnel shall not be allowed within the fence of the pump station. Construction personnel may park on site outside the fenced-in areas as approved by the Engineer. The Contractor shall be responsible for providing access to and for preparing and maintaining/approved parking areas.

2. An unobstructed traffic route around the site shall be maintained at all times for the Owner's operations personnel and maintenance equipment. Vehicular access to all pump station buildings and equipment for Owner personnel shall be maintained at all times by the Contractor.

3. The Contractor shall provide temporary measures to protect the existing pavement by filling over with earthen material or supplying other measures acceptable to the Engineer, and he shall repair any damage to existing paved surfaces that occurs during the construction period. Any areas disturbed along the shoulders of the access road and interior roads and elsewhere inside and outside of the site shall be repaired, graded, seeded, etc. as necessary to match pre-existing conditions.

4. The Contractor shall not undertake the restoration/construction of new roadway (paved, gravel, or asphalt overlay) shown on the Contract Drawings, until all other work on the facility improvements has been completed.

5. It shall be the responsibility of the Contractor to obtain any permits required from the Georgia DOT and pay all associated fees.

B. Personnel Access

1. County personnel shall have access to all areas which remain in operation throughout the construction period. The Contractor shall locate stored material, dispose of construction debris and trash, provide temporary walkways, provide temporary lighting, and other such work as directed by the Engineer to maintain personnel access to areas in operation. Access and adequate parking areas for personnel must be maintained throughout construction.

C. Plumbing Facilities

1. Unless otherwise allowed by the Engineer, sanitary facilities in the existing structures shall be operational at all times for operating personnel. All other building plumbing systems such as roof and floor drains, pumping, etc., shall be maintained for all structures.

D. Building Heating and Ventilating

1. Building heating and ventilating for the existing structures shall be in service for the entire construction period. Additional temporary heating and ventilation shall be provided as required to maintain facilities under construction adequately heated and vented. The temperatures to be maintained in any areas occupied by operating personnel such as offices, lunchrooms, locker rooms, bathrooms, etc., shall be at least 65°F. The temperatures to be maintained in all other interior areas, whether new, existing or temporary, shall be maintained at a minimum of 55°F.

E. Power, Light and Communications Systems (General)

1. Electric power, lighting service and communications systems shall be maintained in uninterrupted operation in all areas which remain in operation. Individual units may be disconnected as required for replacement, but service shall be available at all times including periods when facilities are out of service. Shutdown of electrical facilities shall be limited to not more than five (5) hours. The Owner may allow

longer outages under conditions determined by the Owner by making use of the existing and/or the proposed engine-generator at the site. All costs associated with operation of the engine-generators shall be paid by the Contractor. The Electrical Subcontractor shall coordinate shutdowns required with the Contractor to minimize the total number of shutdowns required to complete construction. Owner's phone service to the site shall be maintained in continuous operation during construction.

F. Draining Process Pipes and Conduits (General)

1. The contents of all pipes and conduits to be removed, replaced or relocated (or dewatered for a specific purpose) shall be transferred to a suitable facility in a manner approved by the Owner through hoses or piping, or by using pumps if hydraulic conditions so require them. The Contractor shall provide the pumps, piping and hoses at no additional cost to the Owner. No uncontrolled spillage of a pipe or conduit shall be permitted. Any spillage, other than potable water, shall be immediately washed down and flushed into the appropriate process flow train.

G. Potable Water System

1. Potable water service shall be maintained in continuous service at all times during construction except for short term interruptions required for tie-ins. Shutdown of the potable water system shall be fully planned and coordinated with the Owner and shall be limited to not more than two (2) hours. Existing fire hydrants within the site shall be operational at all times, unless otherwise approved by the Owner.

H. Sump Pumps and Sumps

1. All existing sumps shall be maintained in an operable condition with either existing pumps or temporary pumps. Interim piping, power and controls shall be provided as required by the staged construction sequence.

I. Seal Water and Service Water Piping

1. A supply of service and seal water and the necessary connections to existing equipment shall be maintained during construction. Interim piping shall be provided as required.

1.04 SPECIFIC OPERATIONAL CONSTRAINTS

A. The Contractor shall schedule the work for the following based on the constraints given in such a manner as to maintain the pumping station in continuous operation.

B. The Riverside Road Pump Station must remain operational during this construction project. The following requirements affect the Sequence of Construction for the Contractor in performance of the Work. Additional requirements of the Sequence of Construction are indicated on the Drawings.

1. The pump station has two wet wells. Only one wet well will be allowed out of service at a time.

2. The pump station has three screening channels. Only one screening channel will be allowed out of service at a time.

3. The existing SCADA system for the pump station must remain in service until the new SCADA system is installed, tested, and fully operational.

4. The existing odor control system for the pump station must remain in service until the new odor control system is installed, tested, and fully operational.

5. Coordination with Georgia Power is required to maintain electric service.

6. 48” force main can only be removed from service during “low flow” periods and cannot be removed from service for more than 6 hours.

7. 24” force main can only be removed from service during “low flow” periods and cannot be removed from service for more than 8 hours.

8. One force main must be operational at all times.

9. Shutdown of 24” force main must be coordinated with Willeo Pump Station.

10. Installation of paralleling switchgear and associated tie in to the existing electrical system will require temporary power feed between the transformers and the switchgear in the control room. Coordination with Georgia Power is requied.

PART 2 -- PRODUCTS

(NOT USED)

PART 3 -- EXECUTION

(NOT USED)

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# SECTION 01530

# PROTECTION OF EXISTING FACILITIES

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Contractor shall be responsible for the preservation and protection of property adjacent to the work site against damage or injury as a result of his operations under this Contract. Any damage or injury occurring on account of any act, omission or neglect on the part of the Contractor shall be restored in a proper and satisfactory manner or replaced by and at the expense of the Contractor to an equal or superior condition than previously existed.

B. Contractor shall comply promptly with such safety regulations as may be prescribed by the Owner or the local authorities having jurisdiction and shall, when so directed, properly correct any unsafe conditions created by, or unsafe practices on the part of, his employees. In the event of the Contractor's failure to comply, the Owner may take the necessary measures to correct the conditions or practices complained of, and all costs thereof will be deducted from any monies due the Contractor. Failure of the Engineer to direct the correction of unsafe conditions or practices shall not relieve the Contractor of his responsibility hereunder.

C. In the event of any claims for damage or alleged damage to property as a result of work under this Contract, the Contractor shall be responsible for all costs in connection with the settlement of or defense against such claims. Prior to commencement of work in the vicinity of property adjacent to the work site, the Contractor, at his own expense, shall take such surveys as may be necessary to establish the existing condition of the property. Before final payment can be made, the Contractor shall furnish satisfactory evidence that all claims for damage have been legally settled or sufficient funds to cover such claims have been placed in escrow, or that an adequate bond to cover such claims has been obtained.

### 1.02 PROTECTION OF WORK AND MATERIAL

A. During the progress of the work and up to the date of final payment, the Contractor shall be solely responsible for the care and protection of all work and materials covered by the Contract.

B. All work and materials shall be protected against damage, injury or loss from any cause whatsoever, and the Contractor shall make good any such damage or loss at his own expense. Protection measures shall be subject to the approval of the Engineer.

### 1.03 BARRICADES, WARNING SIGNS AND LIGHTS

A. The Contractor shall provide, erect and maintain as necessary, strong and suitable barricades, danger signs and warning lights along all roads accessible to the public, as required by the authority having jurisdiction, to insure safety to the public. All barricades and obstructions along public roads shall be illuminated at night and all lights for this purpose shall be kept burning from sunset to sunrise.

B. Each Contractor shall provide and maintain such other warning signs and barricades in areas of and around their respective work as may be required for the safety of all those employed in the work, the Owner's operating personnel, or those visiting the site.

1.04 EXISTING UTILITIES AND STRUCTURES

A. The term existing utilities shall be deemed to refer to both publicly-owned and privately-owned utilities such as electric power and lighting, telephone, water, gas, storm drains, process lines, sanitary sewers and all appurtenant structures.

B. Where existing utilities and structures are indicated on the Drawings, it shall be understood that all of the existing utilities and structures affecting the work may not be shown and that the locations of those shown are approximate only. It shall be the responsibility of the Contractor to ascertain the actual extent and exact location of existing utilities and structures. In every instance, the Contractor shall notify the proper authority having jurisdiction and obtain all necessary directions and approvals before performing any work in the vicinity of existing utilities.

C. Prior to beginning any excavation work, the Contractor shall, through field investigations, determine any conflicts or interferences between existing utilities and new utilities to be constructed under this project. This determination shall be based on the actual locations, elevations, slopes, etc., of existing utilities as determined in the field investigations, and locations, elevation, slope, etc. of new utilities as shown on the Drawings. If an interference exists, the Contractor shall bring it to the attention of the Engineer as soon as possible. If the Engineer agrees that an interference exists, he shall modify the design as required. Additional costs to the Contractor for this change shall be processed through a Change Order as detailed elsewhere in these Contract Documents. In the event the Contractor fails to bring a potential conflict or interference to the attention of the Engineer prior to beginning excavation work, any actual conflict or interference which does arise during the Project shall be corrected by the Contractor, as directed by the Engineer, at no additional expense to the Owner.

D. The work shall be carried out in a manner to prevent disruption of existing services and to avoid damage to the existing utilities. Temporary connections shall be provided, as required, to insure uninterruption of existing services. Any damage resulting from the work of this Contract shall be promptly repaired by the Contractor at his own expense in a manner approved by the Engineer and further subject to the requirements of any authority having jurisdiction. Where it is required by the authority having jurisdiction that they perform their own repairs or have them done by others, the Contractor shall be responsible for all costs thereof.

E. Where excavations by the Contractor require any utility lines or appurtenant structures to be temporarily supported and otherwise protected during the construction work, such support and protection shall be provided by the Contractor. All such work shall be performed in a manner satisfactory to the Engineer and the respective authority having jurisdiction over such work. In the event the Contractor fails to provide proper support or protection to any existing utility, the Engineer may, at his discretion, have the respective authority to provide such support or protection as may be necessary to insure the safety of such utility, and the costs of such measures shall be paid by the Contractor.

PART 2 -- PRODUCTS

(NOT USED)

PART 3 -- EXECUTION

(NOT USED)

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# SECTION 01540

# DEMOLITION AND REMOVAL OF EXISTING STRUCTURES AND EQUIPMENT

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. This Section covers the demolition, removal, and disposal of existing buildings, structures, pavement, curbs, and sidewalk, removal and disposal of asbestos materials, and any existing equipment including electrical, plumbing, heating and ventilating equipment and piping not required for the operation of the rehabilitated facility as indicated on the Drawings and as specified hereinafter. The Contractor shall furnish all labor, materials and equipment to demolish buildings and structures and to remove fixtures, anchors, supports, piping and accessories designated to be removed on the Drawings.

### 1.02 TITLE TO EQUIPMENT AND MATERIALS

A. Contractor shall have no right or title to any of the equipment, materials or other items to be removed from the existing buildings or structures unless and until said equipment, materials and other items have been removed from the premises. The Contractor shall not sell or assign, or attempt to sell or assign any interest in the said equipment, materials or other items until the said equipment, materials or other items have been removed.

B. Contractor shall have no claim against the Owner because of the absence of such fixtures and materials.

### 1.03 CONDITION OF STRUCTURES AND EQUIPMENT

A. The Owner does not assume responsibility for the actual condition of structures and equipment to be demolished and removed.

B. Conditions existing at the time of inspection for bidding purposes will be maintained by the Owner so far as practicable.

C. The information regarding the existing structures and equipment shown on the Drawings is based on visual inspection and a walk-through survey only. Neither the Engineer nor the Owner will be responsible for interpretations or conclusions drawn therefrom by the Contractor.

## PART 2 – PRODUCTS (NOT USED)

## PART 3 -- EXECUTION

### 3.01 DEMOLITION AND REMOVALS

A. The removal of all equipment and piping, and all materials from the demolition of buildings and structure shall, when released by the Owner and Engineer, shall be done by the Contractor and shall become the Contractor's property, unless otherwise noted, for

disposition in any manner not contrary to the Contract requirements and shall be removed from the site to the Contractor's own place of disposal.

B. The Electrical Contractor (Subcontractor) specifically, shall de-energize all panelboards, lighting fixtures, switches, circuit breakers, electrical conduits, motors, limit switches, pressure switches, instrumentation such as flow, level and/or other meters, wiring, and similar power equipments prior to removal. Any electric panels or equipment which are to be retained shall be relocated or isolated by the Electrical Contractor (Subcontractor) specifically, prior to the removal of the equipment specified herein.

C. The Contractor shall proceed with the removal of the equipment, piping and appurtenances in a sequence designed to maintain the facility in continuous operation as described in Section 01510, Temporary Utilities, and Section 01520, Maintenance of Utility Operations During Construction, and shall proceed only after approval of the Engineer.

D. Any equipment piping and appurtenances removed without proper authorization, which are necessary for the operation of the existing facilities shall be replaced to the satisfaction of the Engineer at no cost to the Owner.

E. Excavation caused by demolitions shall be backfilled with fill free from rubbish and debris.

3.02 PROTECTION

A. Demolition and removal work shall be performed by competent experienced workmen for the various type of demolition and removal work and shall be carried out through to completion with due regard to the safety of Owner employees, workmen on-site and the public. The work shall be performed with as little nuisance as possible.

B. The work shall comply with the applicable provisions and recommendation of ANSI A10.2, Safety Code for Building Construction, all governing codes, and as hereinafter specified.

C. The Contractor shall make such investigations, explorations and probes as are necessary to ascertain any required protective measures before proceeding with demolition and removal. The Contractor shall give particular attention to shoring and bracing requirements so as to prevent any damage to new or existing construction.

D. The Contractor shall provide, erect, and maintain catch platforms, lights, barriers, weather protection, warning signs and other items as required for proper protection of the public, occupants of the building, workmen engaged in demolition operations, and adjacent construction.

E. The Contractor shall provide and maintain weather protection at exterior openings so as to fully protect the interior premises against damage from the elements until such openings are closed by new construction.

F. The Contractor shall provide and maintain temporary protection of the existing structure designated to remain where demolition, removal and new work is being done, connections made, materials handled or equipment moved.

G. The Contractor shall take necessary precautions to prevent dust from rising by wetting demolished masonry, concrete, plaster and similar debris. Unaltered portions of the existing

buildings affected by the operations under this Section shall be protected by dust-proof partitions and other adequate means.

H. The Contractor shall provide adequate fire protection in accordance with local Fire Department requirements.

I. The Contractor shall not close or obstruct walkways, passageways, or stairways and shall not store or place materials in passageways, stairs or other means of egress. The Contractor shall conduct operations with minimum traffic interference.

J. The Contractor shall be responsible for any damage to the existing structure or contents by reason of the insufficiency of protection provided.

K. During the entirety of performing the Work, Contractor shall install and maintain a temporary fence around the perimeter of the construction site.

3.03 WORKMANSHIP

A. The demolition and removal work shall be performed as described in the Contract Documents. The work required shall be done with care, and shall include all required shoring, bracing, etc. The Contractor shall be responsible for any damage which may be caused by demolition and removal work to any part or parts of existing structures or items designated for reuse or to remain. The Contractor shall perform patching, restoration and new work in accordance with applicable Technical Sections of the Specifications and in accordance with the details shown on the Drawings. Prior to starting of work, the Contractor shall provide a detailed description of methods and equipment to be used for each operation and the sequence thereof for review by the Engineer.

B. All supports, pedestals and anchors shall be removed with the equipment and piping unless otherwise specified or required. Concrete bases, anchor bolts and other supports shall be removed to approximately 1-inch below the surrounding finished area and the recesses shall be patched to match the adjacent areas. Superstructure wall and roof openings shall be closed, and damaged surfaces shall be patched to match the adjacent areas, as specified under applicable Sections of these Specifications, as shown on the Drawings, or as directed by the Engineer. Wall sleeves and castings shall be plugged or blanked off, all openings in concrete shall be closed in a manner meeting the requirements of the appropriate Sections of these Specifications, as shown on the Drawings, and as directed and approved by the Engineer.

C. Owner shall provide Contractor with a list of materials or items designated to remain the property of the Owner. Such items shall be removed with care and stored at a location at the site to be designated by the Owner.

D. Where equipment is shown or specified to be removed and relocated, the Contractor shall not proceed with removal of this equipment without specific prior approval of the Engineer. Upon approval, and prior to commencing removal operations, the equipment shall be operated in the presence of representatives of the Contractor, Owner and Engineer. Such items shall be removed with care, under the supervision of the trade responsible for reinstallation and protected and stored until required. Material or items damaged during removal shall be replaced with similar new material or item. Any equipment that is removed without proper authorization and is required for facility operation shall be replaced at no cost to the Owner.

E. Wherever piping is to be removed for disposition, the piping shall be drained by the Contractor and adjacent pipe and headers that are to remain in service shall be blanked off or plugged and then anchored in an approved manner.

F. Materials or items demolished and not designated to become the property of the Owner or to be reinstalled shall become the property of the Contractor and shall be removed from the property and legally disposed of.

G. The Contractor shall execute the work in a careful and orderly manner, with the least possible disturbance to the public and to the occupants of the building.

H. In general, masonry shall be demolished in small sections, and where necessary to prevent collapse of any construction, the Contractor shall install temporary shores, struts, and bracing.

I. Where alterations occur, or new and old work join, the Contractor shall cut, remove, patch, repair or refinish the adjacent surfaces to the extent required by the construction conditions, so as to leave the altered work in as good a condition as existed prior to the start of the work. The materials and workmanship employed in the alterations, unless otherwise shown on the Drawing or specified, shall comply with that of the various respective trades which normally perform the particular items or work.

J. The Contractor shall finish adjacent existing surfaces to new work to match the specified finish for new work. The Contractor shall clean existing surfaces of dirt, grease, loose paint, etc., before refinishing.

K. The Contractor shall cut out embedded anchorage and attachment items as required to properly provide for patching and repair of the respective finishes.

L. The Contractor shall confine cutting of existing roof areas designated to remain to the limits required for the proper installation of the new work. The Contractor shall cut and remove insulation, etc., and provide temporary weather tight protection as required until new roofing and flashings are installed.

M. The Contractor shall remove temporary work, such as enclosures, signs, guards, and the like when such temporary work is no longer required or when directed at the completion of the work.

3.04 MAINTENANCE

A. The Contractor shall maintain the buildings, structures and public properties free from accumulations of waste, debris and rubbish, caused by the demolition and removal operations.

B. The Contractor shall provide on-site dump containers for collection of waste materials, debris and rubbish, and he shall wet down dry materials to lay down and prevent blowing dust.

C. At reasonable intervals during the progress of the demolition and removal work or as directed by the Engineer, the Contractor shall clean the site and properties, and dispose of waste materials, debris and rubbish.

## 3.05 EQUIPMENT AND MATERIALS RETAINED BY OWNER

A. Owner shall provide Contractor with a list of materials or items designated to remain the property of the Owner. All equipment and materials removed from the pump station shall be delivered to a storage location designated by the Owner, unless the Owner does not want the equipment/materials. In this case, the equipment/materials shall become the property of the Contractor and shall be properly disposed of by the Contractor.

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# SECTION 01550

# SITE ACCESS AND STORAGE

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Access Roads

1. The General Contractor shall construct and maintain such temporary access roads as required to perform the work of this Contract.

2. Access roads, where possible, shall be located over the areas of the future road system.

3. Access roads shall be located within the property lines of the Owner unless the Contractor independently secures easements for his use and convenience. Contractor shall submit written documentation to the Engineer for any Contractor secured easements across privately held property. Easement agreement shall specify terms and conditions of use and provisions for site restoration. A written release from the property owner certifying that all terms of the easement agreement have been complied by the Contractor shall be furnished to the Engineer prior to final payment.

4. Existing access roads used by the Contractor shall be suitably maintained by the Contractor at his expense during construction. Contractor shall not be permitted to restrict Owner access to existing facilities. Engineer may direct Contractor to perform maintenance of existing access roads when Engineer determines that such work is required to insure all weather access by the Owner.

5. The Contractor shall obtain and pay all cost associated with any bonds required by the Georgia Department of Transportation (GDOT) for the use of State maintained roads.

B. Parking Areas

1. Each Contractor shall construct and maintain suitable parking areas for his construction personnel on the project site where approved by the Engineer and the Owner.

C. Restoration

1. At the completion of the work, the surfaces of land used for access roads and parking areas shall be restored by each Contractor to its original condition and to the satisfaction of the Engineer. At a minimum, such restoration shall include establishment of a permanent ground cover adequate to restrain erosion for all disturbed areas.

D. Traffic Regulations

1. Contractor shall obey all traffic laws and comply with all the requirements, rules and regulations of the Georgia Department of Transportation (GDOT), and other local authorities having jurisdiction to maintain adequate warning signs, lights, barriers, etc., for the protection of traffic on public roadways.

E. Storage of Equipment and Materials

1. Contractor shall store his equipment and materials at the job site in accordance with the requirements of the General Conditions, the Supplemental Conditions, and as hereinafter specified. All equipment and materials shall be stored in accordance with manufacturer's recommendations and as directed by the Owner or Engineer, and in conformity to applicable statutes, ordinances, regulations and rulings of the public authority having jurisdiction. Where space or strip heaters are provided within the enclosure for motors, valve operators, motor starters, panels, instruments, or other electrical equipment, the Contractor shall make connections to these heaters from an appropriate power source and operate the heaters with temperature control as necessary until the equipment is installed and being operated according to its intended use.

2. Contractor shall enforce the instructions of Owner and Engineer regarding the posting of regulatory signs for loadings on structures, fire safety, and smoking areas.

3. Contractor shall not store materials or encroach upon private property without the written consent of the owners of such private property.

4. Contractor shall not store unnecessary materials or equipment on the job site, and shall take care to prevent any structure from being loaded with a weight which will endanger its security or the safety of persons.

5. Materials shall not be placed within ten (10) feet of fire hydrants. Gutters, drainage channels and inlets shall be kept unobstructed at all times.

6. Contractor shall provide adequate temporary storage buildings/facilities, if required, to protect materials or equipment on the job site.

## PART 2 -- PRODUCTS

(NOT USED)

## PART 3 -- EXECUTION

(NOT USED)

- END OF SECTION -

# SECTION 01560

# TEMPORARY ENVIRONMENTAL CONTROLS

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Dust Control

1. Contractor shall take all necessary measures to control dust from his operations, and to prevent spillage of excavated materials on public roads.

2. Contractor shall remove all spillage of excavated materials, debris or dust from public roads by methods approved by the Engineer.

3. Contractor shall sprinkle water at locations and in such quantities and at such frequencies as may be required by the Engineer to control dust and prevent it from becoming a nuisance to the surrounding area.

4. Dust control and cleaning measures shall be provided at no additional cost to the Owner.

## PART 2 -- PRODUCTS

(NOT USED)

## PART 3 -- EXECUTION

(NOT USED)

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# SECTION 01590

# FIELD OFFICE, EQUIPMENT, AND SERVICES

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Resident Representative's Field Office

1. The Contractor shall provide and maintain field office space for the exclusive use of the Engineer. The facilities shall be available for his use during the entire life of the Project and shall not be disturbed, moved, or interrupted without the Engineer's approval. The office shall be a separate room containing at least 100 square feet of floor area, sealed from the weather, completed and ready for occupancy within thirty (30) days following the Notice to Proceed with the Project. The office shall be erected on a location approved by the Engineer. The Contractor shall arrange for the office to be cleaned at least one (1) time every week in a manner satisfactory to the Engineer.

2. All doors and windows shall be equipped with locking devices to prevent unauthorized entry, and all keys to the door locks shall be loaned to the Engineer for his use during the life of the project. The office shall contain adequate heating, air conditioning, and ventilating facilities. Adequate electric lights shall be provided with a wall receptacle on each of the four walls. Functional, totally enclosed water closet and lavatory shall be provided. An individual, direct-line telephone service, fax, and DSL shall be located as directed for the exclusive use of the Engineer. DSL, Fax, Telephone service for all calls relation to the Work including long distance, all heat, light, water, and sanitary facilities shall be furnished and paid for by the Contractor.

3. A 24-inch by 36-inch plywood sign shall be erected on the outside wall of the field office in a location determined by the Engineer. The sign shall be painted white with blue, 3-inch high lettering, neatly arranged as follows:

Field Office
HAZEN AND SAWYER, P.C.
ENVIRONMENTAL ENGINEERS AND SCIENTISTS
ATLANTA, GEORGIA

4. The following office furniture and equipment shall be furnished:

| | |
|---|---|
| 1 | Flat top desk, 2-1/2 x 5 feet, with drawers at each end |
| 1 | Plywood drawing table, 3 feet x 6 feet tilt top with drafting stool |
| 2 | Straight chairs |
| 1 | Four-drawer, legal size steel filing cabinet with lock and key |
| 1 | Large metal waste basket |
| 1 | Rack from which to hang drawings, including related appurtenances |
| 1 | Electric water cooler with bottle water supply and disposable drink cups |
| 1 | Bookcase with 3 shelves, 3 feet long |

1 18-inch square by 6-foot high locker
1 Tilt/swivel type desk chair
1 Telephone
1 Telecopier

5. On completion of the project, the field office shall be removed from the site.

6. Engineer's office may be located within the Contractor's field office.

B. Contractor's Field Office

1. The Contractor shall furnish, equip, and maintain a field office at the site of a size required for his operations and the Engineer's office as described in Article 1.01, Paragraph A. The Contractor shall provide his own telephone service and shall have readily accessible at the field office, copies of the Contract Documents, latest approved Shop Drawings, and all field Project related correspondence, Change Order, etc.

C. Project Sign and Sign Panel

1. The General Contractor shall erect a sign at the Project site identifying the Project. The sign shall be erected within twenty-one (21) days after the Notice to Proceed and shall be in accordance with the Specifications and details included in this Section. The project sign and sign panel shall be furnished, erected, and maintained by the Contractor at the location designated by the Engineer. Wording and colors shall be as shown on the detail at the end of this Section.

2. The project sign shall be fabricated, erected and maintained by the Contractor in accordance with the following specifications:

a) Sign Panel: The sign panel shall be constructed of 3/4-inch minimum thickness marine plywood rabetted into a 2-inch x 4-inch wood frame. All fasteners used in the construction of the sign shall be of a rustproof nature.

b) Painting: All supports, trim and back of the sign panel shall be painted with at least two (2) coats of the same paint used for the sign face. All paint used shall be exterior grade paint, suitable for use on wood signs.

c) Sign Supports: The supports for the project sign shall be at least two 4-inch by 4-inch treated wood posts. The sign panel shall be securely fastened to the sign supports with at least six (6) 3/8-inch diameter galvanized bolts, nuts, and washers. The positioning and alignment of the sign shall be as determined by the Engineer.

d) Maintenance: The project sign shall be maintained by the Contractor, in good condition, at all times, for the duration of construction.

e) Removal of Sign from Project Site: The removal of the project sign from the construction site by the Contractor shall be at the completion of construction, when ordered by the Engineer.

f) Payment: The cost of the fabrication, erection, maintenance, and removal of the project sign, including all labor and materials, shall be included in the Contractor's Lump Sum Bid. No extra payment will be made for obliterating certain names and offices and replacement thereof of others because of administrative changes during the course of this Contract.

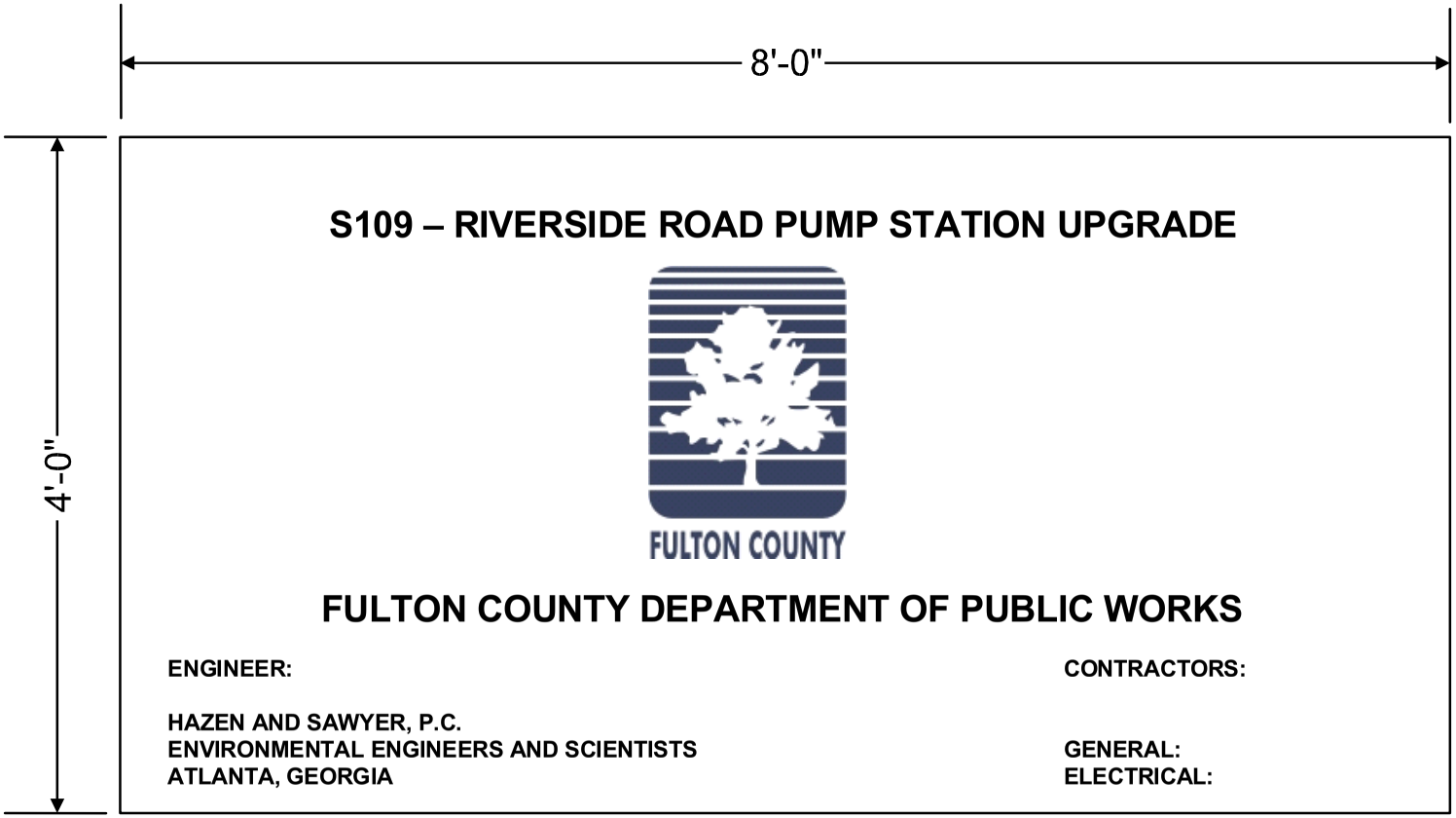
PART 2 -- PRODUCTS

(NOT USED)

PART 3 -- EXECUTION

(NOT USED)

- END OF SECTION -




1. **Provide black letters on white background.**

2. **Use of ½" duraply signboard with vinyl lettering will be acceptable as an alternate to plywood and painted letters.**

# SECTION 01600

# MATERIALS AND EQUIPMENT

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Furnish and Install

1. Where the words "furnish", "provide", "supply", "replace", or "install" are used, whether singularly or in combination, they shall mean to furnish and install, unless specifically stated otherwise.

2. In the interest of brevity, the explicit direction "to furnish and install" has sometimes been omitted in specifying materials and/or equipment herein. Unless specifically noted otherwise, it shall be understood that all equipment and/or materials specified or shown on the Drawings shall be furnished and installed under the Contract as designated on the Drawings.

B. Concrete Foundations for Equipment

1. Each Contractor shall provide all concrete foundations shown, specified or required for all equipment furnished under their respective Contract.

2. Anchor bolts and templates for equipment foundations shall be furnished under the respective Contracts for installation by the respective Contractor. The General Contractor shall cooperate with the respective Contractors to secure a satisfactory installation and to maintain the schedule of construction.

3. All concrete foundations for equipment shall be treated, by the respective Contractor, with an approved sealer to prevent oil from seeping into the concrete.

### 1.02 EQUIPMENT AND MATERIALS

A. All equipment, materials, instruments or devices incorporated in this project shall be new and unused, unless indicated otherwise in the Contract Documents. Equipment and materials to be incorporated into the work shall be delivered sufficiently in advance of their installation and use to prevent delay in the execution of the work, and they shall be delivered as nearly as feasible in the order required for executing the work.

B. The Contractor shall protect all equipment and materials from deterioration and damage, including provisions for temporary storage buildings as needed and as specified in Section 01550, Site Access and Storage. Storage of equipment and materials shall be in locations completely protected from flooding, standing water, excessive dust, falling rock, brush fire, etc. Storage areas shall be located sufficiently distant from all construction activities and the movement of construction vehicles to minimize the potential for accidental damage. Any equipment or materials of whatever kind which may have become damaged or deteriorated from any cause shall be removed and replaced by good and satisfactory items at the Contractor's expense for both labor and materials.

## 1.03 INSTALLATION OF EQUIPMENT

A. Equipment and materials shall be installed in accordance with the requirements of the General Conditions, Supplemental Conditions and the respective Specification Sections.

B. Concrete foundations for equipment shall be of approved design and shall be adequate in size, suitable for the equipment erected thereon, properly reinforced, and tied into floor slabs by means of reinforcing bars or dowels. Foundation bolts of ample size and strength shall be provided and properly positioned by means of suitable templates and secured during placement of concrete. Foundations shall be built and bolts installed in accordance with the manufacturer's certified drawings.

C. Before mounting equipment on a foundation, the Contractor shall clean the top surface; if necessary, rough it with a star chisel and clean again; and clean out all foundation bolt sleeves. The Contractor shall provide a sufficient number of steel plate shims about 2-inches wide and 4-inches long, and of a varying thickness from 1/8 to 1/2-inch. A combination of these shims shall be placed next to each foundation bolt to bring the bottom of the bedplate or frame about 1/8-inch above the final setting. The equipment shall be lowered by changing the combination of shims. Using brass shim stock of various thicknesses, continue to level the equipment a little at a time and in rotation until it is at the correct elevation in both directions. When the equipment is level, tighten down on the foundation bolts a little at a time in rotation to make certain the equipment remains level and does not shift on the shims. A preliminary alignment check shall be made before grout is placed.

D. Equipment shall be set, aligned and assembled in conformance with manufacturer's drawings or instructions. Run out tolerances by dial indicator method of alignment shall be plus or minus .002-inches, unless otherwise approved by the Engineer.

E. All blocking and wedging required for the proper support and leveling of equipment during installation shall be furnished by the Contractor. All temporary supports shall be removed, except steel wedges and shims, which may be left in place with the approval of the Engineer.

F. Each piece of equipment or supporting base, bearing on concrete foundations, shall be bedded in grout. The Contractor shall provide a minimum of 1-1/2-inch thick grouting under the entire baseplate supporting each pump, motor drive unit and other equipment. Grout shall be non-shrink grout, as specified under Section 03600, Grout.

G. When motors are shipped separately from driven equipment, the motors shall be received, stored, meggered once a month, and the reports submitted to the Engineer. After driven equipment is set, the motors shall be set, mounted, shimmed, millrighted, coupled and connected complete.

## 1.04 CONNECTIONS TO EQUIPMENT

A. Connections to equipment shall follow manufacturer's recommendations as to size and arrangement of connections and/or as shown in detail on the Drawings or approved Shop Drawings. Piping connections shall be made to permit ready disconnection of equipment with minimum disturbance of adjoining piping and equipment.

B. The Electrical Contractor or General Contractor if no electrical contract exists shall be responsible for bringing proper electrical service to each item of equipment requiring electrical service as shown on the Drawings or approved Shop Drawings. Electrical connections to equipment requiring electrical service shall be made by the Electrical Contractor, unless otherwise indicated on the Drawings or in the Technical Specifications.

C. The HVAC Contractor or General Contractor if no HVAC Contract exists shall bring and connect HVAC service to all equipment items requiring same as shown on the Drawings. Electrical connections to equipment requiring electrical service shall be made by the Electrical Contractor, unless otherwise indicated on the Drawings or in the Technical Specifications.

D. The Plumbing Contractor or General Contractor if no plumbing contract exists shall bring and connect plumbing service to all equipment items requiring same as shown on the Drawings.

1.05 SUBSTITUTIONS

A. Reference Section 01630 – Substitutions and Product Options.

PART 2 -- PRODUCTS

(NOT USED)

PART 3 -- EXECUTION

(NOT USED)

- END OF SECTION -

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# SECTION 01630

# SUBSTITUTIONS AND PRODUCT OPTIONS

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. This Section sets forth the procedures and requirements for substitutions and defines the product options available to the CONTRACTOR.

B. The CONTRACTOR may supply any of the materials specified or offer an equivalent. The ENGINEER will determine whether the material offered is equivalent to that specified.

C. Requests for Substitutions must be submitted within the time frame stipulated and prior to starting the Work, so as not to cause any delay in completion of the Project. No other Requests for Substitutions will be considered after expiration of the period specified, except that in exceptional cases, where it is determined to be in the best interest of the OWNER, as approved by the ENGINEER.

D. The CONTRACTOR agrees to pay for all engineering and design services, if required, to make all changes and adjustments in material and work of all trades directly or indirectly affected by the substitute, to the satisfaction of the ENGINEER, at no additional cost to the OWNER.

E. Any revision to structures, piping, mechanical, electrical, instrumentation, or any other work made necessary by such substitution must be approved by the ENGINEER, and the entire cost both direct and indirect of these revisions shall be borne by the CONTRACTOR.

F. The specified Contract completion time is not to be affected by any circumstance developing from the provisions of this Section.

G. If the ENGINEER determines that a substitute offered by the CONTRACTOR is not equal to the specified material, the CONTRACTOR shall then furnish and install the specified material.

H. The ENGINEER'S findings shall be final.

I. Installation and use of substitute items shall not be made until approved by the ENGINEER.

### 1.02 DEFINITIONS

A. "Substitute Item": A product, material, or manufacturer offered as a replacement to the specified product, material, or manufacturer.

B. "Basis of Design": The first-named product, material, or manufacturer specified by brand or trade name and model number is the basis for the Project design.

C. “Equivalent”: Means the proposed substitution has the same function, design, performance, materials, construction, workmanship, finishes, overall quality, operating features, ease of maintenance, reliability, service life warranty terms, local service facilities, and any other salient feature.

1.03 CONTRACTOR’S OPTIONS

A. General:

1. Whenever a product is identified in the Bidding Documents by reference to manufacturers or vendors names, trade names, catalog numbers, etc., it is intended only to denote the quality standard of product desired and that they do not restrict Bidders to a specific brand, make, manufacturer or specific name. These listings and citations are used only to set forth and convey to Bidders the general style, type, character and quality of product desired. Equivalent products will be acceptable, subject to the substitution provisions of this Section.

2. Whenever a product specification includes minimum experience requirements which the manufacturer selected by the CONTRACTOR cannot meet, the manufacturer shall furnish the OWNER with a cash deposit, or bond acceptable to the OWNER in an amount equal to the cost of the product, which shall remain in effect until the experience requirement has been met.

B. No substitutions will be considered for the manufacturers listed in the Bid Form except as listed below:

1. The specified product is unavailable through no fault of the CONTRACTOR;

2. Subsequent information discloses that the specified product is unable to perform properly;

3. Manufacturer or fabricator refuses to certify or guarantee performance of specified product, as required; or

4. Substitution saves substantial cost, time or other considerations. Show accurate cost data on proposed substitution in comparison with product or method specified or backup documentation from the manufacturer pertaining to delivery times.

C. Products, materials, or equipment specified by both brand or trade name and model number are approved for use, provided that specified item meets all specification requirements. Specification of a product, material, or equipment by brand or trade name and model number is not a representation or warranty that the product, material, or equipment can be used without modification to meet the requirements of the plans and specifications. Products, materials, and equipment may be specified with optional features that are not standard. CONTRACTOR shall, at his sole cost, modify such products, material, or equipment so that they comply with all requirements of the Contract Documents.

D. If the term “OR PRE-APPROVED EQUAL” follows the name(s) of acceptable manufacturers in the specifications, then Bidders may submit product information from other manufacturers desiring approval as an acceptable manufacturer to the ENGINEER

for approval during the Bidding phase, as indicated herein. An equivalent product, equipment, or material, may be submitted for substitution provided a Request for Substitution, as set forth in this Section, is submitted for any product not specifically named.

E. When products, equipment, and materials, are specified by brand or trade name and are followed by the words “OR EQUAL,” an equivalent product, equipment or material may be submitted for substitution. The CONTRACTOR must submit a Request for Substitution, as set forth in this Section, for any product not specifically named.

F. When products, materials, or equipment are specified by naming only one (1) product and manufacturer followed by the words “NO SUBSTITUTIONS” or words of similar meaning, there is no option and no substitutions will be allowed.

G. Where no specific product, material, or manufacturer is specified in the Contract Documents, any product, material, or manufacturer can be submitted, provided the submitted item meets the specified requirements. This is not considered a substitute.

1.04 EVALUATION OF PROPOSED SUBSTITUTIONS

A. Approval of a substitution as an acceptable product, material, or equipment by the ENGINEER is dependent on the determination that the product offered is essentially equivalent to the specified item.

B. The party requesting the substitution has the burden of demonstrating, through the procedures specified herein, that the proposed substitution is equivalent to, or superior to, the first-named product, material, or equipment, and complies with all other requirements of the Contract Documents. If revisions or modifications to the design or construction of the work are necessitated by the use of the substitution, the party requesting the substitution also has the burden of demonstrating, through the procedures specified herein, that the use of the substitution will not be detrimental to the quality, utility or appearance of the Work, or any portion thereof.

C. In reviewing the supporting data submitted for substitutions, the ENGINEER will use, for the purposes of comparison, all of the characteristics of the specified material or equipment as they appear in the manufacturer’s published data even though all the characteristics may not have been specifically mentioned in the Specifications.

D. The ENGINEER may refuse to approve any requested substitution where, in the reasonable opinion of the ENGINEER, the party requesting the substitution has failed to demonstrate, through the procedures specified herein, that the proposed substitution is equivalent to, or superior to, the first-named product, material or equipment, in quality, utility, and appearance and that the proposed substitution complies with all other requirements of the Contract Documents.

E. Substitutions will not be considered if:

1. A Substitution Request Form is not provided;

2. The substitution is indicated, or implied, on shop drawings or product data submittals without a formal request submitted in accordance with this Section;

3. Acceptance will require significant modifications to site general arrangement, structures, mechanical systems, electrical systems, or instrumentation and control systems;

4. In the ENGINEER'S judgment, the product, material, or equipment is not equivalent.

1.05 PROCEDURE – GENERAL

A. In making a Request for Substitution, the party requesting the substitution represents:

1. That the proposed product or method has been investigated and determined to be equivalent or superior to in all respects to the product specified;

2. It has been verified that the item being furnished will fit in the space allowed, perform the same functions and have the same capabilities as the item specified;

3. That the same guarantee will be provided for the substitution as for the product or method specified;

4. Installation of accepted substitutions will be coordinated into the Work, making such changes as required to the Work so it is complete in all respects;

5. All claims for additional costs related to the substitution, which consequently become apparent, will be waived.

6. The cost data is complete and includes all related costs under the Contract.

a. Include in its Bid the cost of all accessory items which may be required by the other listed substitute product;

b. Include the cost of any architectural, structural, mechanical, piping, electrical or other modifications required; and

c. Include the cost of required additional work by the ENGINEER, if any, to accommodate the item.

B. The party requesting the substitution shall, at their expense, furnish data concerning items offered by it as equivalent to those specified. The party requesting the substitution shall have the material tested as required by the ENGINEER to determine that the quality, strength, physical, chemical, or other characteristics, including durability, finish, efficiency, dimensions, service, and suitability are such that the items will fulfill its intended function.

C. Test methods shall be subject to the approval of the ENGINEER. Test results shall be reported promptly to the ENGINEER, who will evaluate the results and determine if the substitute items are equivalent.

1.06 PROCEDURE "PRE-APPROVED EQUAL" ITEMS

A. If a product, material, or piece of equipment is designated aas a "PRE-APPROVED EQUAL" item in the Bidding Documents, then a Request for Substitution of the product,

material or piece of equipment, may be submitted by a bidder by the deadline specified in the Bidding Documents. Because of time constraints, only one submittal will be allowed for each such substitution request. Requests for substitutions of products, material or equipment designated for evaluation prior to award may not be made after the deadline specified in the Bidding Documents, and such requests shall not be considered unless the request and supporting data is submitted on or before the deadline specified in the Bidding Documents.

B. Bidders shall include the following information in any Request for Substitution for "PRE-APPROVED EQUAL" submittal:

1. Completed Substitution Request Form (attached at the end of this Section);

2. Descriptive literature including information on materials utilized, minimum design standards, standard design features, manufacturing processes and facilities, and similar information which will indicate experience and expertise in the manufacture of the product being evaluated.

3. Performance specifications applicable to the manufacturer's standard design which indicates the level of performance to be expected from the product.

4. A complete set of submittal drawings of similar products which have been completed and placed into operation.

5. A list of existing installations of products similar in type and size, information required to satisfy specified experience requirements, or a copy of the bond to be submitted in lieu of experience.

6. Evidence of technical ability of the manufacturer to design and manufacture products meeting Project requirements.

7. Evidence submitted shall include, as a minimum, descriptions of engineering and manufacturing staff capabilities.

8. A copy of the manufacturer's most recent annual business report. Include a statement comparing the present net worth of the manufacturer in comparison to the total value of all products proposed to be furnished. Net worth must exceed the total value of all products proposed.

9. A complete description of field service capabilities, including the location of field service facilities which would serve the proposed facility and the number and qualifications of personnel working from that location.

10. A complete list of all requirements of the Contract Documents with which the manufacturer cannot conform, including reasons why alternate features are considered equivalent.

11. If descriptive literature or drawings illustrate standard products with design features or materials not in compliance with Project requirements then these exceptions must be specifically listed. Failure to do so will indicate intent by the manufacturer to modify design features and alter materials to meet Project requirements.

12. Where additional information is submitted to supplement the submittal, all changes to the list of exceptions shall be specifically noted.

C. Submittals which do not include a complete list of exceptions to Project requirements, or the statement “No exceptions to the Specifications will be taken”, will automatically be rejected by the ENGINEER.

D. Bids based on products which have not received the approval of the ENGINEER may be determined non-responsive by the OWNER and rejected.

1.07 PROCEDURE – “OR EQUAL” ITEMS

A. All requests for substitution for “OR EQUAL” items are to be made through the CONTRACTOR. Submissions by the CONTRACTOR shall imply the CONTRACTOR’S approval of such substitution.

B. Substitute items will be considered after the Bid only if the term “OR EQUAL” follows the names of acceptable manufacturers in the Specification.

C. Contractor shall submit a completed Substitution Request Form and complete data substantiating compliance of proposed substitutions with the Contract Documents. Contractor shall submit shop drawings on the substitute item for the ENGINEER’S review in accordance with the Section 01300 and as follows:

1. For products, materials, or equipment:

a. Complete technical data including drawings, performance specifications, samples, and test reports of the item proposed for substitution;

b. Product identification including Manufacturer’s name and address;

c. Manufacturer’s literature: Product description, performance and test data and reference standards;

d. Samples (when requested); and

e. Name and address of similar projects where product was used and the date of installation.

2. For construction methods:

a. Detailed description of proposed method.

b. Drawings illustrating methods.

3. Itemized comparison of proposed substitutions with product or method specified.

4. Data relating to changes in construction schedule.

5. Accurate cost data on proposed substitution in comparison with product or method specified.

6. Statement by CONTRACTOR that the proposed substitution is in full compliance with the requirements of the Contract Documents and Applicable Code Requirements.

7. List of Subcontractors, if any, that may be affected by the substitution.

8. CONTRACTOR prepared specifications and drawings, including design and engineering calculations, prepared by an appropriately licensed professional, depicting all revisions and modifications to the design and construction of the Work necessitated by the use of the substitution. If no revisions or modifications are necessary, submit a written statement that no revisions or modifications to the design or construction of the Work are necessitated by the use of the product, material, or equipment.

D. If the ENGINEER, in reviewing a proposed substitution, notes that revisions or corrections need to be made to previously accepted shop drawings and/or supplemental supporting data, CONTRACTOR shall do so within 30 days of being notified that re-submittals are required. A proposed substitution may be rejected if CONTRACTOR fails to submit such revisions, corrections, or supplemental supporting data within the specified time period.

E. Except for products, material or equipment designated in the Bidding Documents as "PRE-APPROVED EQUAL" items, Requests for Substitution, including the data required by Paragraph 1.07 C., must be submitted to the ENGINEER no later than 45 days after the date of the Notice to Proceed. No Requests for Substitutions of products, materials, or equipment, subject to the 45-day deadline will be considered unless the request and supporting data is submitted on or before the deadline.

PART 2 -- PRODUCTS

(NOT USED)

PART 3 -- EXECUTION

(NOT USED)

- END OF SECTION -

Request for Substitution Form follows on next page

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## REQUEST FOR SUBSTITUTION FORM

TO: _____

PROJECT NAME: _____

CONTRACT NUMBER: _____

BIDDER/CONTRACTOR: _____

MANUFACTURER: _____

We submit for consideration the following product instead of the specified item.

| SECTION | PARAGRAPH | SPECIFIED ITEM |
|---|---|---|
| _____ | _____ | _____ |

PROPOSED SUBSTITUTION: _____

_____

_____

*Attach and submit:*

- Complete dimensional information and technical data, including laboratory tests if applicable.
- Complete information on changes to Drawings and Specifications which the proposed substitution will require for its proper installation.
- All necessary samples and substantiating data to prove equal quality and performance to that which is specified. Clearly mark manufacturer's literature to indicate equality in performance. Indicate differences in quality of materials and construction.

*Fill in the blanks below:*

1. Does the substitution affect the civil, structural, mechanical, electrical, or instrumentation and control design?
   Yes ___ No ____ If yes, clearly describe the necessary design changes to accommodate the substitution changes (attach shop drawings as necessary to clearly illustrate the requested changes.)

2. Will the proposed substitution reduce the Bid/Contract amount?
   Yes _____ No _____ If yes, provide a detailed cost comparison between the substitution and the first named manufacturer.

3. What effect does the substitution have on other trades, other contracts, and the contract completion date?

4. What effect does the substitution have on Code requirements?

5. Describe the differences between the proposed substitution and specified items:

6. Compare the manufacturer's guarantees of the proposed substitution and specified items.
   Same: _____ Different: _____ (explain)

Submitted by (signature): _____

Name and title (printed): _____

Firm Name: _____

Address: _____

_____

Telephone: _____ Date: _____

# SECTION 01650

# FIELD TESTING

## PART 1 – GENERAL

### 1.01 SECTION INCLUDES

A. Field testing equipment and systems.

### 1.02 THE REQUIREMENTS

A. Provide field testing in compliance with the following requirements for procedures and schedules.

B. Approval of the field tests is a prerequisite for obtaining payments in excess of 95 percent for the equipment furnished.

### 1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01300 – Submittals

B. Section 01400 – Quality Control

C. Section 01700 – Project Closeout

### 1.04 PRELIMINARY CHECKINGS

A. The following operations, to be conducted in the presence of the Engineer, are a prerequisite for the Field Tests:

1. Set, align, and assemble all equipment and systems in conformance with the manufacturer's drawings and instructions.

2. Check direct coupled shafts with flexible or rigid couplings for parallel and angular misalignment using dial indicators. Maximum allowable misalignment in either direction shall be 0.002-inch unless otherwise directed, or specified by the manufacturer

3. Check alignment and realign as necessary after all piping connections to equipment are made.

4. Check equipment for proper rotation.

5. Check motor for no-load current draw.

6. Run the equipment dry if applicable and check equipment for excessive vibration and noise.

B. Equipment Checkout Records

1. When the checkout operations have been completed, Contractor shall transmit to the Engineer his Equipment Checkout Record with all pertinent data from the checkings.

2. The Equipment Checkout Record will not be valid if not initialed by the Witnessing Engineer.

3. Field Tests will not be initiated if valid Equipment Checkout Records have not been prepared and approved beforehand for the equipment to be tested.

1.05 FIELD TESTS OF EQUIPMENT AND SYSTEMS

A. Definition of System: A system for purposes of testing is defined as the components, equipment, valves, piping, instrumentation, ducts, etc. which are so related as to form a complete unit.

B. Scope of System Testing: System testing is required to demonstrate that the equipment, interconnections, and accessories perform as specified. In addition to specific requirements called for in the specific Sections of the Technical Specifications, the following are to be considered a part of all system test procedures:

1. Variable capacity equipment is to be operated over the full capacity range and at a minimum of 3 intermediate points for at least 30 minutes at each point.

2. Multiple equipment groupings are to be operated both singly and together up to the maximum capacity of the system. The timing of maximum capacity tests shall be coordinated with the Owner at least seven (7) days in advance.

3. Headered and cross-connected groups of units are to be operated using all connecting combinations.

4. All equipment items, including standby units are to be tested. It may be necessary to repeat system tests at maximum condition to insure that standby units are included in system tests.

5. Each operating unit shall be run for at least one hour alone (equipment field test) and for four hours as a system at maximum capacity after reaching stable operating conditions.

6. All equipment, interconnecting piping, and accessories are to be checked for leakage and specified rate performance capability. Instrumentation and controls shall be tested as part of the equipment they relate to.

C. Field Tests

1. Preliminary Field Tests: These tests shall be made with water and/or air.

a. Preliminary Field Tests of Equipment: Shall prove that equipment and appliances meet their operating cycles and are free from defects such as overheating, overloading, and undue vibration.

b. Preliminary Field Tests of Systems: Shall prove that all equipment and appurtenances of each system are properly installed, free from defects, meet their specified operating cycles and characteristics when operating as part of the system.

2. Final Field Tests: These tests shall be made with water and/or air.

a. Final Field Tests of Equipment: Shall prove that equipment and appliances meet their operating cycles and are free from defects such as overheating, overloading, and undue vibration.

b. Final Field Tests of Systems: Shall prove that all equipment and appurtenances of each system are properly installed, free from defects, meet their specified operating cycles and characteristics when operating as part of the system.

3. Intersystem Field Tests: Scope is to test the process. Tests shall prove that the system equipment and appurtenances meet their operating cycles and characteristics as specified for the process.

a. Test the entire process with either water or air.

b. Operate the equipment as a unit with all related piping, valves, ducting, electrical controls, instrumentation and mechanical operation.

4. Training period shall not begin until all field testing is completed, including successful completion of final field test for the continuous period of time as specified in PART 3. All punch list items shall be completed prior to start of training period. No training shall take place on defective or malfunctioning equipment.

D. Successful Tests: For a successful test of equipment or system the equipment or system shall operate trouble free for a continuous period of time as specified in PART 3. If there are any interruptions in operation during the test, the test shall be repeated until the equipment or system operates trouble free for the specified time period.

E. Contractor's, Manufacturer's, Engineer's and Owner's Responsibilities

1. Contractor

a. Prepare and submit Testing Plans 60 days prior to the scheduled field test, which will include the testing procedure, schedule, and manpower requirements for all equipment items and systems in accordance with Section 01300, Submittals.

b. Coordinate with equipment manufacturers to ensure presence of representatives during testing.

c. Furnish all labor, unskilled and skilled, necessary for testing.

d. Ensure the presence of manufacturer(s) representative(s) as required.

e. Provide lubricants, fuel and chemicals as required for testing.

f. Conduct tests.

g. Prepare and submit Field Test Reports in accordance with Section 01300, Submittals.

2. Manufacturer:

a. Provide the services of qualified factory trained representatives of the equipment manufacturers for all equipment furnished under this Contract.

b. Supervise and assist in the installation of the equipment to ensure a proper installation of the equipment.

c. Check the installation of the equipment and make all necessary adjustments prior to placing the equipment in service.

d. Supervise the preliminary and final equipment and system field test.

3. Engineer

a. Review and approve Testing Plans.

b. Witness all tests.

c. Certify test results.

d. Review Field Test Reports.

e. Approve Field Test Reports.

4. Owner

a. Provide power, water, and other process materials, and instrument air, as hereinafter specified.

b. Observe tests.

c. Provide personnel as required for training.

F. Conduct of Tests: Contractor shall conduct the tests and be responsible for all decisions made.

G. Contractor's Liabilities: Contractor shall be liable for, and shall neither have nor make any claim for:

1. Accidents occurring to any person during the tests

2. Improper operation of equipment during tests and instruction periods;

3. Any damage which may occur to equipment prior to the time when the Owner

formally takes over the operation thereof

H. Support by Unskilled and Skilled Labor: Contractor shall ensure, at no additional cost to the Owner, and for the whole duration of the test, prompt assistance by Mechanics, Plumbers, Electricians, etc, as required, and supervision, adjustment and tuning of equipment as well as materials, instruments, equipment, etc. Overtime wages, if necessary, shall be paid by the Contractor.

I. Testing Schedule

1. Perform all testing within the time periods designated in the construction schedule (CPM) during regular weekday daytime working hours.

2. Submit a Field Testing Schedule within 90 days after the Notice to Proceed.

3. Update the Field Testing Schedule every two months, or sooner if necessary, until completion of the required testing.

4. Submit two copies of the Field Testing Schedule not later than one month before the commencement of the tests.

5. Content of Testing Schedule

a. Proposed test dates

b. Preliminary or final field test, equipment or system being tested

c. Specification references

d. Equipment identification numbers

e. An indication of whether the Testing Plan has been submitted for approval and approved status

J. Permission to Proceed: Contractor shall not proceed with any testing until the Testing Plan has been approved by the Engineer. The Witnessing Engineer will personally authorize the start of a test.

K. Presence of Manufacturer's Representative(s): This is a prerequisite for the tests. No test shall be performed in the absence of the Manufacturer's Representative, who shall ensure his/her presence for the whole duration of the test.

L. Test Procedure and Manpower Schedule

1. Approved Testing Plans for the tests of each equipment item or system are a prerequisite for the Field Tests

2. Prepare and submit two copies of each Testing Plan not later than two weeks before the date of the test.

3. Manpower requirements, to be attached to each Testing Plan, shall specify number and qualifications of people to be present for the manufacturer(s)

(manufacturer's representatives) and for the Contractor (unskilled and skilled labor).

M. Field Test Reports: Test Report Forms will be prepared by the Engineer for the Preliminary and Final Field Tests. These forms shall be used by the Contractor for data recording and notes during the tests. When the tests have been completed and accepted by the Engineer, the Contractor shall sign the Field Test Report; the Witnessing Engineer will initial the report and take it with him/her for an analysis of the test data.

N. Test Failure

1. Correction of Defects and Repetition of the Tests: Any defects in the equipment or failure to meet the guarantees or performance requirements of the Specifications shall be promptly corrected by the Contractor by replacements or otherwise. The test shall be repeated as directed. Resulting time delays and additional expenses shall be accrued to the Contractor.

2. Rejection of Equipment

a. If the Contractor fails to make the corrections called for in the above Paragraph 1, or if the improved equipment fails again to meet the guarantees or specified requirements, the Owner, notwithstanding his having made partial payment for work and materials which have entered into the manufacture of said equipment, may reject said equipment and order the Contractor to remove it from the premises at the Contractor's expense.

b. Bill of Sale: In case the Owner rejects equipment, then the Contractor shall repay to the Owner all sums of money paid to him for said rejected equipment on progress certificates or otherwise on account of lump sum prices. Upon receipt of said sums of money, the Owner will execute and deliver to the Contractor a Bill of Sale of all his rights, title, and interest in and to said rejected equipment; provided, however, that said equipment shall not be removed from the premises until the Owner obtains from other sources other equipment to take the place of that rejected. Said bill of sale shall not abrogate Owner's right to recover damages for delays, losses, or other conditions arising out of the basic contract.

O. Costs

1. All costs in connection with field testing of equipment and systems, such as light, lubricants, instruments, chemicals, labor, equipment, etc., shall be borne by the Contractor.

2. All extra costs related to testing performed after regular working hours, or related to repetition of failed tests, including but not limited to overtime, food, and transportation, shall be borne by the Contractor.

## PART 2 - PRODUCTS

(NOT USED)

## PART 3 - EXECUTION

### 3.01 PRELIMINARY FIELD TESTS

A. Preliminary Field Tests of Equipment: A successful test shall consist of at least one continuous hour, or longer if so specified, of trouble free operation.

B. Preliminary Field Tests of Systems

1. Test all systems by operating the systems equipment together as a unit with all related piping, valves, electrical controls, and mechanical operations.

2. For a successful test, run each system with water and air trouble free for four continuous hours.

### 3.02 FINAL FIELD TESTS

A. Final Field Tests of Equipment: A successful test shall consist of at least one continuous hour, or longer if so specified, of trouble free operation.

B. Final Field Tests of Systems

1. Test all systems by operating the equipment as a unit with all related piping, valves, ducting, electrical controls, instrumentation, and mechanical operation.

2. For a successful test, run each system trouble free for seven (7) consecutive days.

### 3.03 INTERSYSTEM FIELD TESTS

A. Test the process by operating the equipment as a unit with all related piping, valves, ducting, electrical controls, instrumentation, and mechanical operation. The tests shall prove that the system equipment and appurtenances are properly installed, free from defects, meet their operating cycles and characteristics as specified for the process.

B. For a successful test, run related groups of systems trouble free for seven (7) consecutive days.

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# SECTION 01660

# EQUIPMENT TESTING AND STARTUP

## PART 1 -- GENERAL

### 1.01 GENERAL

A. Equipment testing and startup are requisite to satisfactory completion of the Contract and, therefore, shall be completed within the Contract time.

B. As construction of the project enters the final stages of completion, the Contractor shall, in accordance with the requirements set forth in the Contract Documents, attend to the following items:

1. Complete all Punch List items required by the Engineer prior to startup.

2. Schedule equipment manufacturer's visits to site.

3. Calibration of instruments and controls.

4. Perform required testing, adjusting, and balancing of project components.

5. Complete all Punch List items that result from testing.

6. Schedule and coordinate training and testing activities.

7. Furnish skilled personnel from manufacturers and suppliers during training and testing activities.

8. Furnish operation and maintenance training for Owner’s personnel.

9. Successfully demonstrate reliable operation of project systems.

### 1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01300 – Submittals

B. Section 01700 – Project Closeout

### 1.03 DEFINITIONS

A. Facility Startup: Includes putting Project in operating order, cleaning, adjusting, and balancing equipment, initial operation (startup) of equipment items, operating equipment, starting systems, operation of systems, testing of equipment and systems, completing required punch list items, and demonstration and verification of the completed facility as a unit.

B. Functional Test: A test or tests in the presence of the Engineer and/or Owner to demonstrate that the installed equipment or system meets manufacturer’s installation and adjustment requirements and other requirements specified including, but not limited to,

noise, vibration, alignment, speed, proper operation of electrical, mechanical, and information and control equipment, thrust restraint, proper rotation, and initial servicing.

C. System Performance Test: A test performed in the presence of the Engineer and/or Owner after satisfactory completion of required functional testing, to demonstrate and confirm that the equipment and/or system meet the specified performance requirements for a specified minimum operation period without significant interruption. System performance testing shall not begin until the following are completed:

1. The Contractor has submitted written test reports, installation reports, and performance affidavits as required in the Contract Documents.

2. The Contractor has completed all punch list items.

3. The Contractor has completed all functional testing.

D. Operation Period: The operation period for the Pump Station system Performance Test shall be one (1) consecutive calendar week without significant interruption.

E. Significant Interruption: May include any of the following events:

1. Failure of Contractor to maintain qualified onsite startup personnel as scheduled.

2. Failure to meet specified performance for more than two (2) consecutive hours.

3. Failure of any critical equipment unit, system, or subsystem that is not satisfactorily corrected within five (5) hours after failure.

4. Failure of noncritical unit, system, or subsystem that is not satisfactorily corrected within eight (8) hours after failure.

5. As may be determined by Engineer.

F. System: The overall process, or a portion thereof, that performs a specific function. A system may consist of two or more subsystems as well as two or more types of equipment. The “System” shall be as determined by the Engineer.

G. Training: The services provided by the Contractor and his equipment supplier to ensure that the Owner’s staff is completely prepared to operate and maintain the contract facilities. Training shall include classroom instruction, as well as “hands-on” field/equipment demonstration, operation, and maintenance. Equipment/Contract facilities shall be 100 percent “operational” (as defined by the Engineer) during training activities.

1.04 CONTRACTOR’S RESPONSIBILITIES

A. The Contractor shall designate and furnish one or more persons to be responsible for coordinating and expediting Contractor’s facility startup, testing, and training duties. The person or persons shall be present during Facility Startup, Functional Testing, and Training meetings and shall be available at all times during the Facility Startup and training period. In addition, the person or persons shall be “on call” (available to assist the Owner) at all times during the System Performance Testing.

B. The Contractor shall provide the services of an experienced and authorized representative of the supplier of each item of equipment (excluding minor items of equipment specifically exempted by the Engineer in writing), who shall visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. In each case, the Contractor shall arrange to have the supplier's representative revisit the job site as often as necessary until any and all trouble is corrected and the equipment installation and operation are satisfactory to the Engineer.

C. The Contractor shall require that each supplier's representative furnish to the Engineer a written report addressed to the Owner and copied to the Engineer, certifying that the equipment has been properly installed and lubricated, is in accurate alignment, is free from any undue stress imposed by connecting piping or anchor bolts, has been operated satisfactorily under the complete range of, including but not limited to, full-load conditions, is ready for operation, and the Owner's operating personnel have been instructed in the operation, maintenance, and lubrication of the equipment.

D. The Contractor shall furnish all personnel, power, water, chemicals, fuel, oil, grease, and all other necessary equipment, facilities, and services required for conducting the tests.

E. The Contractor shall coordinate startup, testing, and training activities with Owner and Engineer in advance and in writing.

1.05 SUBMITTALS

A. Test Schedules and Plan: Eight (8) copies of functional and system performance test schedules and plans for equipment, units, and systems shall be submitted to the Engineer, in accordance with Section 01300, Submittals, at least 30 days prior to start of related testing. The test plan shall contain the following at a minimum:

1. A schedule of all testing to be conducted.

2. A brief description of the testing to be performed.

3. Testing criteria.

4. Checklists and procedures for performing each test.

5. Sample forms for the collection of test data.

6. Sample test results documentation.

7. Requirements for other parties.

B. Test Reports and Certificates of Compliance: Functional and performance testing reports, and certificates of compliance, in a format acceptable to the Engineer, shall be furnished in accordance with Section 01300, Submittals. Test reports and certificates of compliance shall be submitted prior to project closeout in accordance with the requirements of Section 01700, Project Closeout.

C. Training Schedules and Plan: Eight (8) copies of written training schedule and written training plan shall be submitted to the Engineer, in accordance with Section 01300, Submittals, and Section 01830, Training and Demonstration.

1.06 TOOLS

A. Any special tools which may be necessary for the adjustment, operation, and maintenance of any equipment shall be furnished with the respective equipment. The Contractor shall furnish a complete list of tools and instructions for their use, recommended by the manufacturer or Contractor with the Shop Drawing submittal.

1.07 SPARE PARTS

A. Spare parts for equipment shall be furnished where indicated in the equipment specifications and/or recommended by the equipment manufacturer. Spare parts shall be identical and interchangeable with original parts. Parts shall be supplied and prepared for storage in clearly identified containers. Large or bulky items shall also be prepared for storage, clearly identified and wrapped in polyethylene or other suitable protection.

B. The parts shall be stored separately in a locked area, maintained by the Contractor, and shall be delivered to the Owner as a complete package for each equipment item at a location designated by the Owner. The Contractor shall furnish an inventory listing all spare parts for each piece of equipment utilizing the form included at the end of this Section.

PART 2 -- PRODUCTS (Not Used)

PART 3 -- EXECUTION

3.01 PREPARATION FOR EQUIPMENT FUNCTIONAL TESTING

A. Conduct (or have previously conducted, whichever is appropriate) all field inspections and tests as defined in the individual specification sections, installation checks, disinfection, hydrostatic tests, other preliminary or initial tests, and necessary corrections required, to demonstrate that individual components of the Work have been properly erected and found to operate in accordance with the Contract Documents, so that they can be utilized for their intended purposes.

B. Remove all electrical jumpers, bypasses, or other items connected to the equipment which are not intended to remain in the facility and are not required by the specifications. Demonstrate that each component is operating under its own control as designated.

C. Confirm that all electrical circuits are energized in the automatic position, that valves and gates are set to their normal position, and that the flow path through the Work is unobstructed.

D. Equipment and electrical tagging shall be complete prior to initiation of function testing.

E. All spare parts and special tools shall be delivered to Owner prior to initiation of function testing.

F. Provide written supplier's certification of installation confirming readiness for functional testing.

## 3.02 FUNCTIONAL TESTING

A. General:

1. Begin testing at a time mutually agreed upon by the Owner and/or Engineer, manufacturer's representative(s), and Contractor.

2. Notify in writing Owner, Engineer, and manufacturer's representative at least 14 days prior to scheduled date of functional tests.

3. Separate items of equipment demonstrated to function properly during subsystem testing may require no further functional test if documentation of subsystem testing is acceptable to Engineer.

4. Conduct functional test until each individual component item or system has achieved two (2) continuous hours of satisfactory operation. Demonstrate all operational features and controls function during this period while in automatic modes.

5. If, in Engineer's opinion, each system meets the functional requirements specified, such system will be accepted as conforming for purposes of advancing to performance testing phase, if required. If, in Engineer's opinion, functional test results do not meet requirements specified, the systems will be considered as nonconforming.

## 3.03 SYSTEM PERFORMANCE TESTING

A. General:

1. The startup of each facility and performance testing is a highly complex operation requiring the combined technical expertise of the Contractor, suppliers, subcontractors, the Engineer, and the Owner. The Contractor shall provide the effective and advance coordination of all parties necessary for the successful startup.

2. System performance testing shall not commence until Punch List items are adequately addressed to the Engineer's satisfaction, and the equipment or system meets functional tests specified.

3. All defects in materials or workmanship that appear during the system performance test shall be immediately corrected by the Contractor. Time lost for equipment repairs, wiring corrections, control point settings, or other reasons which actually interrupt the startup may, at the discretion of the Engineer, be justifiable cause for extending the system performance test operation period.

4. Should a significant interruption as defined previously in this Section be incurred, the test shall be restarted from the beginning, unless the failure is of two (2) hours or less in duration, or considered minor by the Engineer. The Contractor shall bear all costs associated with restarting the test period. Restart of the test period shall be solely at the Engineer's discretion.

B. System Performance Testing:

1. The duration of the system performance test shall be as defined in Article 1.02 of this Section, or as defined elsewhere in the Documents, whichever is more detailed.

2. The Contractor shall provide technical representatives of all equipment manufacturers, system suppliers, subcontractors, etc. for as-needed service to address mechanical malfunctions.

3. The Contractor shall furnish and coordinate the services of technical representatives of all equipment manufacturers to perform the testing services outlined in Contract Documents and the testing plan. The technical representatives of all equipment manufacturers shall perform startup testing and prepare test reports.

4. During the System Performance Testing, the Contractor shall assist the Owner in directing the Owner's personnel performing routine operating functions for the new facility.

5. The Contractor shall also be responsible for furnishing mechanics, labor, materials, and equipment that may be required to repair any malfunctions to equipment furnished and installed under the scope of this project.

3.04 O&M TRAINING

A. The training period shall not begin until successful completion of all system Functional Testing and Performance Testing, including successful completion of final field test for the continuous period of time as specified in Section 01650, Field Testing. Also, training shall not begin until all O&M Manuals, specified in Section 01300, Submittals, have been accepted by the Engineer. All punch list items shall be completed prior to start of training period. No training shall take place on defective or malfunctioning equipment; Contractor shall demonstrate reliable operation of all equipment prior to start of training period.

B. During the training period, the Contractor shall provide the services of an experienced representative of the supplier of each item of equipment (excluding minor items of equipment specifically exempted by the Engineer in writing), who shall visit the site and instruct the Owner's operating and maintenance personnel in correct operation and maintenance procedures. It is noted that training requirements are specified throughout the Contract Documents. The instruction shall demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment. Training shall include classroom and field/hands-on (with operational equipment) instruction. Classroom training shall be held at a location selected by the Owner and shall occur prior to field/hands-on training. Training shall be provided only while the respective representative's equipment is fully operational. On-site instruction shall be given by qualified persons who have been made familiar in advance with the equipment and systems at the project site.

C. Training shall be scheduled and coordinated by the Contractor. Training hours shall be arranged in writing with the Owner in accordance with Section 01830, Training and Demonstration.

**SPARE PARTS INVENTORY**

**SUMMARY SHEET**

EQUIPMENT NO. _____ DATE _____

LOCATION _____ REV. _____

NAME _____

ADDRESS _____

_____ PHONE (  ) _____

SPARE PARTS INVENTORY:

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# SECTION 01700

# PROJECT CLOSEOUT

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Final Cleaning

1. At the completion of the work, the Contractor shall remove all rubbish from and about the site of the work, and all temporary structures, construction signs, tools, scaffolding, materials, supplies and equipment which he or any of his Subcontractors may have used in the performance of the work. Contractor shall broom clean paved surfaces and rake clean other surfaces of grounds.

2. Contractor shall thoroughly clean all materials, equipment and structures; all marred surfaces shall be touched up to match adjacent surfaces; dirty filters and burned out lights replaced as required; all glass surfaces cleaned and floors cleaned and polished so as to leave work in a clean and new appearing condition.

3. Contractor shall maintain cleaning until project, or portion thereof, is occupied by the Owner.

B. Lubrication Survey

1. A lubrication survey, made by a lubricant supply firm, subject to the approval of the Owner shall be provided and paid for by the Contractor.

2. The lubrication survey shall list all equipment, the equipment manufacturer's lubrication recommendations, and an interchangeable lubricants tabulation standardizing and consolidating lubricants whenever possible.

3. The Contractor shall supply all lubricants, applicators and labor for lubricating the equipment, in accordance with manufacturer's recommendations, for field testing and prior to final acceptance. A supply of required lubricants sufficient for start-up and one year of operation shall also be supplied by the Contractor.

4. Ten (10) copies of the approved lubrication survey shall be furnished to the Engineer prior to final acceptance.

C. Spare Parts and Special Tools

1. As soon as practicable after approval of the list of equipment, the Contractor shall furnish spare parts data for each different item of equipment listed. The data shall include a complete list of parts and supplies, with current unit prices and source or sources of supply.

2. Contractor shall also furnish a list of parts and supplies that are either normally furnished at no extra cost with the purchase of the equipment or specified to be furnished as part of the Contract and a list of additional items recommended by the manufacturer to assure efficient operation for a period of three-hundred and sixty-five (365) days for the particular installation.

3. All parts shall be securely boxed and tagged, and clearly marked on the box and individually for identification as to the name of manufacturer or supplier, applicable equipment, part number, description and location in the equipment. All parts shall be protected and packaged for a shelf life of at least ten (10) years.

4. Contractor shall furnish at no additional cost to the Owner with each piece of equipment as a minimum, one (1) complete set, or the number of sets called for in the Technical Specifications, of suitably marked special tools and appliances which may be needed to adjust, operate, maintain, or repair the equipment.

5. Contractor shall submit, for approval by the Engineer, a complete list of the special tools and appliances to be furnished. Such tools and appliances shall be furnished in approved painted steel cases properly labeled and equipped with good grade cylinder locks and duplicate keys.

D. Equipment Start-Up Services

1. Equipment start-up period, for the training of pump station personnel, shall begin after satisfactory completion and acceptance of the field tests and after the certified date of substantial completion for the part of the work for which the equipment is included. If the equipment is not covered by a certificate of substantial completion for a part of the work, the period shall begin upon substantial completion of the project.

2. During the equipment start-up period the Contractor shall furnish, at no additional cost to the Owner the services of factory trained representatives of the equipment manufacturers for the equipment designated in the Specifications to:

   a. Assist in the start-up and operations of the equipment.

   b. Assist in the training of pump station personnel, designated by the Owner in the proper operation and maintenance of the equipment.

3 The Owner shall:

   a. Provide the necessary pump station personnel to be instructed in the operation and maintenance of the equipment. The Owner's personnel shall operate all equipment.

   b. Pay for all fuel, power and chemicals consumed beyond quantities specified in the Contract Documents. The Contractor shall pay for fuel, power, and chemicals consumed up to the date of “certified substantial completion” except as otherwise specified herein.

4. Contractor shall be available to promptly repair all work during the start-up period so as to cause minimum disruption to the total pump station operation.

5. Contractor shall be responsible for contacting the factory trained representatives of the equipment manufacturers and informing them of the schedule of both the start-up and training periods.

6. Upon completion of a minimum of ten (10) consecutive and continuous days of satisfactory operation, or the number of days called for in the Technical Specifications, the Owner will assume operation and operating cost of the equipment. If the equipment malfunctions during this start-up period, the start-up period will be repeated until satisfactory operation is achieved.

7. In the event a system, equipment or component proves defective or is unable to meet specified performance criteria, the Contractor shall replace the defective item and the minimum one (1) year guarantee period, or the guarantee period called for in the Technical Specifications for the item shall start after satisfactory replacement and testing of the item.

E. Final Cleanup; Site Rehabilitation

1. Before finally leaving the site, the Contractor shall wash and clean all exposed surfaces which have become soiled or marked, and shall remove from the site of work all accumulated debris and surplus materials of any kind which result from his operation, including construction equipment, tools, sheds, sanitary enclosures, etc. The Contractor shall leave all equipment, fixtures, and work, which he has installed, in a clean condition. The completed project shall be turned over to the Owner in a neat and orderly condition.

2. The site of the work shall be rehabilitated or developed in accordance with other sections of the Specifications and the Drawings. In the absence of any portion of these requirements, the Contractor shall completely rehabilitate the site to a condition and appearance equal or superior to that which existed just prior to construction, except for those items whose permanent removal or relocation was required in the Contract Documents or ordered by the Owner.

F. Final Inspection

1. Final cleaning and repairing shall be so arranged as to be finished upon completion of the construction work. The Contractor will make his final cleaning and repairing, and any portion of the work finally inspected and accepted by the Engineer shall be kept clean by the Contractor, until the final acceptance of the entire work.

2. When the Contractor has finally cleaned and repaired the whole or any portion of the work, he shall notify the Engineer that he is ready for final inspection of the whole or a portion of the work, and the Engineer will thereupon inspect the work. If the work is not found satisfactory, the Engineer will order further cleaning, repairs, or replacement.

3. When such further cleaning or repairing is completed, the Engineer, upon further notice, will again inspect the work. The "Final Payment" will not be processed until the Contractor has complied with the requirements set forth, and the Engineer has made his final inspection of the entire work and is satisfied that the entire work is

properly and satisfactorily constructed in accordance with the requirements of the Contract Documents.

G. Project Close Out

1. As construction of the project enters the final stages of completion, the Contractor shall, in concert with accomplishing the requirements set forth in the Contract Documents, attend to or have already completed the following items as they apply to his contract:

   a. Scheduling equipment manufacturers' visits to site.

   b. Required testing of project components.

   c. Scheduling start-up and initial operation.

   d. Correcting or replacing defective work, including completion of items previously overlooked or work which remains incomplete, all as evidenced by the Engineer's "Punch" Lists.

   e. Scheduling and furnishing skilled personnel during initial operation.

   f. Attend to any other items listed herein or brought to the Contractor's attention by the Engineer.

2. Just before the Engineer's Certificate of Substantial Completion is issued, the Contractor shall accomplish the cleaning and final adjustment of the various building components as specified in the Specifications and as follows:

   a. Clean all glass and adjust all windows and doors for proper operation.

   b. Clean all finish hardware after adjustment for proper operation.

   c. Touch up marks or defects in painted surfaces and touch up any similar defects in factory finished surfaces.

   d. Wax all resilient flooring materials.

   e. Remove bitumen from gravel stops, fascias, and other exposed surfaces.

   f. Remove all stains, marks, fingerprints, soil, spots, and blemishes from all finished surfaces, tile, stone, brick, and similar surfaces.

   g. Vacuum and remove all dust and foreign matter from all equipment and electrical panels.

3. In addition, and before the Certificate of Substantial Completion is issued, the Contractor shall submit to the Engineer (or to the Owner if indicated) certain records, certifications, etc., which are specified elsewhere in the Contract Documents. A partial list of such items appears below, but it shall be the Contractor's responsibility to submit any other items which are required in the Contract Documents:

a. Test results of project components.

b. Performance Affidavits for equipment.

c. Certification of equipment or materials in compliance with Contract Documents.

d. Operation and maintenance instructions or manuals for equipment.

e. Two (2) sets of neatly marked-up record drawings showing as-built changes and additions to the work under his Contract.

f. Any special guarantees or bonds (Submit to Owner).

4. The Contractor's attention is directed to the fact that required certifications and information under Item 3 above, must actually be submitted earlier in accordance with other Sections of the Specifications.

PART 2 -- PRODUCTS

(NOT USED)

PART 3 -- EXECUTION

(NOT USED)

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# SECTION 01730

# OPERATION AND MAINTENANCE MANUALS

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Compile product data and related information appropriate for Owner's maintenance and operation of products furnished under this Contract.

B. Prepare operating and maintenance data as specified in this Section and as referenced in other pertinent Sections of specifications.

C. The Contractor shall furnish all labor, equipment, materials, and all other items to supply and deliver to the Engineer equipment and system manuals for the Work in accordance with the requirements of this Section.

D. O&M Manuals shall be submitted in electronic as well as hard copy format. All electronic files are to be in Microsoft Windows compatible formats as noted herein.

### 1.02 SUBMITTALS

A. Reference Section 01300, Submittals, for required number of submittals and procedures.

B. Electronic Operation and Maintenance Manual Submittal Requirements:

1. All Operation and Maintenance - Maintenance Instruction Manuals, catalog sheets, product and component data sheets, and factory and on-site (field) test reports/data shall be submitted in bound hard-copies and electronic copies. Electronic copies shall be in Adobe Acrobat® Release 5.0 (*.pdf files) or later and shall be submitted on CD-ROM.

2. All drawings, cross-sectional view drawings, wiring diagram drawings, connection detail drawings, physical layout and detail drawings, elevations, etc., shall be developed electronically using AutoCAD® 2005 software (or latest AutoCAD® Release). Electronic version shall be submitted on CD-ROM. Provide an electronic copy of each drawing in Adobe Acrobat® Release 5.0 (*.pdf files) or later on the CD-ROM.

3. All Bill of Material sheets and/or tables indicating product data, quantities, physical location and reference, catalog number, reference, wiring diagram drawing number reference, cost, and any other field entered in the bill of materials sheet and/or any other spreadsheets and/or any other table and/or listings of references, etc., shall all be electronically developed and submitted in a database format, using Microsoft® Access 2003 software. This applies to all summary sheets, material listings, etc., to be submitted for this Project. Submittals shall include hard-copies and an electronic version developed in Microsoft® Access 2003. Electronic version shall be submitted on CD-ROM.

4. Binders and File Organization of the Electronic Copies: Clearly label each CD-ROM copy of the electronic version of the O&M Manuals. The CD-ROM volume numbers, organization of the electronic files contained within, and labeling formats shall match and shall be identical to those of the hard copies. Additionally, in each electronic volume (a CD-ROM), a navigation tool shall be installed that shall guide and navigate the user to open and/or close a desired section and/or subsection (within each volume) simply by clicking on the section/subsection name and number. Install a hard copy of the table of contents in the case (enclosure) of each CD-ROM and CD-ROM copies. All labels and tables of contents shall be neatly typed and labeled. Handwritten labels and/or tables of contents will not be accepted. Organize each set (a complete series) of O&M electronic copies in a CD-ROM hard-plastic case with locking and hinged cover. Install a neatly typed label on each case that shall provide all the information required to be listed on the cover of the O&M Manuals by these Specifications.

C. Submit draft O&M manuals for equipment and systems prior to conducting operator training on the equipment. Draft O&M manuals to include, at a minimum, the information defined in Article 1.06, Paragraphs B.1 through B.8.

1.03 FORM OF SUBMITTALS

A. In general, the manuals shall have two (2) levels: systems level and individual component level.

1. The systems level shall:

a. Describe the system, including sequence of operation, automatic control strategy, manual operating procedure and process flow diagrams.

b. Explain start-up, shutdown, normal operations, and malfunction of the system.

c. Tabulate a lubrication schedule for the system.

d. Describe preventive maintenance checking procedures for the system.

e. Include a cross reference to all individual component manuals.

2. The individual component level shall contain:

a. Storage requirements.

b. Installation instructions.

c. Alignment instructions and tolerances.

d. Operating instructions.

e. Troubleshooting instructions.

f. Lubrication requirements.

g. Maintenance instructions.

h. Parts list.

i. Recommended spare parts list and how to obtain same.

B. Format:

1. Manuals shall be limited to page sizes of 8-1/2-inch × 11-inch or drawings folded into such size.

2. Cover: Identify each volume with typed or printed title, “OPERATING AND MAINTENANCE INSTRUCTIONS” and list:

   a. Title of project.

   b. Volume number and number of volumes.

   c. Owner’s project number and date.

3. Paper: 20 pound minimum, white, for typed pages

4. Index: Furnish each volume with a complete index for all volumes in the set. The index is to indicate the volume and section for each piece of equipment.

5. Divide manuals into sections paralleling the equipment specifications.

6. Text: Manufacturer's printed or neatly typewritten data. Materials in manuals shall be suitable for photographic reproduction. Where copies of identical material are included, clarity and quality of copies shall be equal to the original, square to the page. Faxed copies will not be accepted.

7. Drawings:

   a. Provide reinforced punched binder tab, bind in with text.

   b. Reduce larger drawings and fold to size of text pages, but not larger than 14-inch x 17-inch.

8. 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.

9. Provide a Maintenance Summary Form for each piece of equipment. The maintenance summary form shall be prepared as follows:

   a. General: All Operations and Maintenance Manuals are to include a Maintenance Summary Form in the format and style of the example form attached to this Section as Attachment “A”. Manuals will not be accepted for

review without this form. The Maintenance Summary Form is to be a typed document prepared by the equipment manufacturer specifically for the equipment furnished. Title and subheadings are to be as shown on Attachment "A" – they are not to be modified. If a subheading is not applicable to the specific piece of equipment, it is to be noted by the words "Not Applicable" after the heading. Additional notes and comments may be added to the end of the form at the manufacturer's discretion.

b. Format:

1) Size: 8-1/2-inch × 11-inch (portrait orientation only)

2) Margins: Top: 1 inch, Left: 0.75 inch, Right: 0.75 inch, Bottom: 0.75 inch

3) Font:

i. Title: Arial - 16 point - bold

ii. Subheadings: Arial - 12 point - bold

iii. Text: Arial - 12 point - regular

iv. Tables: As shown in Attachment "A" - minimum text size Arial - 10 point - regular

c. Specific Instructions:

1) Equipment Item: Include generic name for equipment along with service and specification reference.

2) Manufacturer: List manufacturer's physical address for shipping and receiving and mailing address (if different from physical address). Include telephone number and facsimile telephone number.

3) Equipment Identification Number(s): Provide list of equipment serial numbers cross-referenced to equipment tag numbers in tabular form. When multiple items are provided, list each item separately.

4) Total Weight: Note the assembled weight of the equipment.

5) Nameplate Data: Reproduce the nameplate data exactly as it appears on the equipment. For driven equipment, include the driver nameplate data.

6) Manufacturer's Local Representative: Provide the name, address, phone number, and facsimile telephone number of the local representative.

7) Maintenance Requirements:

i. Maintenance Operation: List briefly each maintenance

operation required to maintain warranty in effect and refer to specific information in manufacturer's standard maintenance manual.

ii. List required frequency of each maintenance operation.

iii. Refer by symbol to lubricant list.

8) Lubricant List: List each recommended lubricant by symbol, noting generic type of lubricant, and a minimum of two manufacturers.

9) Spare Parts: Include recommendations regarding what spare parts, if any, should be maintained on site for routine maintenance.

10) Contractor's Job Order: Identify Contractor's purchase order number.

11) Closest Service Technician: Identify the closest factory trained and authorized service technician by name, address, and telephone number. Include pager number if applicable.

12) Closest Parts and Service Center: List closest factory authorized parts and service center, the physical address for shipping and receiving and mailing address (if different from physical address). Include telephone number and facsimile telephone number.

C. Binders:

1. Filled to not more than 75 percent capacity.

2. When multiple binders are used, arrange the data into related consistent groupings.

1.04 CONTENT OF O&M MANUAL

A. Table of Contents: Neatly typewritten table of contents for each volume, arranged in systematic order.

B. The minimum required information for each O&M Manual is as follows:

1. Maintenance Summary Form.

2. Safety precautions.

3. Normal operations.

4. Preventive maintenance plan and schedule.

5. Troubleshooting guides and diagnostic techniques.

6. Maintenance and repair procedures.

7. Removal and replacement instructions.

8. Wiring diagrams and control diagrams.

9. Spare parts and supply list.

10. Parts identification.

11. Warranty information.

12. Testing equipment and special tool information.

13. Approved and corrected shop drawings showing “as-built” conditions.

C. Product data:

1. Include only those sheets that are pertinent to the specific product. Manufacturers pre-printed literature may be accepted provided that it has been modified by underlining the specific model used and striking through inapplicable information.

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.

D. Drawings:

1. Supplement product data with drawings as necessary to clearly illustrate:

a. Relations of 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.

E. Written text, as required to supplement product data for the particular installation, shall:

1. Be organized in consistent format under separate headings for different procedures.

2. Provide logical sequence of instructions of each procedure.

3. Describe how complete system is to operate.

F. A copy of each warranty, bond, and service contract issued shall be provided:

1. Provide the following information sheet for Owner’s personnel:

a. Proper procedures in event of failure.

b. Instances that might affect validity of warranties or bonds.

G. Any training manuals used will become part of this manual.

1.05 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Content, for each unit of equipment and system, as appropriate:

1. Description of system:

a. Design and performance criteria.

b. Sequence of operation.

c. Automatic control strategy.

d. Manual operating procedures.

e. Single-line process flow diagram showing each component of the system including its name and number.

2. Description of unit and component parts:

a. Function, normal operating characteristics and limiting conditions.

b. Performance curves, engineering data and tests.

c. Complete nomenclature and commercial number of replaceable parts.

d. Model number and nameplate data for each piece of equipment.

3. Operating Procedures:

a. Start-up, break-in, routine and normal operating instructions.

b. Regulation, control, stopping, shut-down, and emergency instructions.

c. Summer and winter operating instructions.

d. Special operating instructions.

e. Control settings and ranges.

4. Maintenance Procedures: Manufacturer's printed operating and maintenance instructions. (This is not to be a generalized catalog of the entire product line unless the specific equipment item provided or installed is highlighted.)

a. Include manufacturer’s schedule for routine preventative maintenance and inspections required to ensure proper and economical operation and to minimize corrective maintenance and repair. Provide manufacturer’s

projection of preventative maintenance man-hours on an annual basis.

b. Troubleshooting Guides and Diagnostic Techniques: Include step-by-step procedures to promptly isolate the cause of typical malfunctions. Describe clearly why the checkout is performed and what conditions are to be sought. Identify tests or inspections and test equipment required to determine whether parts and equipment may be reused or require replacement.

c. Disassembly, Repair, and Reassembly: Include step-by-step procedures and list required tools and supplies for removal and replacement of components, accessories, and attachments. Provide tolerances, dimensions, settings and adjustments required. Instructions to include a combination of text and illustrations.

d. Alignment, adjusting, and checking procedures

e. Spare Parts: Include lists of spare parts and supplies required for maintenance and repair to ensure continued service or operation without unreasonable delays. List of original manufacturer's spare parts, manufacturer's current prices and recommended quantities to be maintained in storage.

5. Servicing and lubrication schedule:

a. List of lubricants required.

b. Period between lubrication.

6. Parts Identification: Provide identification and coverage for all parts of each component and accessory of the end items subject to replacement. Include special hardware requirements, such as requirement to use high-strength bolts and nuts. Identify parts by make, model, serial number, and source of supply to allow reordering without any further identification required. Provide clear and legible illustrations, drawings, and exploded views to enable easy identification of the items. When illustrations and separate listing to show the index, reference, or key number which will cross-reference the illustrated part to be the listed part. Parts shown in the listings to be grouped by components.

7. Description of sequence of operation by control manufacturer.

8. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.

a. Predicted life of parts subject to wear.

b. Items recommended to be stocked as spare parts.

9. As-installed control diagrams by controls manufacturer.

10. Each Contractor’s coordination drawings.

11. Charts of valve tag numbers, with location and function of each valve:

a. Reference drawing valves are on.

b. Manufacturer model and serial numbers.

c. Operation of valve (manual, hydraulic, electric or pneumatic).

12. Other data as required under pertinent sections of specifications.

13. Local services (process water, drains, HVAC, natural gas, steam, and process air).

1.06 MANUAL FOR ELECTRIC AND ELECTRONIC SYSTEMS

A. Content, for each electric and electronic system, as appropriate:

1. Make a table identifying each piece of equipment, each associated control or instrument, the location of the control or instrument, and the junction of the control or instrument.

2. Description of system and component parts.

a. Function, normal operating characteristics and limiting conditions for both the system and the component parts.

b. Performance curves, engineering data and tests.

c. Complete nomenclature and commercial number of replaceable parts.

3. Circuit directories of panel boards:

a. Electrical service.

b. Controls.

c. Communications.

4. Wiring Diagrams and Control Diagrams: Wiring diagrams and control diagrams to be point-to-point drawings of wiring and control circuits including factory-field interfaces. Provide a complete and accurate depiction of the actual job specific wiring and control work. On diagrams, number electrical and electronic wiring and the terminals for each type, identically to actual installation numbering. Furnish control schematics reproduced from control schematics shown on Drawings with modifications as required, but not redrawn or redesigned in another format.

5. Instrument loop diagrams showing the path that a control or instrumentation signal takes from its origin to the action it takes:

a. An electrical schematic for each item.

b. A chart listing the controls/instruments in a loop identifying the equipment abbreviated symbol, a description of the symbol, design criteria, process flow, quantity supplied and manufacturer's model and serial number.

6. Operating procedures:

    a. Routine and normal operating instructions.

    b. Sequences required.

    c. Special operating instructions.

7. Maintenance procedures:

    a. Routine operations.

    b. Guide to “trouble-shooting”.

    c. Disassembly, repair, and reassembly.

    d. Adjustment and checking.

8. Manufacturer's printed operating and maintenance instructions.

9. List of all protective relays, breaker types, cable and fuse sizes and settings (where applicable).

    a. Protective Relays: Provide information on the relay type used and time current curves.

    b. Breakers: Provide catalog numbers and breaker trip curves.

    c. Cables: Provide cable size, cable type, and length of each cable installed.

    d. Power Fuses: Provide fuse catalogue number, rating, and fuse curve.

10. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

11. Other data as required under pertinent sections of specifications.

12. Abnormal and emergency operation:

    a. Potential overloads.

    b. Procedures for equipment breakdown.

    c. Action to be taken in a power outage.

    d. Identify alarms by equipment location and action to correct.

    e. Equipment safety features, requirements and potential hazards.

13. Documentation of field functional tests and performance test described in the specifications. Include the test results and calibration reports of all equipment.

14. Calibration data sheet including set points: Include all calibration data sheets.

1.07 MANUAL FOR CONTROL AND INFORMATION SYSTEMS

A. O&M Manuals for Control and Information Systems shall be as specified in Section 17030, Control and Information Systems Submittals.

PART 2 -- PRODUCTS

2.01 BINDERS

A. All draft O&M Manuals are to be bound in a folder or 3-ring binder. Unbound, stapled, or clipped submittals will not be accepted for review. Maximum width of any single draft equipment O&M Manual is 4 inches.

B. The completed O&M manuals are to be bound in a heavy duty, fabric reinforced fiberboard, three post, expandable binder with a maximum binding width of 5 inches. Three-ring vinyl reinforced binders will not be acceptable. Manual to have information listed in Article 1.05, Paragraph B, Item 2 printed on the front cover as well as the binder spine. Each binder is to have an index outlining all information in the set of volumes.

PART 3 -- EXECUTION

(NOT USED)

## ATTACHMENT "A"

## MAINTENANCE SUMMARY FORM

1. **EQUIPMENT ITEM:**

2. **MANUFACTURER INFORMATION:**

3. **EQUIPMENT IDENTIFICATION NUMBER(S):**

| *Equipment Tag Number* | *Equipment Serial Number* | *Driver Serial Number* |
|---|---|---|
| | | |
| | | |

4. **TOTAL WEIGHT:**

5. **NAMEPLATE DATA (HP, Voltage, Speed, etc.):**

6. **MANUFACTURER'S LOCAL REPRESENTATIVE:**

7. **MAINTENANCE REQUIREMENTS:**

| *Maintenance Operation* | *Frequency* | *Lubricant* (if applicable) | *Comments* |
|---|---|---|---|
| | | | |
| | | | |

8. **LUBRICANT LIST:**

9. **SPARE PARTS:**

| *Part Description* | *Quantity* | *Part Number* |
|---|---|---|
| | | |
| | | |

10. **CONTRACTOR'S JOB ORDER:**

11. **CLOSEST SERVICE TECHNICIAN:**

12. **CLOSEST PARTS AND SERVICE CENTER:**

- END OF SECTION -

# SECTION 01830

# TRAINING AND DEMONSTRATION

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. This Section defines requirements for instructing and training Owner's personnel regarding operation and maintenance of the process equipment, instrumentation, and process control system furnished as part of the work.

B. Training of Owner's personnel includes preparing training manuals; conducting classroom instructions; performing field, factory, and hands-on training; and all other activities required to provide a comprehensive training program as specified herein.

C. The cost for training of the Owner's personnel is to be included in the cost of the equipment. Training as specified herein is at no additional cost to the Owner.

D. All training and demonstration events shall be offered at least twice to enable attendance by the various plant operations shifts. Training and demonstration events shall be coordinated in advance with the Owner and Engineer in order to satisfy this requirement.

### 1.02 SUBMITTALS

A. Training Plan: Submit 90 days after Notice to Proceed.

B. Training Schedule: Submit not less than 21 days prior to start of equipment installation and revise as necessary for acceptance.

C. Training Materials:

1. Submit written outlines of proposed training sessions not less than 21 days prior to scheduled training.

2. Furnish complete training materials, to include operation and maintenance data as required in this Section not less than 14 days prior to training session.

D. Video tape(s) of training sessions.

### 1.03 DEFINITIONS

A. As used herein, the term "day" shall mean an eight-hour day within regular plant working hours.

B. As used herein, the term "week" shall mean a five-day, 40-hour week.

C. The term "Training Instructor" as used herein means an articulate, factory trained, authorized representative of the manufacturer, who is experienced in the technical applications, installation, operation, and maintenance of respective equipment,

subsystem, or system. The Training Instructor is subject to acceptance by Owner. No substitute representatives will be allowed unless prior written approval by Owner has been given.

D. Training Sessions are exclusive of system startup services or acceptance tests.

1.04 GENERAL REQUIREMENTS

A. Schedule training activities to avoid conflicting with other onsite testing or other manufacturer's onsite services. Determine that all conditions necessary to allow successful testing have been met before scheduling services.

B. Unless otherwise specified, all training courses shall be conducted in the Owner's facilities.

C. A minimum of two training sessions shall be provided for each item so as to accommodate shift workers and eliminate full work force draw.

D. Written Notification: Any Contractor activity that may impact operation of existing facilities shall be confirmed in writing at least 48 hours in advance of initiation of that activity. This requirement is in addition to the 30-day advance submittal of plans to more clearly confirm coordination efforts required. This notification shall include, as a minimum:

1. Scheduled date and time (start, finish, duration) of Contractor's activity.

2. Brief description of the activity.

3. Brief description of any Owner activity that is required to coordinate with Contractor's activity (such as shutdown of a unit process or system, power supply, etc.).

1.05 TRAINING PLAN

A. Submit for each proposed course:

1. Title and objectives.

2. Training schedule.

3. A brief description of the training to be performed.

4. Qualifications of the supplier's representative performing the training.

5. Prerequisite training and experience of attendees.

6. Recommended types of attendees (e.g., managers, engineers, operators, maintenance, laboratory, etc.).

7. Course description and outline of course content, which shall include, at a minimum:

a. General description of the equipment item

b. Start-up procedure

c. Shutdown procedure

d. Operation and control description

e. Adjustment and trouble-shooting

f. Maintenance

8. Duration

9. Location (e.g., training center or site)

8. Format (e.g., lecture, self-study, demonstration, hands-on)

9. Instruction materials and equipment requirements

1.06 PROPOSED TRAINING AGREEMENT

A. When requested by the Owner, submit a proposed training agreement to extend the training services described above for a period of up to five years from the expiration of the guarantee period. The proposed agreement shall include provisions for payment on a cost plus expenses basis and re-negotiation of contract prices based upon changes in recognized economic indicators published by the United States Department of Commerce.

PART 2 -- PRODUCTS

(NOT USED)

PART 3 -- EXECUTION

3.01 PRE-STARTUP TRAINING

A. 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 Manuals and with Section 01660, Equipment Testing and Startup.

B. Complete at least 14 days prior to actual startup.

3.02 TRAINING FOR OPERATION OF PROCESS EQUIPMENT

A. Train the Owner's operations personnel as follows:

1. Being able to implement start-up and shutdown procedures for each piece of equipment individually, as well as the start-up and shutdown of the systems comprising the equipment. This instruction shall include normal operation, alternative operations, and emergency operations.

2. Emergency procedures for equipment and systems installed under this Contract during pump malfunction, chemical spills, and other extreme conditions.

B. Course materials to be used for training Owner's operation personnel include:

1. Process control videotapes.

2. Pertinent portions of the Operations and Maintenance Manuals, including start-up and shutdown procedures; descriptions of equipment and instrumentation functions and modes of operations, control and monitoring; trouble-shooting instructions and process control instructions.

3. Detailed course outlines and operations guides for equipment and processes for field use. The operations guides shall include general operating procedures, start-up and shutdown procedures, optimization procedures and emergency operating procedures.

4. Provide a minimum of two (2) copies of any materials required for classroom instruction, such as training workbooks, VHS videos, DVDs or computer software, to the Owner a minimum of two (2) weeks in advance of the start of the training period.

3.03 TRAINING FOR MAINTENANCE OF PROCESS EQUIPMENT

A. Train the Owner’s maintenance personnel as follows:

1. Component preventive and corrective maintenance activities required to keep the equipment in good operating condition.

2. Instruct the trainees in locating the probable source of equipment malfunctions, determining the symptoms of the trouble, establishing the probable cause, and affecting a solution.

3.04 TAPING OF TRAINING SESSIONS

A. Furnish audio and color video taping of pre-startup and post-startup instruction sessions, including manufacturer’s representatives’ hands-on equipment instruction and classroom sessions.

B. Use VHS format suitable for playback on standard equipment available commercially in the United States.

C. Label videotape cassettes with the following information:

1. Name and number of construction contract

2. Name of Contractor

3. Subject matter of tape:

   a. Equipment item or system

   b. Manufacturer of equipment or system

4. Date of production of videotape

H. Prepare and submit an index of all videotapes, with a numbering system categorized according to subject matter.

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# SECTION 02050

# DEMOLITION

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. The Contractor shall furnish all labor, materials and equipment to demolish and remove all concrete and asphaltic paving, curbs, sidewalk, and miscellaneous yard structures as required and shown on the Contract Drawings during the construction work.

## PART 2 -- EXECUTION

### 2.01 DEMOLITION

A. Existing concrete and asphaltic paving, curbs, sidewalk and miscellaneous yard structures within the areas designated for new construction work shall be completely demolished and all debris removed from the site.

B. Excavation caused by demolition shall be backfilled with fill free from rubbish and debris.

C. Work shall be performed in such manner as not to endanger the safety of the workmen or the public or cause damage to nearby structures.

D. Provide all barriers and precautionary measures in accordance with Owner's requirements and other authorities having jurisdiction.

E. Where parts of existing structures, roadways or sidewalks are to remain in service, demolish the portions to be removed, repair damage, and leave the structure, roadway or sidewalk in proper condition for the intended use. Remove concrete, masonry, and asphalt to the lines designated by drilling, chipping, or other suitable methods. Leave the resulting surfaces reasonably true and even, with sharp straight corners that will result in neat joints with new construction and be satisfactory for the purpose intended. Where existing reinforcing rods are to extend into new construction, remove the concrete so that the reinforcing is clean and undamaged. Cut off other reinforcing 1/2 inch below the surface and fill with epoxy resin binder flush with the surface.

F. Prior to the execution of the work, the Contractor, Owner and Engineer shall jointly survey the condition of the adjoining and/or nearby structures, roadways or sidewalks. Photographs and records shall be made of any prior settlement or cracking of structures, pavements, and the like, that may become the subject of possible damage claims.

### 2.02 DISPOSAL OF MATERIAL

A. All debris resulting from the demolition and removal work shall be disposed of by the Contractor as part of the work of this Contract. Material designated by the Engineer to be salvaged shall be stored on the construction site as directed. All other material shall be disposed of off site by the Contractor at his expense.

B. Burning of any debris resulting from the demolition will not be permitted at the site.

- END OF SECTION -

# SECTION 02100

# CLEARING, GRUBBING, AND SITE PREPARATION

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Includes all labor, material, equipment, and appliances required for the complete execution of any additions, modifications, or alterations to existing building(s) and new construction work as shown on the Drawings and specified herein.

B. Principal items of work include:

1. Notifying all authorities owning utility lines running to or on the property. Protecting and maintaining all utility lines to remain and capping those that are not required in accordance with instructions of the Utility Companies, and all other authorities having jurisdiction.

2. Clearing the site within the Contract Limit Lines, including removal of grass, brush, shrubs, trees, loose debris and other encumbrances except for trees marked to remain.

3. Boxing and protecting all trees, shrubs, lawns and the like within areas to be preserved. Relocating trees and shrubs, so indicated on the Drawings, to designated areas.

4. Repairing all injury to trees, shrubs, and other plants caused by site preparation operations shall be repaired immediately. Work shall be done by qualified personnel in accordance with standard horticultural practice and as approved by the Engineer.

5. Removing topsoil to its full depth from designated areas and stockpiling on site where directed by the Engineer for future use.

6. Disposing from the site all debris resulting from work under this Section.

### 1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Rules and Regulations of the State of Georgia, Chapter 391-3-7.

### 1.03 STREET AND ROAD BLOCKAGE

A. Closing of streets and roads during progress of the work shall be in compliance with the requirements of the Owner, GDOT, and other authorities having jurisdiction. Access shall be provided to all facilities remaining in operation.

### 1.04 PROTECTION OF PERSONS AND PROPERTY

A. All work shall be performed in such a manner to protect all personnel, workmen, pedestrians and adjacent property and structures from possible injury and damage.

B. All conduits, wires, cables, and appurtenances above or below ground shall be protected from damage.

C. Provide warning and barrier fence where shown on the Drawings and as specified herein.

## PART 2 -- EXECUTION

### 2.01 CLEARING OF SITE

A. Before removal of topsoil, and start of excavation and grading operations, the areas within the clearing limits shall be cleared and grubbed.

B. Clearing shall consist of cutting, removal, and satisfactory disposal of all trees, fallen timber, brush, bushes, rubbish, sanitary landfill material, fencing, and other perishable and objectionable material within the areas to be excavated or other designated areas. Prior to the start of construction, the Contractor shall survey the entire Contract site and shall prepare a plan which defines the areas to be cleared and grubbed, trees to be pruned, extent of tree pruning, and/or areas which are to be cleared but not grubbed. This plan shall be submitted to the Engineer for approval. Should it become necessary to remove a tree, bush, brush, or other plants adjacent to the area to be excavated, the Contractor shall do so only after permission has been granted by the Engineer.

C. Excavation resulting from the removal of trees, roots, and the like shall be filled with suitable material, as approved by the Engineer, and thoroughly compacted per the requirements contained in Section 02200 – Earthwork.

D. Unless otherwise shown or specified, the Contractor shall clear and grub a strip at least 15 feet wide along all permanent fence lines installed under this Contract.

E. In temporary construction easement locations, only those trees and shrubs shall be removed which are in actual interference with excavation or grading work under this Contract, and removal shall be subject to approval by the Engineer. However, the Engineer reserves the right to order additional trees and shrubs removed at no additional cost to the Owner, if such, in his opinion, are too close to the work to be maintained or have become damaged due to the Contractor's operations.

### 2.02 STRIPPING AND STOCKPILING EXISTING TOPSOIL

A. Existing topsoil and sod on the site within areas designated on the Drawings shall be stripped to whatever depth it may occur, and stored in locations directed by the Engineer.

B. The topsoil shall be free of stones, roots, brush, rubbish, or other unsuitable materials before stockpiling the topsoil. Topsoil shall be as defined in Section 02200 – Earthwork.

C. Care shall be taken not to contaminate the stockpiled topsoil with any unsuitable materials.

### 2.03 GRUBBING

A. Grubbing shall consist of the removal and disposal of all stumps, roots, logs, sticks and other perishable materials to a depth of at least 6 inches below ground surfaces.

B. Large stumps located in areas to be excavated may be removed during grading operations, subject to the approval of the Engineer.

2.04 DISPOSAL OF MATERIAL

A. All debris resulting from the clearing and grubbing work shall be disposed of by the Contractor as part of the work of this Contract. Material designated by the Engineer to be salvaged shall be stored on the construction site as directed by the Engineer for reuse in this Project or removal by others.

B. Burning of any debris resulting from the clearing and grubbing work will not be permitted at the site.

2.05 WARNING AND BARRIER FENCE

A. The fence shall be made of a visible, lightweight, flexible, high strength polyethylene material. The fence shall be MIRASAFE as manufactured by Mirafi, Inc., or equal.

B. Physical Properties

Fence:

| | |
|---|---|
| Color: | International Orange |
| Roll Size: | 4 feet x 164 feet |
| Roll weight: | 34 lbs. |
| Mesh opening: | 1-1/2-inch x 3-inch |

Posts:

| | |
|---|---|
| ASTM Designation: | ASTM 702 |
| Length: | 5 feet long (T-Type) |
| Weight: | 1.25 #/Foot (min) |
| Area of Anchor Plate: | 14 Sq. In. |

C. Drive posts 12 to 18 inches into ground every 10 feet to 12 feet. Wrap fence material around first terminal post allowing overlap of one material opening. Use metal tie wire or plastic tie wrap to fasten material to itself at top, middle and bottom. At final post, cut with utility knife or scissors at a point halfway across an opening. Wrap around and tie at final post in the same way as the first post.

D. Use tie wire or tie wrap at intermediate posts and splices as well. Thread ties around a vertical member of the fence material and the post, and bind tightly against the post. For the most secure fastening, tie at top, middle and bottom. Overlap splices a minimum of four fence openings, tie as above, fastening both edges of the fence material splice overlap.

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# SECTION 02200

# EARTHWORK

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Furnish all labor, equipment and materials required to complete all work associated with excavation, including rock excavation, hauling, off-site borrow excavation, dewatering, backfill, foundation and backfill stone, filter fabric, embankments, stockpiling topsoil and any excess suitable material in designated areas, in place compaction of embankments, backfill and subgrades beneath foundations and roadways, excavation support, disposing from the site all unsuitable materials, providing erosion and sedimentation control grading, site grading and preparation of pavement and structure subgrade, and other related and incidental work as required to complete the work shown on the Drawings and specified herein.

B. All excavations shall be in conformity with the lines, grades, and cross sections shown on the Drawings or established by the Engineer.

C. It is the intent of this Specification that the Contractor conduct the construction activities in such a manner that erosion of disturbed areas and off-site sedimentation be absolutely minimized.

D. All work under this Contract shall be done in conformance with and subject to the limitations of the latest editions of the OSHA Construction Standards, Part 1926, Subpart P, Excavations, Trenching and Shoring, and Subpart O, Motor Vehicles, Mechanized Equipment, and Marine Operations and to the State of Georgia requirements. In the event of a conflict between OSHA and State of Georgia requirements, the more stringent requirement shall apply.

### 1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Requirements of related work are included in Division 1 and Division 2 of these Specifications.

### 1.03 SUBSURFACE CONDITIONS

A. Information on subsurface conditions is referenced under Division 1, General Requirements.

B. Attention is directed to the fact that there may be water pipes, storm drains and other utilities located in the area of proposed excavation. Perform all repairs to same in the event that excavation activities disrupt service. Flowable fill is required under existing roadways and utilities that are undermined by pipeline or structural excavations.

### 1.04 SUBMITTALS

A. In accordance with the procedures and requirements set forth in Section 01300 - Submittals, the Contractor shall submit the following:

1. Name and location of all material suppliers.

2. Certificate of compliance with the standards specified above for each source of each material.

3. List of disposal sites for waste and unsuitable materials and all required permits for use of those sites.

4. Plans and cross sections of open cut excavations showing side slopes and limits of the excavation at grade.

5. Samples of synthetic filter fabric and reinforced plastic membrane with manufacturer's certificates or catalog cuts stating the mechanical and physical properties. Samples shall be at least one (1) foot wide and four (4) feet long taken across the roll with the warp direction appropriately marked.

6. Construction drawings and structural calculations for any types of excavation support required. Drawings and calculations shall be sealed by a currently registered Professional Engineer in the State of Georgia.

7. Dewatering procedures.

8. Movement monitoring plan and pre-construction condition inspection and documentation of adjacent structures, utilities, and roadway for each excavation support.

## 1.05 FIELD CONTROL

### A. Field Layout

1. The Owner will provide a bench mark adjacent to the project for job reference and control. The bench mark's northing, easting and elevation will be provided for the Contractor's use. The Contractor's Professional Surveyor shall tie into the bench mark and layout the limits of Work for the Contractor, over the entire project site in accordance with the coordinate system established for the Contract Drawings. Each benchmark shall be located in the field, so that in the event the bench marks are physically lost during construction, the Contractor's surveyor shall be responsible for relocating them at no additional cost to the Owner.

### B. Measurements

1. The Engineer or Engineer's surveyor shall take measurements to calculate pay quantities. The Contractor shall retain a Professional Surveyor (registered in the State of Georgia) to establish other bench marks and control points in the vicinity of working areas, necessary to perform the Work.

2. The Professional Surveyor shall make his equipment available to the Engineer to perform independent measurements and to confirm readings. Bench marks shall be established around the project site and all survey information is to be made available to the Engineer, and his staff to measure cut and fill elevations to calculate pay quantities.

3. The Contractor's surveyor shall confirm bottom elevations of all excavations before placement of any backfill material.

C. Calculations

1. The pay quantities shall be calculated from the Engineer's field notes. The Contractor may retain an independent Professional Engineer to review the pay quantity calculations.

1.06 PRODUCT HANDLING

A. Soil and rock material shall be excavated, transported, placed, and stored in a manner so as to prevent contamination, segregation and excessive wetting. Materials which have become contaminated or segregated will not be permitted in the performance of the work and shall be removed from the site.

PART 2 – PRODUCTS

2.01 ROCK

A. Any material occupying an original volume of at least one cubic yard which cannot be excavated with a single-tooth riper drawn by a crawler tractor having minimum draw bar pull rated at not less than 60,000 pounds (Caterpillar D 8N, or equivalent). Excavation of material with larger equipment will be paid as Earth excavations unless Contractor demonstrates inability to excavate with above specified equipment.

2.02 SELECT FILL

A. Soils from the excavations meeting requirements stipulated herein with the exceptions of topsoil and organic material may be used as select fill for backfilling, constructing embankments, reconstructing existing embankments, and as structural subgrade support.

B. Select fill used for embankment construction shall be a silty or clayey soil material with a Maximum Liquid Limit (LL) of 40 and a Plasticity Index (PI) between 7 and 20.

C. Select fill used for backfilling shall either be material as described in Paragraph B above or a granular soil material with a Maximum Plasticity Index (PI) of 6.

D. Regardless of material used as select fill, materials shall be compacted at a moisture content satisfactory to the Engineer, which shall be approximately that required to produce the maximum density except that the moisture content shall not be more than 3% below nor more than 3% above the optimum moisture content for the particular material tested in accordance with the ASTM D698.

E. Select fill used as subgrade support shall be a coarse aggregate material meeting the gradation requirements of #57 or #67 aggregates in accordance with ASTM C-33, or Granular Aggregate Base (GAB) as defined in Section 02207 – Aggregate Materials.

F. Where excavated material does not meet requirements for select fill, Contractor shall furnish off-site borrow material meeting the specified requirements herein. Determination of

whether the borrow material will be paid for as an extra cost will be made based on Article 4 of the General Conditions, as amended by the Supplementary Conditions. When the excavated material from required excavations is suitable for use as backfill, bedding, or embankments, but is replaced with off-site borrow material for the Contractor's convenience, the costs associated with such work and material shall be borne by the Contractor.

2.03 TOPSOIL

A. Topsoil shall be considered the surface layer of soil and sod, suitable for use in seeding and planting. It shall contain no mixture of refuse or any material toxic to plant growth.

2.04 GEOTEXTILES

A. Reference Section 02274 – Geotextiles

PART 3 -- EXECUTION

3.01 STRIPPING OF TOPSOIL

A. In all areas to be excavated, filled, paved, or graveled the topsoil shall be stripped to its full depth and shall be deposited in storage piles on the site, at locations designated by the Engineer, for subsequent reuse. Topsoil shall be kept separated from other excavated materials and shall be piled free of roots and other undesirable materials.

3.02 EXCAVATION

A. All material excavated, regardless of its nature or composition, shall be classified as UNCLASSIFIED EXCAVATION. Excavation shall include the removal of all soil, rock, weathered rock, rocks of all types, boulders, conduits, pipe, and all other obstacles encountered and shown to be removed within the limits of excavation shown on the Drawings or specified herein. The cost of excavation shall be included in the Lump Sum Bid Price and no additional payment will be made for the removal of obstacles encountered within the excavation limits shown on the Drawings and specified herein.

B. Where rock is encountered at or above footing or pipe invert elevations, Contractor shall excavate any material to a minimum of 2' below bottom of footing or pipe invert elevation and return the area to design grade with Select Fill material.

C. On any cut slopes where rock, as defined in Article 2.01, is exposed such slopes shall be cut and dressed to a stable condition and cleaned by such methods as brushes or air pressure to remove any loose debris as directed by the Engineer.

D. In cases where the Engineer determines rock, as defined in Article 2.01, may remain in place at elevations above those shown on the Contract Drawings, such rock shall be cut and dressed back to a stable condition and cleaned by such methods as brushes or air pressure to remove any loose debris as directed by the Engineer.

E. All suitable material removed in the excavation shall be used as far as practicable in the formation of embankments, subgrades, and shoulders, and at such other places as may be indicated on the Drawings or indicated by the Engineer. No excavation shall be wasted

except as may be permitted by the Engineer. Refer to the drawings for specific location and placement of suitable excavated materials in the formation of embankments, backfill, and structural and roadway foundations. THE ENGINEER WILL DESIGNATE MATERIALS THAT ARE UNSUITABLE. The Contractor shall furnish off site disposal areas for the unsuitable material. Where suitable materials containing excessive moisture are encountered above grade in cuts, the Contractor shall construct above grade ditch drains prior to the excavation of the cut material when in the opinion of the Engineer such measures are necessary to provide proper construction.

F. All excavations shall be made in the dry and in such a manner and to such widths as will give ample room for properly constructing and inspecting the structures and/or piping they are to contain and for such excavation support, pumping and drainage as may be required. Excavation shall be made in accordance with the grades and details shown on the Drawings and as specified herein.

G. Excavation slopes shall be flat enough to avoid slides that will cause disturbance of the subgrade or damage of adjacent areas. Excavation requirements and slopes shall be as indicated in the Drawings. The Contractor shall intercept and collect surface runoff both at the top and bottom of cut slopes. The intersection of slopes with natural ground surfaces, including the beginning and ending of cut slopes, shall be uniformly rounded as shown on the Drawings or as may be indicated by the Engineer. Concurrent with the excavation of cuts the Contractor shall construct intercepting berm ditches or earth berms along and on top of the cut slopes at locations shown on the Drawings or designated by the Engineer. All slopes shall be finished to reasonably uniform surfaces acceptable for seeding and mulching operations. No rock or boulders shall be left in place which protrude more than 1 foot within the typical section cut slope lines, and all rock cuts shall be cleaned of loose and overhanging material. All protruding roots and other objectionable vegetation shall be removed from slopes. The Contractor shall be required to submit plans of open-cut excavation for review by the Engineer before approval is given to proceed.

H. It is the intent of these Specifications that all structures shall bear on an aggregate base, crushed stone or screened gravel bedding placed to the thickness shown on the Drawings, specified in these Specifications, or not less than 6-inches. Bedding for process piping shall be as specified in Section 15000 - Basic Mechanical Requirements, or as shown on the Drawings.

I. The bottom of all excavations for structures and pipes shall be examined by the Engineer for bearing value and the presence of unsuitable material. If, in the opinion of the Engineer, additional excavation is required due to the low bearing value of the subgrade material, or if the in-place soils are soft, yielding, pumping and wet, the Contractor shall remove such material to the required width and depth and replace it with thoroughly compacted select fill, and/or crushed stone or screened gravel as indicated by the Engineer. Payment for such additional work ordered by the Engineer shall be made as an extra by a Change Order in accordance with the General Conditions and Division 1. No payment will be made for subgrade disturbance caused by inadequate dewatering or improper construction methods.

J. All cuts shall be brought to the grade and cross section shown on the Drawings, or established by the Engineer, prior to final inspection and acceptance by the Engineer.

K. Slides and overbreaks which occur due to negligence, carelessness or improper construction techniques on the part of the Contractor shall be removed and disposed of by the Contractor as indicated by the Engineer at no additional cost to the Owner. If grading

operations are suspended for any reason whatsoever, partially completed cut and fill slopes shall be brought to the required slope and the work of seeding and mulching or other required erosion and sedimentation control operations shall be performed.

3.03 EXCAVATION SUPPORT

A. The Contractor shall furnish, place, and maintain such excavation support which may be required to support sides of excavation or to protect pipes and structures from possible damage and to provide safe working conditions. If the Engineer is of the opinion that at any point sufficient or proper supports have not been provided, he may order additional supports put in at the expense of the Contractor. The Contractor shall be responsible for the adequacy of all supports used and for all damage resulting from failure of support system or from placing, maintaining and removing it.

B. Selection of and design of any proposed excavation support systems is exclusively the responsibility of the Contractor. Contractor shall submit drawings and calculations on proposed systems sealed by a Professional Engineer currently registered in the State of Georgia.

C. The Contractor shall exercise caution in the installation and removal of supports to insure that excessive or unusual loadings are not transmitted to any new or existing structure. The Contractor shall promptly repair at his expense any and all damage that can be reasonably attributed to installation or removal of excavation support system.

D. The contractor shall monitor movement in the excavation support and movement at adjacent structures, utilities, and roadway adjacent to the excavation support. The contractor shall submit a monitoring plan developed by the excavation support design engineer for approval. A pre-construction condition inspection and documentation of adjacent structures on-site and off-site shall be performed by the Contractor. If cracking or movement occurs in any adjacent structure, utility, or roadway the engineer shall be notified immediately. The Contractor shall be responsible for any damage to any roadway, structure, or utility line, pipes, etc., on-site and off-site as a result of his operations.

E. All excavation supports shall be removed upon completion of the work except as indicated herein. The Engineer may permit supports to be left in place at the request and expense of the Contractor. The Engineer may order certain supports left permanently in place in addition to that required by the Contract. The cost of the materials so ordered left in place, less a reasonable amount for the eliminated expense of the removal work omitted, will be paid as an extra by a Change Order in accordance with the General Conditions and Division 1. Any excavation supports left in place shall be cut off at least two (2) feet below the finished ground surface or as directed by the Engineer.

3.04 PROTECTION OF SUBGRADE

A. To minimize the disturbance of bearing materials and provide a firm foundation, the Contractor shall comply with the following requirements:

1. Use of heavy rubber-tired construction equipment shall not be permitted on the final subgrade unless it can be demonstrated that drawdown of groundwater throughout the entire area of the structure is at least 3 feet below the bottom of the excavation (subgrade). Even then, the use of such equipment shall be prohibited should subgrade disturbance result from concentrated wheel loads.

2. Subgrade soils disturbed through the operations of the Contractor shall be excavated and replaced with compacted select fill or crushed stone at the Contractor's expense as indicated by the Engineer.

3. The Contractor shall provide positive protection against penetration of frost into materials below the bearing level during work in winter months. This protection can consist of a temporary blanket of straw or salt hay covered with a plastic membrane or other acceptable means.

## 3.05 PROOFROLLING

A. The subgrade of all structures and all areas that will support pavements or select fill shall be proofrolled. After stripping of topsoil, excavation to subgrade and prior to placement of fills, the exposed subgrade shall be carefully inspected by probing and testing as needed. Any topsoil or other organic material still in place, frozen, wet, soft, or loose soil, and other undesirable materials shall be removed. The exposed subgrade shall be proofrolled with a heavily loaded tandem-wheeled dump truck to check for pockets of soft material hidden beneath a thin crust of better soil. Any unsuitable materials thus exposed shall be removed and replaced with an approved compacted material.

## 3.06 DEWATERING

A. The Contractor shall do all dewatering as required for the completion of the work. Procedures for dewatering proposed by the Contractor shall be submitted to the Engineer for review prior to any earthwork operations. All water removed by dewatering operations shall be disposed of in accordance with the Manual for Erosion and Sediment Control in Georgia.

B. The dewatering system shall be of sufficient size and capacity as required to control groundwater or seepage to permit proper excavation operations, embankment construction and reconstruction, subgrade preparation, and to allow concrete to be placed in a dry condition. The system shall include a sump system or other equipment, appurtenances and other related earthwork necessary for the required control of water. The Contractor shall drawdown groundwater to at least 3 feet below the bottom of excavations (subgrade) at all times in order to maintain a dry and undisturbed condition.

C. The Contractor shall control, by acceptable means, all water regardless of source. Water shall be controlled and its disposal provided for at each berm, structure, etc. The entire periphery of the excavation areas shall be ditched and diked to prevent water from entering the excavation. The Contractor shall be fully responsible for disposal of the water and shall provide all necessary means at no additional expense to the Owner. The Contractor shall be solely responsible for proper design, installation, proper operation, maintenance, and any failure of any component of the system.

D. The Contractor shall be responsible for and shall repair without cost to the Owner, any damage to work in place and the excavation, including damage to the bottom due to heave and including removal of material and pumping out of the excavated area. The Contractor shall be responsible for damages to any other area or structure caused by his failure to maintain and operate the dewatering system proposed and installed by the Contractor.

E. The Contractor shall take all the steps that he considers necessary to familiarize himself with the surface and subsurface site conditions, and shall obtain the data that is required to analyze the water and soil environment at the site and to assure that the materials used for the dewatering systems will not erode, deteriorate, or clog to the extent that the dewatering systems will not perform properly during the period of dewatering. Copies of logs of borings and laboratory test results are available to the Contractor. This data is furnished for information only, and it is expressly understood that the Owner and Engineer will not be held responsible for any interpretations or conclusions drawn therefrom by the Contractor.

F. Prior to the execution of the work, the Contractor, Owner and Engineer shall jointly survey the condition of adjoining structures. Photographs and records shall be made of any prior settlement or cracking of structures, pavements, and the like, that may become the subject of possible damage claims.

3.07 EMBANKMENTS

A. The Contractor shall perform the construction of embankments in such a manner that cut and fill slopes will be completed to final slopes and grade in a continuous operation. The operation of removing excavation material from any cut and the placement of embankment in any fill shall be a continuous operation to completion unless otherwise permitted by the Engineer.

B. Surfaces upon which embankments are to be constructed shall be stripped of topsoil, organic material, rubbish and other extraneous materials. After stripping and prior to placing embankment material, the Contractor shall compact the top 12-inches of in place soil as specified under Paragraph 3.09 - COMPACTION.

C. Any soft or unsuitable materials revealed before or during the in place compaction shall be removed as indicated by the Engineer and replaced with select fill.

D. Ground surfaces on which embankment is to be placed, shall be scarified or stepped in a manner which will permit bonding of the embankment with the existing surface. The embankment soils shall be as specified under Part 2 - Products, and shall be deposited and spread in successive, uniform, approximately horizontal layers not exceeding 8-inches in compacted depth for the full width of the cross section, and shall be kept approximately level by the use of effective spreading equipment. Hauling shall be distributed over the full width of the embankment, and in no case will deep ruts be allowed to form during the construction of the embankment. The embankment shall be properly drained at all times. Each layer of the embankment shall be thoroughly compacted to the density specified under Paragraph 3.09 - COMPACTION.

E. The embankment or fill material in the layers shall be of the proper moisture content before rolling to obtain the prescribed compaction. Wetting or drying of the material and manipulation when necessary to secure a uniform moisture content throughout the layer shall be required. Should the material be too wet to permit proper compaction or rolling, all work on all portions of the embankment thus affected shall be delayed until the material has dried to the required moisture content. Samples of all embankment materials for testing, both before and after placement and compaction, will be taken at frequent intervals. From these tests, corrections, adjustments, and modifications of methods, materials, and moisture content will be made to construct the embankment.

F. Where embankments are to be placed and compacted on hillsides, or when new embankment is to be compacted against embankments, or when embankment is built in part widths, the slopes that are steeper than 4:1 shall be loosened or plowed to a minimum depth of 6 inches or, if in the opinion of the Engineer, the nature of the ground is such that greater precautions should be taken to bind the fill to the original ground then benches shall be cut in the existing ground as indicated by Engineer.

G. When rock and other embankment material are excavated at approximately the same time, the rock shall be incorporated into the outer portions of the embankments and the other material which meets the requirements for select fill shall be incorporated into the formation of the embankments. Stones or fragmentary rock larger than 4-inches in their greatest dimension will not be allowed within the top 6-inches of the final grade. Stones, fragmentary rock, or boulders larger than 12-inches in their greatest dimension will not be allowed in any portions of embankments and shall be disposed of by the Contractor as indicated by the Engineer. When rock fragments or stone are used in embankments, the material shall be brought up in layers as specified or directed and every effort shall be exerted to fill the voids with finer material to form a dense, compact mass which meets the densities specified for embankment compaction.

## 3.08 BACKFILLING

A. All structures and pipes shall be backfilled with the type of materials shown on the Drawings and specified herein. Select fill shall be deposited in successive, uniform, approximately horizontal layers not exceeding 8-inches in compacted depth for the full width. Stones or fragmentary rock larger than 4-inches in their greatest dimension will not be allowed within the top 6-inches of the ground nor within 6 inches of pipes. No stone or fragmentary rock larger than 6-inches in their greatest dimension will be allowed for any portion of backfill. Compaction shall be in accordance with the requirements of Paragraph 3.09 - COMPACTION.

B. Where excavation support is used, the Contractor shall take all reasonable measures to prevent loss of support beneath and adjacent to pipes and existing structures when supports are removed. If significant volumes of soil cannot be prevented from clinging to the extracted supports, the voids shall be continuously backfilled as rapidly as possible. The Contractor shall thereafter limit the depth below subgrade that supports will be installed in similar soil conditions or employ other appropriate means to prevent loss of support.

## 3.09 COMPACTION

A. The Contractor shall compact embankments, backfill, crushed stone, aggregate base, and in place subgrade in accordance with the requirements of this Section. The densities specified herein refer to percentages of maximum density as determined by the noted test methods. Compaction of materials on the project shall be in accordance with the following schedule:

| | Density % Std. Proctor (D698) | Density % Mod. Proctor (D1557) | Max. Lift Thickness as Compacted Inches |
|---|---|---|---|
| Embankments Beneath Pavements and Structures* | 98 | 95 | 8 |
| Other Embankments | 95 | 92 | 8 |

| | Density % Std. Proctor (D698) | Density % Mod. Proctor (D1557) | Max. Lift Thickness as Compacted Inches |
|---|---|---|---|
| Backfill Around Structures | 95 | 92 | 8 |
| Backfill in Pipe Trenches | 95 | 92 | 8 |
| Crushed Stone Beneath Structures | ** | ** | 12 |
| Select Sand | -- | 98 | 8 |
| Aggregate Base Course (ABC) Beneath Pavements and Structures | -- | 98 | 8 |
| Crushed Stone Backfill | ** | ** | 12 |
| Crushed Stone Pipe Bedding | ** | ** | 12 |
| In place Subgrade Beneath Structures | 98 | 95 | Top 12-inches |

* Embankments beneath structures shall be considered to include a zone 10 feet out from the foundation of the structure extending down to the natural ground on a 45° slope.

** The aggregate shall be compacted to a degree acceptable to the Engineer by use of a vibratory compactor and/or crawler tractor.

B. Field density tests will be made by the Engineer to determine if the specified densities have been achieved, and these tests shall be the basis for accepting or rejecting the compaction. In-place density tests will be performed in accordance with ASTM D 1556, ASTM D 2167, or ASTM D 2922. The Engineer will be the sole judge as to which test method will be the most appropriate. Failure to achieve the specified densities shall require the Contractor to re-compact the material or remove it as required. The Contractor shall, if necessary, increase his compactive effort by increasing the number of passes, using heavier or more suitable compaction equipment, or by reducing the thickness of the layers. The Contractor shall adjust the moisture contents of the soils to bring them within the optimum range by drying them or adding water as required.

C. Testing will be performed as frequently as deemed necessary by the Engineer. As a minimum, one in-place density test shall be performed for each 1000 cubic yards of embankment placed and 500 cubic yards of backfill placed or one test performed each day for either.

## 3.10 REMOVAL OF EXCESS AND UNSUITABLE MATERIALS

A. The Contractor shall remove and dispose of off-site all unsuitable materials. Within thirty (30) consecutive days after Notice to Proceed, the Contractor shall submit to the Engineer for review all required permits and a list of disposal sites for the unsuitable materials. If the disposal site is located on private property, the submittal shall also include written permission from the owner of record.

B. All unsuitable materials shall be disposed of in locations and under conditions that comply with federal, state and local laws and regulations.

C. The Contractor shall obtain an off-site disposal area prior to beginning demolition or excavation operations.

D. Any surplus excavated material not used for backfilling or embankment suitable for reuse shall be deposited on-site in the disposal area indicated on the Drawings or as directed by the Engineer. Approved disposal areas may also be used by the Contractor for spreading and drying any excavated material suitable as select fill that is too wet for use immediately after being excavated. The Contractor shall maintain the earth surfaces of the disposal area, both during the work and until the completion of all seeding and mulching or other erosion control measures specified, in a manner which will effectively control erosion and sedimentation. If necessary, the Contractor shall clear and grub the disposal site prior to any excavation work.

1. Earth waste shall be shaped to contours which are comparable to and blend in with the adjacent topography where practical, but in no case will slopes steeper than 3 horizontal to 1 vertical be permitted.

2. Seeding and mulching shall be performed over all the earth waste area within 7 days of the completion of stockpiling activities. The work of seeding and mulching shall be performed in accordance with Section 02910 - Final Grading and Landscaping.

3. The Engineer shall have the authority to establish whatever additional requirements may be necessary to insure the satisfactory appearance of the completed work.

E. When all excess and unsuitable material disposal operations are completed, the Contractor shall leave the disposal sites in a condition acceptable to the Owner and Owner(s) of the disposal site(s).

3.11 BORROW EXCAVATION

A. Description:

1. The work covered by this section consists of the excavation of approved material from borrow sources and the hauling and utilization of such material as required on the Drawings or directed by the Engineer. It shall also include the removing, stockpiling, and replacement of topsoil on the borrow source; the satisfactory disposition of material from the borrow source which is not suitable for use; and the satisfactory restoration of the borrow source and haul roads to an acceptable condition upon completion of the work.

2. Borrow excavation shall not be used before all available suitable unclassified excavation has been used for backfill and incorporated into the embankments.

B. Coordination with Seeding Operations: The Contractor shall coordinate the work covered by this section with the construction of embankments so that the requirements of Section 02200 – Earthwork are met.

C. Materials: All material shall meet the requirements of Division 2 shown below:

1. Borrow Material Section 02200, Subsection 2.01 - Select Fill

D. Construction Methods:

1. General: The surface of the borrow area shall be thoroughly cleared and grubbed and cleaned of all unsuitable material including all organics, topsoil, etc., before beginning the excavation. Disposal of material resulting from clearing and grubbing shall be in accordance with Section 02100 – Clearing, Grubbing and Site Preparation.

2. Each borrow operation shall not be allowed to accumulate exposed, erodible slope area in excess of 1 acre at any one given time without the Contractor's beginning permanent seeding and mulching of the borrow source or other erosion control measures as may be approved by the Engineer.

3. The topsoil shall be removed and stockpiled at locations that will not interfere with the borrow operations and that meet the approval of the Engineer. Temporary erosion control measures shall be installed as may be necessary to prevent the erosion of the stockpile material. Once all borrow has been removed from the source or portion thereof, the stockpiled topsoil shall be spread uniformly over the source.

4. Where it is necessary to haul borrow material over existing roads, the Contractor shall use all necessary precautions to prevent damage to the existing roads. The Contractor shall also conduct his hauling operations in such a manner as to not interfere with the normal flow of traffic and shall keep the traffic lanes free from spillage at all times.

E. Owner Furnished Sources:

1. Where borrow sources are furnished by the Owner the location of such sources will be as designated on the Drawings or as directed by the Engineer.

2. The Owner will furnish the necessary haul road right-of-way at locations designated by the Engineer. All haul roads required shall be built, maintained, and when directed by the Engineer, obliterated, at no cost to the Owner. Where the haul road is to be reclaimed for cultivation the Contractor shall plow or scarify the area to a minimum depth of 8 inches.

3. The borrow sources shall be left in a neat and presentable condition after use. All slopes shall be smoothed, rounded, and constructed not steeper than 3:1. Where the source is to be reclaimed for cultivation the source shall be plowed or scarified to a minimum depth of 8 inches, disc harrowed, and terraces constructed. The source shall be graded to drain such that no water will collect or stand and a functioning drainage system shall be provided.

4. All sources shall be seeded and mulched in accordance with Section 02910, within 7 days of completion of borrow activities.

F. Contractor Furnished Sources:

1. Prior to the approval of any off-site borrow source(s) developed for use on this project, the Contractor shall obtain certification from the Georgia Historic Preservation Division of the Georgia Department of Natural Resources certifying

that the removal of the borrow material from the borrow source(s) will have no effect on any known district, site building, structure, or object that is included or eligible for inclusion in the National Register of Historic Places. A copy of this certification shall be furnished to the Engineer prior to performing any work on the proposed borrow source.

2. The approval of borrow sources furnished by the Contractor shall be subject to the following conditions:

   a. The Contractor shall be responsible for acquiring the right to take the material and any rights of access that may be necessary; for locating and developing the source; and any clearing and grubbing and drainage ditches necessary.

      Such right shall be in writing and shall include an agreement with the Owner that the borrow source may be dressed, shaped, seeded, mulched, and drained as required by these Specifications after all borrow has been removed.

   b. Except where borrow is to be obtained from a commercial source, the Contractor and the property owner shall jointly submit a borrow source development, use, and reclamation plan to the Engineer for his approval prior to engaging in any land disturbing activity on the proposed source other than material sampling that may be necessary. The Contractor's plan shall address the following:

      (1) Drainage: The source shall be graded to drain such that no water will collect or stand and a functioning drainage system shall be provided. If drainage is not practical, and the source is to serve as a pond, the minimum average depth below the water table shall be 4 feet or the source graded so as to create wetlands as appropriate.

      (2) Slopes: The source shall be dressed and shaped in a continuous manner to contours which are comparable to and blend in with the adjacent topography, but in no case will slopes steeper than 3:1 be permitted.

      (3) Erosion Control: The plan shall address the temporary and permanent measures that the Contractor intends to employ during use of the source and as a part of the reclamation. The Contractor's plan shall provide for the use of staged permanent seeding and mulching on a continual basis while the source is in use and the immediate total reclamation of the source when no longer needed.

G. Maintenance: During construction and until final acceptance the Contractor shall use any methods approved by the Engineer which are necessary to maintain the work covered by this section so that the work will not contribute to excessive soil erosion.

## 3.15 EARTHWORK TOLERANCES

A. Roadways

1. The Contractor shall take the necessary steps to prevent the loss of material from the roadway due to the actions of wind or water. During construction of the roadway, the road bed shall be maintained in such condition that it will be well drained at all times.

2. The excavated surface shall be less than 0.08 feet above or below the grades specified after deducting for the roadway pavement thickness, if any.

3. Vertical alignment tolerances permitted on the roadway surfaces shall not exceed plus or minus 0.20 feet from the vertical alignment specified, with the provision that, within the tolerance range, local surface irregularities shall not exceed 0.15 feet as measured by the gap between the roadway surface and a 10-foot straightedge placed on any flat graded surface. On vertical curves the same standards will apply except that an additional gap allowance will be made for the road surface curvature over the 10-foot length of the straightedge.

4. Horizontal alignment tolerances permitted shall not exceed plus or minus 1 foot, providing the departure is relatively uniform over any specific length of the roadway.

B. Earthwork

1. Earthwork shall be constructed to the lines and grades as shown on the Contract Drawings. Contractor shall perform earthwork operations in a workman like manner to the satisfaction of the Owner and Engineer. Maximum allowable deviation from the lines and grades, as shown on the Contract Drawings are shown in the following table.

2. Allowable Deviation from the Lines and Grades

| | | |
|---|---|---|
| a. | Horizontal Geometry, Location | ± 0.10 ft |
| b. | Compacted Embankment Surface Elevation | ± 0.10 ft |
| c. | Theoretical Area of Swale | ± 2.0% |
| d. | Select Fill Thickness | - 0 ft + 0.1 ft |

C. The Contractor shall be responsible for verifying lines and grades by surveying methods by a Registered Professional Surveyor. Survey data shall be provided to the Engineer for review and approval.

D. The Engineer shall verify lines, grades and thickness of key components of construction. A combination of direct measurement, excavation and measurement and survey methods will be employed by the Engineer for Quality Assurance purposes. The Contractor shall cooperate with the Engineer and his representatives during quality assurance measurements and shall add or remove soil as required to meet earthwork tolerances presented above. CQA measurements conducted by the Engineer shall not replace the As-Built Surveys that are the responsibility of the Contractor.

- END OF SECTION -

# SECTION 02207

# AGGREGATE MATERIALS

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. The Contractor shall furnish all labor, equipment, and materials required to complete all work associated with the installation of aggregate material beneath foundations, as backfill and as roadway subgrades and other related and incidental work as required to complete the work shown on the Drawings and specified herein.

### 1.02 SUBMITTALS

A. Submit the following in accordance with Section 01300 – Submittals.

1. Materials gradation and certification

2. ASTM C127, ASTM C136, and ASTM C535 test results

## PART 2 -- PRODUCTS

### 2.01 CRUSHED STONE, SCREENED GRAVEL AND GRADED AGGREGATE BASE (GAB)

A. Crushed stone or screened gravel shall meet the requirements of Aggregate Standard Size No. 57 or No. 67 as defined by GDOT Standard Specifications.

B. GAB shall meet the requirements of GAB as defined by GDOT Standard Specifications.

### 2.02 SELECT SAND

A. Select sand shall meet the requirements of the GDOT Standard Specifications for materials and gradation. The size used shall be Size No. 10NS as listed and defined in the GDOT Standard Specifications.

## PART 3 -- EXECUTION

### 3.01 CRUSHED STONE, SCREENED GRAVEL, AND GRADED AGGREGATE BASE (GAB)

A. Contractor shall install crushed stone, screened gravel, and GAB in accordance with the GDOT Standard Specifications and as shown on the Drawings and indicated in the Contract Documents.

1. Unless otherwise stated herein or shown on the Drawings, all mat foundations (bottom slabs) for the proposed structures shall have a blanket of crushed stone or GAB 6 inches thick minimum placed directly beneath the proposed mat. The blanket shall extend a minimum of 12 inches beyond the extremities of the mat.

2. For subgrade preparation at structures and structural fill, the foundation material shall be GAB where specifically specified on Drawings, otherwise, crushed stone or screened gravel shall be used.

3. For ground under drains, pipe bedding, and drainage layers beneath structures the coarse aggregate shall meet the requirements of aggregate standard Size No. 57 or No. 67, as defined by GDOT Standard Specifications.

3.02 SELECT SAND

A. Contractor shall install select sand in accordance with the GDOT Standard Specifications and as shown on the Drawings and indicated in the Contract Documents.

- END OF SECTION -

# SECTION 02210

# TRENCHING AND BACKFILLING

## PART 1 - GENERAL

### 1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to work of this section.

### 1.02 DESCRIPTION

A. This section and related drawings describe requirements pertaining to earthwork.

B. Trenching and Backfilling includes:

- Dewatering excavation
- Excavating all materials
- Handling and disposal of unsuitable material
- Backfilling and compacting

C. Trenching and Backfilling does not include:

- Shoring and bracing excavation

D. Perform trenching and backfilling within rights of way of state, municipal, public utility or other governmental agencies in accordance with requirements of those respective agencies. Such requirements shall take precedence and supersede provisions of these specifications.

### 1.03 SITE INFORMATION

A. Any data on indicated subsurface conditions are not intended as representations or warranties of the continuity of such conditions. It is expressly understood that the OWNER will not be responsible for interpretations or conclusions drawn there from by the CONTRACTOR.

B. Soil investigations may be made by the CONTRACTOR at no cost to the OWNER, provided such operations are acceptable and approved in writing by the ENGINEER.

### 1.04 SOIL QUALITY CONTROL TESTING DURING CONSTRUCTION

A. The OWNER will retain the services of a soils consultant to test for compliance with these specifications. When fill or backfill is required to be compacted to any specified density, the ENGINEER may order such fill or backfill to be laboratory tested in order to ascertain compliance with specification requirements. Tests will be executed immediately prior to covering of such compacted areas.

### 1.05 REMOVAL OF EXISTING UNDERGROUND UTILITIES

A. Demolish and completely remove from the site all existing underground utilities indicated to be removed. Coordinate with local utility companies for verification or shut-off of services if lines are active.

1.06 UNCLASSIFIED EXCAVATION

A. Excavate all materials without regard to type of soil or rock encountered. No extra payment will be made considering the type or quality of excavated materials.

1.07 SAFETY STANDARDS

A. Conduct excavation operations to meet requirements of OSHA Construction Standards, Part. 1926, Subpart P, "Excavation, Trenching and Shoring", and Subpart O. "Motor Vehicles, Mechanized Equipment, and Marine Operations". Where local excavation safety standards are more stringent than OSHA Standards, the local standards shall take precedence.

B. Place safety and traffic barriers at all construction areas to warn vehicles traffic and pedestrians of such excavation. Provide lighted barricades, flagmen, and other public safety procedures as required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.01 SATISFACTORY SOIL MATERIALS

A. Satisfactory soil materials are defined as those complying with the American Association of State Highway Officials (AASHTO) Designation M145, soil classification Groups A-1, A-2-4, A-2-5, and A-3. At time of compaction of 3%+ of the optimum moisture content as determined by ASTM D698 or D1557.

2.02 UNSATISFACTORY SOIL MATERIALS

A. Unsatisfactory soil materials are defined as those described in AASH) M145, soil classification Groups A-2-6, 2-7, A-4, A-5 and A-6, and A-7; also, peat and other highly organic soils; and soil materials of any classification that have a moisture content other than specified for satisfactory materials.

2.03 COHESIONLESS SOIL MATERIALS

A. Cohesionless soil materials include gravels, sand-gravel mixtures, and sands gravelly-sands.

2.04 COHESIVE SOIL MATERIALS

A. Cohesive soil materials include clayey and silty gravels, sand-clay mixtures, gravel-silt, mixtures, clayey and silty sands, sand-silt mixtures, clays, silts, and very fine sands.

2.05 ROCK

A. Rock excavation consists of the removal and disposal of materials encountered that cannot be excavated without continuous and systematic drilling and blasting or continuous use of a single tooth ripper having a draw-bar pull no less than 56,000 lbs. a

front end loader having a minimum bucket break-out force of 25,600 lbs. or a backhoe having a bucket curling force rated at not less than 33,000 lbs. or other special equipment, except such materials that are classified as earth excavation. Typical of the materials classified as rock are boulders 1.0 cu. yd. or more in volume, solid rock, rock in ledges, and rock-hard cementitious aggregate deposits.

2.06 FILL MATERIALS

A. Excavated material that is suitable, as defined, may be used for fills and backfills. Provide any additional fill materials from off the site as may be required to produce designated lines and grades indicated by the project Drawings.

B. Fill materials shall be approved and conform to the following requirements, except as specifically indicated otherwise:

1. Fill shall be earth, free of debris, cinders, combustibles, frost, ice, roots, sod, wood, cellulose, organic materials, fill may contain rock-like-materials not more than 0.50 cubic foot in volume nor more than 12 inches in length, if evenly distributed in the total fill.

2. Top 18 inches of fills under topsoil of lawn and planted areas shall be earth, free of debris, cinders, frost ice, sod, wood and roots over 1/4 inch in diameter. Up to 10% of fill material may be rock-like materials not more than 0.15 cubic foot in volume nor more than 4 inches in length. Also, up to 20 percent of fill material may be topsoil, but no sod.

3. Fill, within two feet of pipe and other structures, shall be soil free of debris, cinders, combustibles, frost, ice, roots, sod wood, cellulose, and organic materials. Up to 40% of fill material may be rock-like materials not more than 3 inches in length.

PART 3 - EXECUTION

3.01 EXISTING UTILITIES

A. Locate existing underground utilities by careful hand excavation before starting earthwork operations. If utilities are to remain in place, provide protection from damage during construction operation.

B. Should other utilities not shown be encountered during excavation, consult the ENGINEER immediately for directions as to procedure. Cooperate with the OWNERS, and public and private utility companies in keeping services and facilities in operation. Repair damaged utilities to the satisfaction of the utility OWNER.

3.02 USE OF EXPLOSIVES

A. Do not bring explosives onto the site or use in the work without the prior written permission of the ENGINEER. The CONTRACTOR is solely responsible for the handling, storage, and use of explosive materials when their use is permitted.

B. Perform blasting operations using skilled personnel, in compliance with governing

regulations. Comply with ANSI A10.2 "Safety Code for Building Construction" for the minimum requirements for blasting.

C. Store explosives, if permitted on OWNER'S property, only in proper storage structures. Keep storage facilities securely locked at all times except for inspection and for delivery and storage of explosives. Provide fulltime watchman and other controls as required by governing regulations.

D. Conduct blasting operations using explosives of such quantity and power, and fired in such sequence and locations, as not to injure personnel or damage property, or damage adjacent work. Assume full responsibility for damages resulting from or attributable to blasting operations.

3.03 SURFACE PREPARATION

A. Within designated construction areas, remove those improvements as necessary for trenching.

B. Where trenching is to pass through streets, curbs, and other paved areas, saw-cut neat lines in the paving or curbing prior to excavation.

C. Remove existing trees on site which are indicated to be removed. Before removal of any full grown trees that are not specifically designated to be removed, consult with Engineer and obtain permission and full instructions before removal or trimming.

D. Stumps and their roots, that would if not removed, remain within an area of five feet beyond the confines of exterior structure walls, shall be removed in their entirety.

3.04 TRENCH EXCAVATION

A. Excavate all materials necessary for construction including structures and appurtenances at the elevations, grades and alignments as shown on the Drawings.

B. Cut trench banks that are vertical and parallel equidistant from the proposed pipe centerline to a distance 12 inches above the pipe crown and at widths not greater than shown on the Drawings. Where sheeting is used, install so that distance between sheeting surfaces will not exceed maximum allowable trench widths.

C. Cut trench bottom carefully allowing for installation of valves, thrust blocking, pipe bells and other appurtenances. Excavate for pipe, manholes and appurtenances no more than ten joints ahead of installation operations. Fine grade trench bottom so that no part of any pipe joint, coupling or other fitting is in contact with the trench bottom when pipes are joined.

D. Do not excavate more than 400 feet ahead of pipe installation operations.

E. Where trenches are excavated below elevations shown on the Drawings, fill over-excavated area with suitable fill, compacted to 95% Standard Proctor Density at the optimum moisture content, crushed stone or sand in order to obtain required pipe elevations and grades. Payment for over excavation due to existing poor pipe bedding condition will be paid for as authorized and following preparation of a Change Order.

F. Place excavated materials along open trenches in a manner so that no damage occurs outside the construction right-of-way.

G. Control rainfall runoff by placing sediment barriers as shown on the Drawings, or as directed by the OWNER'S representatives, and in a manner meeting the requirements of governmental agencies having jurisdiction.

H. Where rock is encountered over-excavate for the full bottom trench width to the following depths:

Backfill over-excavated areas as described in E, above.

| Pipe Diam. Inches | Over excavation Depth, Inches |
|---|---|
| 8 to 18 | 8 |
| 18 to 30 | 10 |
| 32 and greater | 12 |

3.05 DEWATERING

A. Do not permit water to accumulate in trench bottoms. Use pumps, well points and other appropriate means to keep trench bottoms, and foundations for pipeline appurtenances free of water. Do not permit trench bottoms to be used as a channel to convey water.

B. Do not permit pipe installation in trenches containing standing or running water, or on trench bottoms that have been soaked by water.

C. Where trench bottoms have been, in the opinion of the Owner's representative, weakened by water, over excavate and backfill as described in 3.04 - E, above.

3.06 SHORING AND BRACING

A. Install shoring and bracing as necessary to provide safe working conditions and meet the requirements of authorities having jurisdiction.

B. Design and install shoring and bracing having sufficient strength and rigidity to withstand all soil and other loadings caused by surcharging and adjacent traffic.

C. Shore and brace excavation next to structures and through pavements to prevent settlement. Repair at no expense to the OWNER, any damage claimed due to faulty shoring and bracing.

D. Unless otherwise authorized, remove all shoring and bracing prior to backfilling. Shoring and bracing may be left in place if authorized, and in a manner recommended by the ENGINEER.

3.07 BACKFILLING

A. Begin backfilling immediately following installation of the pipeline and inspection. Use a satisfactory soil material or a cohesionless soil material. Place backfill in the trench in 6 inch depth layers for the full trench width and uniformly compact to specified density.

Backfill from above the class of bedding indicated on the Drawings and compact to provide a minimum 12 inch cover over the pipe. Install backfill to prevent lateral displacement of the pipe. Use special care when backfilling flexible pipes to prevent deformation of the pipe.

B. Within street, alleys and driveways subject to vehicle loads continue compaction in 6 inch layers for full trench depth to within 6 inches of final backfill elevation. Use a crushed stone for the final 6 inches of fill.

C. Within areas not affected by vehicular traffic, place fill for full trench depth in 12 inch layers, each compacted to specified requirements. At finished grade elevation, leave backfill neatly rounded over trench at a sufficient height to allow for trench settlement.

D. Backfill around pipeline structures in 6 inch depth layers and compact to achieve required degree of compaction. Do not place backfill against concrete construction until 28 day compressive strength has been reached and completion of structure is sufficient to accommodate lateral earth loads.

E. Unless otherwise recommended by Soils Reports prepared by qualified geotechnical engineers, place fill in 8 inch layers, loose measure, and compact to the following Standard Proctor densities, ASTM D-698, at optimal moisture content:

| | |
|---|---|
| Below building foundations and floor slabs: | 95% |
| Below streets and in public right-of-way: | 95% |
| Below sidewalks and parking pavements: | 95% |
| Below foundations, floor slabs, streets, parking and driveways, top 1.0 foot: | 100% |
| Below grassed and landscaped areas: | 90% |
| Below natural terrain: | 85% |

3.08 FINAL GRADING

A. Restore and grade excavated areas to finished contours as shown on the Drawings or to original lines and grades. Finish grade to remove loose materials and debris within the construction right-of-way and to allow for restoration of ground cover.

B. Construct slopes and ditches to convey rainfall runoff in the manner and direction occurring prior to construction.

C. Where finished grades and elevations are shown on the Drawings, fine grade to within 0.1 foot.

D. For a period of one year following acceptance of the project, repair all areas subject to settlement within 30 days of receipt of written notice from the OWNER. Repairs include establishment of specified ground cover.

3.09 DISPOSAL OF WASTE MATERIALS

A. To the maximum extent use suitable excavated trench materials for backfilling or other purposes on the construction site. Dispose of unsuitable materials in a legal manner, acceptable to the OWNER'S representative.

B. Dispose of unsuitable materials consisting of wood, construction debris and unsuitable soils in a legally acceptable manner.

C. Do not dump waste materials on private property without first receiving the property OWNER'S written permission.

3.10 TESTING

A. Provide written documentation to the OWNER prepared by a Georgia licensed Engineer to assure compaction densities meet or exceed requirements of this specification.

B. Conduct compaction/density testing as follows:

1. Trenching under buildings: One test per 50 linear feet of trench length per foot of backfill depth; two test minimum per foot of backfill depth.

2. Trenching under roads, streets and parking areas: One test per 100 linear feet of trench length per 2 feet of backfill depth; two tests minimum per 2 feet of backfill depth.

3. Trenching under open/landscaped areas: One test per 200 linear feet of trench length per three feet of backfill depth.

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# SECTION 02276

# EROSION AND SEDIMENTATION CONTROL

## PART 1 – GENERAL

### 1.01 THE REQUIREMENT

A. The Contractor is responsible for implementing best management practices to prevent and minimize erosion and resultant sedimentation in all cleared and grubbed areas during and after construction. This item covers the work necessary for the installation of structures and measures for the prevention and control of soil erosion. The Contractor shall furnish all material, labor, and equipment necessary for the proper installation, maintenance, inspection, monitoring, reporting, and removal (where applicable) of erosion prevention and control measures and to cause compliance with the General NPDES Permit for Storm Water Discharges Associated with Construction Activities for Infrastructure Projects under this Section.

### 1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. The Contractor shall be familiar with the following referenced documents and keep them at the construction site at all times. These documents need to be complied with as applicable.

1. General NPDES Permit for Storm Water Discharges associated with Construction Activity for Infrastructure Projects (the NPDES permit)

2. Manual for Erosion and Sediment Control in Georgia (the “Green Book”)

3. State of Georgia Department of Transportation Standard Specifications, Construction of Roads and Bridges, (the GDOT specifications)

4. National Stone Association, Aggregate Classification (the NSA Classification)

5. City of Roswell Soil Erosion and Sediment Control Ordinance

6. Erosion, Sedimentation, and Pollution Control Plan (the Plan) as required by the NPDES Permit

7. Comprehensive Monitoring Program (the CMP) as required by the NPDES Permit

### 1.03 DEFINITIONS

A. Engineer: For the purpose of this Section, the term Engineer is synonymous with consulting engineer, licensed professional, designer, and consultant used in permits, laws, rules, regulations, ordinances, and other soil erosion and sediment control references. For the purposes of this item, the Engineer may at any time during the project provide direction. This direction shall be considered equivalent to direction from the Engineer.

B. Contractor: For the purposes of this Section, the term Contractor is synonymous with General Contractor, Discharger, Operator, Primary Permittee, and Permittee (permit holder) as used in permits, laws, rules, regulations, ordinances, and other soil erosion and sediment

control references.

C. Qualified Personnel: For the purposes of this Section, the terms Qualified Personnel or Qualified Person mean a person who has successfully completed an erosion and sediment controls short course eligible for continuing education units, or an equivalent course approved by Environmental Protection Division of the Georgia Department of Natural Resources and the State Soil and Water Conservation Commission.

D. Other Definitions: Definitions as listed in the NPDES Permit, Part B shall apply in this section.

1.04 REGULATORY COMPLIANCE

A. Land disturbance activities are not authorized to begin until after all required erosion and sediment control permits are obtained from the United States, the State of Georgia, and/or Fulton County and/or the City of Roswell. Contractor is the Co-Primary Permittee and Operator under the provisions of the NPDES Permit GAR 100002. As such, Contractor will be required to sign certain certifications as described in the NPDES Permit. Contractor shall comply with requirements specified in the Contract Documents or by the Engineer. Contractor shall also comply with all other laws, rules, regulations, ordinances, and requirements concerning soil erosion and sediment control established in the United States, the State of Georgia, Fulton County, and/or the City of Roswell. The following documents and the documents referenced therein define the regulatory requirements for this Section.

1. NPDES Permit: The Georgia National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction Activity for Infrastructure Projects (GAR 100002) governs land disturbance or construction activities of one (1) acre or more. On applicable sites, Contractor is responsible for complying with terms and conditions of this permit.

2. Manual for Erosion and Sediment Control: Contractor shall follow Practices and Standards of the Georgia Soil and Water Conservation Commission Manual for Erosion and Sediment Control in Georgia.

3. SWP3: When a Storm Water Pollution Prevention Plan (SWP3) is provided in the Contract Documents, the Contractor shall follow the practices described in the SWP3.

1.05 SUBMITTALS

A. Contractor shall submit to the Engineer the proposed schedule for installation, maintenance, and removal of all temporary and permanent erosion and sediment control measures. The schedule shall reflect the requirements of Article 1.07 and must show the anticipated starting and completion date for all land development activities including:

1. Installation of temporary and permanent sediment control structures

2. Storm water management facilities

3. Timber salvage operations

4. Clearing operations

5. Grubbing operations

6. Rough and finished grading

7. Building construction

8. Landscaping, including all seeding and sodding

9. Removal of temporary sediment control structures

B. Submit the following in accordance with Section 01300 – Submittals:

1. Product Data

2. Hydroseed mix and application rates for seed, lime, fertilizer, and wood cellulose fiber mulch

3. Certification of all materials

4. Composition and germination certification of test results for grass seed

1.06 SEQUENCE OF CONSTRUCTION OF TEMPORARY SEDIMENT CONTROL MEASURES

A. Install all erosion and sediment control structures specified herein, shown in the Contract Documents, shown on the Approved Erosion Control Plan, or as directed by the Engineer, as the first item of work within a given drainage area. Construction and installation of all sediment control structures shall begin downgrade of the area to be disturbed and shall proceed upgrade. Contractor shall at all times maintain all soil erosion and sediment control structures and practices throughout construction and until permanent grass cover is established.

B. Time: Land disturbance activities are not authorized to begin until after all required erosion and sediment control permits are obtained from the United States, the State of Georgia, and/or the County.

1.07 BUFFER ZONES

A. Construction within a buffer zone of a Water of the United States must meet the following requirements.

B. Definition: The buffer zone is officially defined as the distance, in feet, from the edge of the normal high water line (or for wetlands, the distance from the boundary of the wetland). For the purpose of work within the City Limits of Roswell, the buffer zone for small streams (as determined by the Engineer) shall start at the top of the bank, and the buffer zone for larger streams (as determined by the Engineer) and rivers shall start at the edge of the vegetation. Buffer zones are specified in the table below.

| Type of Water of the United States | Buffer |
|---|---|
| Chattahoochee River | 100 feet |
| Tributaries Within 2000 Feet of Chattahoochee River | 75 feet |
| Other Waters of the United States | 25 feet |

C. Construction Activity: Construction activity within the buffer zone must be approved by the Engineer. Any encroachments must immediately be mulched and/or seeded in accordance with the requirements of Article 2.11 (the General Criteria of Article 2.11 are superseded by the requirements of Article 1.08). All construction within a buffer zone must be complete as soon as possible and within 24 hours when possible of initial land disturbance within the buffer.

## PART 2 – PRODUCTS

### 2.01 SPECIFIC REQUIREMENTS

A. The requirements specified herein and shown in the Contract Documents are minimum requirements for the preventing or minimizing soil erosion and sediment transport. Contractor shall install and maintain soil erosion and sediment control measures in accordance with the following criteria. Requirements set forth in the Manual for Erosion and Sediment Control in Georgia shall govern in case of conflicting information, unless clearly identified as a deviation from the Manual.

### 2.02 TEMPORARY INTERCEPTOR, DIVERSION, AND PERIMETER DIKES

A. Install interceptor, diversion, and perimeter dikes to intercept and prevent storm water runoff from entering disturbed areas from any other upgrade area regardless of whether area is on-site or off-site. Dikes must divert runoff to a drainage ditch, sediment basin, or temporary or permanent channel. Dikes shall remain in place until the disturbed area is permanently stabilized. Construct dikes of earth fill free from all perishable matter and refuse, such as scrap forms, wire, brush, rocks larger than 6 inches, or any foreign materials. Ashes, large stones, muck, or other soft materials shall not be used. Compact all dikes using construction equipment. Dikes shall be stabilized immediately after construction with temporary seeding to prevent sediment transport to downstream areas.

### 2.03 TEMPORARY INTERCEPTOR, DIVERSION, AND PERIMETER DITCHES

A. Install temporary ditches where shown on the Drawings or as directed by the Engineer. In general, temporary ditches shall be installed parallel and contiguous to and upgrade of temporary dikes. Construct ditches to the lines and cross section shown on the drawings, provided that ditches have a minimum depth of 1 foot and side slopes have a slope of 2H:1V or flatter. Ditches shall be free of bank projections, trees, brush, stumps, or other objectionable materials or irregularities that will impede normal flows. Downstream outlets of temporary ditches shall be constructed and stabilized prior to construction of the ditch. The outlet must discharge in such a manner as to not cause an erosion problem.

### 2.04 TEMPORARY SEDIMENT BARRIERS (SILT FENCE)

A. Install silt fence where shown on the Drawings or as directed by the Engineer.

B. Material specifications: Filter fabric must meet the requirements set forth in Section 171-Temporary Silt Fence, of the State of Georgia Department of Transportation (DOT) Standard Specifications, Construction of Roads and Bridges. Contractor shall submit to Engineer copies of delivery invoices, certifications, or other documentation that the filter fabric complies with these specifications if requested by the Engineer.

C. Installation: In general, silt fencing shall be installed on the downgrade side of all areas to be disturbed as well as the perimeter of the project site (Engineer may authorize an exception for a perimeter which is upgrade from all land disturbing activity). All posts used to install silt fence shall comply with the specifications in the Manual for Erosion and Sediment Control in Georgia. Posts must be placed at least 18 inches in the ground and cannot be more than 6 feet apart from one another. Fence fabric must be inserted below ground and fence fabric must be fastened to posts according to the specifications in the Manual. Contractor shall install either Type A, Type B, or Type C silt fence, as shown in detail drawings, when indicated on the plans or when directed by the Engineer.

D. Maintenance: In accordance with Article 3.01, all silt fencing shall be inspected and maintenance performed, if needed, within 24 hours of inspection and once every 7 calendar days and within 24 hours of a rainfall event that had precipitation of 1/2 inch or greater. All silt fencing materials, including fabric, post, and fasteners must be replaced 6 months after installation. At the earlier of (1) every 14 calendar days, or (2) when sediment reaches a depth of 1/2 the installed fence height, all soil, silt, sediment, and other material captured by the silt fence should be removed and returned upgrade on the construction site. The silt fence shall be maintained such that it minimizes sediment transport as designed.

2.05 TEMPORARY SEDIMENT BARRIERS (HAY BALES)

A. Install bales of hay where shown on the Drawings or as directed by the Engineer.

B. Material Specifications: Hay bales shall be wire or nylon bound and of rectangular shape.

C. Installation: Place bales in a row with ends tightly abutting the adjacent bales. Corner abutment is not acceptable. Embed bales in the soil a minimum of 4 inches below grade. Build up backfilled soil a minimum of 4 inches above grade on the uphill side of the barrier and conform to grade on the downhill side of the barrier. Anchor each bale in place with 1 by 2 inch wood stakes or No. 3 reinforcing bars. The first stakes shall be driven toward the previously laid bale to force the bales together. Stakes shall be 24 inches long and shall reach a minimum of 6 inches into the ground.

D. Maintenance: In accordance with Article 3.01, all hay bales shall be inspected and maintenance performed, if needed, within 24 hours of inspection once every 7 calendar days and within 24 hours of a rainfall event that has precipitation of ½ inch or greater. Hay bales must be replaced 1 month after installation. At the earlier of (1) every 14 calendar days or (2) when sediment and other material captured by the hay bales reaches 1/2 the height of the original bales such sediment should be removed and returned upgrade on the construction site. The hay bales shall be maintained such that they minimize sediment transport as designed.

2.06 STONE FILTERS

A. Install stone filter where shown on the Drawings or as directed by the Engineer.

B. Material Specifications: Filter fabric must meet the requirements set forth in Section 171-Temporary Silt Fence, of the State of Georgia Department of Transportation (DOT) Standard Specifications, Construction of Roads and Bridges. Stone shall be No. 57 stone as defined by GDOT Standard Specifications. Contractor shall submit to Engineer copies of delivery invoices, certifications, or other documentation that the filter fabric, stone, and

hardware cloth complies with these specifications if requested by the Engineer.

C. Installation: In general, stone filters shall be installed at the low point of all silt fence as the perimeter of the project site (Engineer may authorize an exception for a perimeter which is upgrade from all land disturbing activity). All posts used to install silt fence shall comply with the specifications in the Manual for Erosion and Sediment Control in Georgia. Posts must be placed at least 18 inches in the ground and cannot be more than 3 feet apart from one another. Fence fabric must be inserted below ground, and fence fabric and cloth hardware must be fastened to posts according to the specifications in the Manual. Contractor shall install fence as shown in detail drawings, when indicated on the plans, or when directed by the Engineer. Minimum length of stone filter shall be 10 feet.

D. Maintenance: In accordance with Article 3.01, all stone filters shall be inspected and maintenance performed, if needed, within 24 hours of inspection and once every 7 calendar days and within 24 hours of a rainfall event that had precipitation of 1/2 inch or greater. All materials, including filter fabric, stone and cloth hardware, post, and fasteners must be replaced 6 months after installation. At the earlier of (1) every 14 calendar days, or (2) when sediment reaches a depth of 1/2 the installed height, all soil, silt, sediment, and other materials captured by the stone filter should be removed and returned upgrade on the construction site. The stone filter shall be maintained such that it minimizes sediment transport as designed. Hardware cloth between filter fabric and No. 57 stone shall be 1/2-inch mesh. Stone shall be No. 57 stone as defined by GDOT Standard Specifications.

## 2.07 CONSTRUCTION EXITS

A. Locate construction exits as shown on the Drawings or as directed by the Engineer.

B. Material Specifications: A geotextile underliner, conforming to Section 881.06 – Plastic Filter Fabric, State of Georgia DOT Standard Specifications, Construction of Roads and Bridges, shall be used in all instances to stabilize and support the pad aggregate. Aggregate size will conform to the National Stone Association's (NSA) R-2 classification 1-1/2-inch to 3-1/2-inch stone.

C. Installation: Construction exits should be located at all points where traffic will be leaving the construction site to a public or private right of way, street, alley, or parking area. All construction exits must be fully installed prior to the commencement of timber salvage, clearing, grubbing, grading, or construction operations.

D. Maintenance: In accordance with Article 3.01, all construction exits shall be inspected and maintenance performed, if needed, within 24 hours of inspection once every 7 calendar days and within 24 hours of rainfall a event that has precipitation of 1/2 inch or greater. At the earlier of (1) 30 calendar days since construction exit was installed or last maintained, or (2) geotextile underliner is visible or if construction exit does not conform to specifications established in this section, construction exit pad shall be top dressed with NSA's R-2 (1-1/2-inch to 3-1/2-inch stone) such that underliner is no longer visible and exit pad conforms to specifications.

## 2.08 CHECK DAMS

A. Install check dams as shown on the Drawings or as directed by the Engineer.

B. Installation: Install check dams in all ditches, channels, or swales draining disturbed areas

of one (1) acre or greater and which are not installed with permanent, non-erodible lining or a vegetative cover as specified in Article 2.09. The specifications for the design criteria, materials, installation, and maintenance of check dams are dependent on the upslope drainage area and are described below. A check dam shall not drain a disturbed area greater than ten (10) acres.

1. Check Dam for Ditches Draining up to 2 Acres: Hay bales may be used if installation conforms to the specifications established in Article 2.05.

2. Check Dam for Ditches Draining Up To 5 Acres: Install stone check dams in ditches draining upgrade areas greater than 2 acres but less than 5 acres. Construct check dam with graded size 5- to 10-inch stone. Hand placement may be required to insure complete coverage of the entire width of ditch.

3. Check Dam for Ditches Draining Up To 5 to 10 Acres: Check dams for use with drainage areas between 5 and 10 acres must serve as a sediment filtering device in addition to reducing the velocity of storm water runoff. Construct check dam with graded size 5- to 10-inch stone. Check dam shall not substantially impound water. Hand placement may be required to ensure complete width and depth of ditch.

C. Maintenance: In accordance with the section titled Article 3.01, all check dams shall be inspected and maintenance performed, if needed, within 24 hours of inspection once every 7 calendar days and within 24 hours of a rainfall event that has precipitation of 1/2 inch or greater. Dress dams with appropriate sized stone or additional hay bales as necessary to maintain check dams in accordance with these specifications. At the earlier of (1) every 14 calendar days, or (2) when sediment reaches a depth of 1/2 the original check dam height, all soil, silt, sediment, and other material captured by the dam should be removed and returned upgrade on the construction site.

## 2.09 INLET SEDIMENT TRAP

A. Install inlet sediment traps where shown on the Drawings, as directed by the Engineer, and all around storm drain drop inlets that receive runoff from disturbed areas.

B. Material Specifications: Filter fabric used on constructing inlet sediment traps shall conform to the specifications established in Article 2.06. For gravel drop inlet filters, stone shall conform to NSA's R-3 specification (3- to 6-inch stone). Baffle box inlet filters shall be constructed of 2-inch x 4-inch posts and 2-inch x 4-inch boards.

C. Installation: Install in accordance with Chapter 6 of the Manual for Erosion and Sediment Control in Georgia. Excavation may only be used in combination with a filtering device such as stone or silt fence. All sediment traps should provide a minimum of 1.5 feet of sediment storage. Sediment traps must be self-draining.

D. Maintenance: In accordance with Article 3.01, all inlet sediment traps shall be inspected and maintenance performed, if needed, within 24 hours of inspection once every 7 calendar days and within 24 hours of a rainfall event that has precipitation of 1/2 inch or greater. Clean and repair traps such that traps meet the specifications of this section and minimize sediment transport. Remove sediment as necessary to provide adequate storage volume for subsequent rains.

## 2.10 TEMPORARY SEDIMENT BASINS AND INLETS

A. Install temporary sediment basins and inlets where shown on the Drawings or as directed by the Engineer.

B. Material Specifications: Concrete used in constructing sediment basins shall be ready mixed, conforming to ASTM C 94, Alternate 2. Compressive filed strength shall be not less than 2,500 psi at 28 days. Maximum size of aggregate shall be 1-1/2-inch. Slump shall be between 2 and 4 inches. Field strength shall be assumed as equal to 85 percent of the strength of laboratory-cured cylinders. Forms used in constructing sediment basin shall have exposed surfaces of plywood; others shall be steel, matched boards, plywood, or other acceptable material. Form all vertical surfaces. Provide fillets on reentrant angles. Trench walls, large rock, or earth will not be acceptable form material. Reinforcing steel shall conform to ASTM A 615, Grade 40, deformed bars. At the option of the Contractor, approved precast units may be substituted for cast-in-place units. Precast units shall conform to ASTM C 478. Submit details of proposed units to the Engineer for review. Concrete risers for extension shall be a maximum of 6 inches high and of the same quality as the sections. Risers shall be reviewed by Engineer before installation. Mortar shall be standard premised mortar conforming to ASTM C 387, Type S, or proportion 1 part Portland cement to 2 parts clean, well-graded sand which will pas a 1/8-inch screen. Admixtures may be sued not exceeding the following percentages of weight of cement: Hydrated lime, 10 percent; diatomaceous earth or other inert materials, 5 percent. Consistency of mortar shall be such that it will readily adhere to the concrete. Cast iron frames and gratings for catch basins and storm drain inlets shall be designed for AASHTO H-20 truck loading and shall be bike-proof veticuline grates. Bearing surfaces shall be clean and shall provide uniform contact. Castings shall be tough, close-grained gray iron, sound, smooth, clean, free from blisters, blowholes, shrinkage, cold shuts and all defects, and shall conform to ASTM A 48, Class 30.

C. Construction: Excavation of basin and backfill of any adjoining pipe trenches shall be as specified in Section 02200 – Earthwork. Construct forms to the dimensions and elevations required. Forms shall be tight and well braced. Chamfer corners of forms. Prior to placing the concrete, remove all water and debris from the forms. Moisten forms just prior to placing the concrete. Handle concrete from the transporting vehicle to the forms in a continuous manner as rapidly as practical without segregation or loss of ingredients. Immediately after placing, compact concrete with a mechanical vibrator. Limit the duration of vibration to the time necessary to produce satisfactory consolidation without causing segregation. Screed the top surface of exposed slabs and walls. When the initial water has been absorbed, float the surfaces with a wood float and lightly trowel with a steel trowel to a smooth finish free from marks or irregularities. Finish exposed edges with a steel edging tool. Remove forms and patch any defects in the concrete with mortar mixed in the same proportions as the original concrete mix. Cure concrete by preventing the loss of moisture for a period of 7 days. Accomplish with a membrane-forming curing compound. Apply the curing compound immediately after removal of forms or finishing of the slabs. Protect concrete from damage during the 7-day curing period. If precast unit is used and material in bottom of trench is unsuitable for supporting unit, excavate and backfill to required grade with 3-inch minus, clean pit-run material. Set units to grade at locations shown. Set frames and grates at elevations indicated on Drawings. Frames may be cast in, or shall be set in mortar.

D. Maintenance: In accordance with Article 3.01, temporary sediment basins and inlets shall

be inspected and maintenance performed, if needed, within 24 hours of inspection once every seven (7) calendar days and within 24 hours of a rainfall event that has precipitation of 1/2 inch or greater. Clean and repair basins and inlets such that they meet the specifications of Article 2.09 and minimize sediment transport. Remove sediment as necessary to provide adequate storage volume for subsequent rains.

## 2.11 TEMPORARY SOIL EROSION STABILIZATION (VEGETATIVE)

A. This section covers work necessary for temporary stabilization of soil to prevent erosion following clearing, grubbing, grading, or other construction, except wetlands. The Engineer may modify the use, location, and quantity of the areas requiring stabilization as considered being in the best interest of the City of Roswell. Temporary stabilization within a buffer zone of Water of the United States shall meet the requirements of Article 1.08.

B. General Criteria: The stabilization measures specified herein shall be initiated on all disturbed areas including dikes and ditches within 24 hours of completion to minimize erosion and soil transport, provided however, that stabilization measures specified herein do not have to be initiated in the event that construction activities will resume on that portion of the site within fourteen (14) days from the date activities temporarily ceased. For cleared areas which may not receive permanent vegetative or other stabilization measure for six (6) months or less AND a suitable growing season is not available for seedings to establish an erosion retardant cover, mulch may be applied according to the specifications below.

C. Material Specifications: Seed shall be clean, delivered in original unopened packages, and bearing an analysis of contents. Seed shall be guaranteed 95 percent pure with minimum germination rate of 85 percent. Seed mix shall be as shown in the Grassing Schedule, which is included in the Erosion and Sediment Control Drawings. Alternative seed mixes may be approved by the Engineer. Fertilizer shall be commercial, chemical type, uniform in composition, free-flowing, conforming to state and federal laws, and suitable for application with equipment designed for that purpose. Fertilizer rates shall be as shown in the Grassing Schedule, which is included in the Erosion and Sediment Control Drawings. Straw mulch shall be threshed straw of oats, wheat, or rye, free from obnoxious weed seeds or obnoxious weeds, or shall be clean hay. Average stalk length shall be 6 inches. Wood waste, asphaltic emulsion, or erosion control matting such as jute, excelsior, are appropriate for temporary stabilization. Asphaltic emulsion shall be CSS-1 as manufactured by Chevron Asphalt Company.

1. The Contractor shall submit to the Engineer certificates of inspection of seed by state or federal authorities and copies of delivery invoices or other documentation of quantities of mulch and fertilizer.

2. The Contractor shall give at least 3 days notice to the Engineer of the time and place of the planting of grass.

3. The Contractor shall keep the Engineer advised of his schedule of operations.

D. Application (temporary seeding): Planting and seeding shall be performed in accordance with the following requirements:

1. Soil Preparation: Prior to seeding operations, and after surface has been shaped, graded, and compacted, scarify surface to a minimum depth of 1 inch.

2. Seeding: All seedbeds shall be a minimum depth of 1 inch. Seedbeds shall be reviewed by the Engineer, prior to seeding. After soil has been scarified, apply required seed mix, uniformly with a hydro-seeder. Hydroseeding shall be as specified in Section 02910 – Final Grading and Landscaping.

3. The required fertilizer mix shall be uniformly applied at the time of seeding. Fertilizer shall not be applied to a land area with a buffer zone of a Water of the United States.

4. Upon completion of the seeding operations, apply straw mulch to a reasonably uniform thickness of 1-1/2 inches to 2-1/2 inches in depth. Mulch shall be loose enough to permit penetration of sunlight and air circulation, but dense enough to shade ground, reduce evaporation rate, and prevent or materially reduce erosion of underlying soil. Retain straw in place by applying asphaltic emulsion at a rate of 100 gallons per acre or mechanically tack the mulch into the soil to approximately 3 inches. Equipment used for tacking shall be specially designed for this use. Mulch shall be paid for separately.

E. Application of Mulch only: For areas to receive mulch only, apply at the following rates, to the following depths, and according to the following specifications:

1. Dry Straw or Hay: Spread at a rate of two and one half (2-1/2) tons per acre. Apply to a depth of 6 to 10 inches. Apply uniformly and anchor as necessary.

2. Wood Waste: Spread at a rate of 6 to 9 tons per acre. Apply to a depth of 2 to 3 inches. Apply wood waste only on slopes that are 3:1 or flatter. Anchoring is not necessary.

3. Jute Matting or Excelsior Netting: Apply in accordance with manufacturer's recommendations.

4. Asphaltic Emulsion: Apply at a rate of 1,200 gallons per acre. Apply uniformly.

F. Maintenance: In accordance with Article 3.01, all stabilized areas shall be inspected and maintenance performed, if needed, within 24 hours of inspection once every 7 calendar days and within 24 hours of a rainfall event that has precipitation of 1/2 inch or greater. Apply additional stabilization materials as needed.

2.12 STRAW WITH NET TEMPORARY ROLLED EROSION CONTROL MAT (RECM)

A. The Contractor shall place straw with net temporary channel and slope RECM as shown on the Drawings. The mat shall consist of clean wheat straw from agricultural crops made into a knitted straw mat that is machine assembled. The straw shall be evenly distributed throughout the mat. The mat shall be covered with a photodegradable synthetic mesh attached to the straw with degradable thread.

B. The Contractor shall place the straw with net temporary channel and slope RECM where directed immediately after the channel or slope has been properly graded and prepared, fertilized, and seeded. If the mat is of single net construction, the netting shall be on top with the straw in contact with the soil.

C. The Contractor will immediately repair or replace any section of straw with net temporary channel and slope RECM which is not functioning properly or has been damaged in any way until a stable growth of grass has been established.

D. Straw with net RECM shall be North American Green S150, American Excelsior Co. Curlex I, Contech SFB1, or equal with a minimum bare soil shear stress value of 1.5 $lb/ft^2$.

2.13 CURLED WOOD OR COCONUT FIBER ROLLED EROSION CONTROL MAT (RECM)

A. The Contractor shall place curled wood or coconut fiber channel and slope RECM in channels or on slopes as shown on the Drawings. The mat shall consist of machine-produced mat of curled wood excelsior or coconut fiber with a majority of the fibers 6 inches or longer with consistent thickness and the fibers evenly distributed over the entire area of the mat. The top of the mat shall be covered with a biodegradable synthetic mesh. The mesh shall be attached to the curled wood excelsior or coconut fiber with photodegradable synthetic yarn.

B. The Contractor shall place the curled wood or coconut fiber channel and slope RECM where directed immediately after the channel or slope has been properly graded and prepared, fertilized, and seeded. If the mat is of single net construction, the mesh shall be on top with the fibers in contact with the soil.

C. The Contractor will immediately repair or replace any section of curled wood or coconut fiber RECM which is not functioning properly or has been damaged in any way until a stable growth of grass has been established.

D. Curled wood or coconut fiber RECM shall be American Excelsior Curlex II, North American Green C125, Contech EFB4, or equal matting with a minimum bare soil shear stress value of 2.0 $lb/ft^2$.

2.14 SYNTHETIC TURF REINFORCEMENT MAT (TRM)

A. The Contractor shall place synthetic channel and slope TRM in channel or on slopes as shown on the Drawings. The mat shall consist of entangled nylon, polypropylene, or polyester monofilaments mechanically joined at their intersections forming a three dimensional structure. The mat shall be crush-resistant, pliable, water-permeable, and highly resistant to chemical and environmental degradation.

B. The Contractor shall place the synthetic TRM where directed immediately after the channel or slope has been properly graded and prepared.

C. After the TRM has been placed, the area shall be properly fertilized and seeded as specified allowing the fertilizer and seeds to drop through the net.

D. The Contractor will immediately repair or replace any section of TRM which is not functioning properly or has been damaged in any way until a stable growth of grass has been established.

E. Synthetic TRM shall be Enkamat 7020 as manufactured by Colbond Geosynthetics, Synthetic Industries Landlock Erosion Mat TRM 1060, Miramat TM8 as manufactured by TC Mirafi, or equal matting with a minimum long-term vegetated shear stress value of 5.0 $lb/ft^2$.

## 2.15 TEMPORARY SLOPE DRAINS

A. Temporary slope drains shall be constructed as shown on the Drawings and as specified herein. The temporary slope drains shall be constructed and maintained in accordance with Article 3 of this Section to the satisfaction of the Engineer until the site has been stabilized. The cost of the temporary slope drains shall include the piping, earthwork, stone for erosion control, and all maintenance activities required.

# PART 3 -- EXECUTION

## 3.01 INSPECTIONS AND MAINTENANCE

A. The Contractor shall designate a Qualified Person to perform inspections required by this Section. The following areas are to be inspected and maintenance performed, if needed, at least once every 7 calendar days and within 24 hours of a rainfall event that has a precipitation of 1/2 inch or greater. Immediate action will be taken to correct deficiencies to BMP's (Best Management Practices). The County reserves the right to stop all construction activities not related to maintaining BMP's until such deficiencies are repaired.

   1. Disturbed areas of the construction site that have not undergone final stabilization

   2. Erosion and sediment control structures

   3. All locations where vehicles enter or exit the site

   4. Material storage and construction laydown areas that are exposed to precipitation and have not been finally stabilized

B. In areas that have been finally stabilized, inspections and, if necessary, maintenance by Contractor will occur at least once per month for the duration of the contract or project, whichever is longer.

C. During inspections the following will be observed and appropriate maintenance procedures taken:

   1. The conformance to specifications and current condition of all erosion and sediment control structures

   2. The effectiveness and operational success of all erosion and sediment control measures

   3. The presence of sediments or other pollutants in storm water runoff at all runoff discharge points

   4. If reasonably accessible, the presence of sediments or other pollutants in receiving waters

   5. Evidence of off-site tracking at all locations where vehicles enter or exit the site

D. The Contractor shall be responsible for preparation of the inspection report as required by the NPDES Permit. This report must be completed in accordance with the requirements of

the NPDES Permit GAR 100002. Completed inspection reports shall be kept on-site with the Contract Documents and submitted to the Engineer on a monthly basis. The Contractor will repair deficiencies within 24 hours of inspection.

3.02 MONITORING AND REPORTING

A. Monitoring: The Contractor shall be responsible for the implementation of the monitoring program defined in the Erosion, Sedimentation, and Pollution Control Plan (the Plan) as required by the NPDES Permit. The implementation must comply with EPD guidelines as set forth in NPDES Permit No. GAR 100002 or most recent version.

B. Reporting: The Contractor shall prepare and submit a summary of the monitoring results to the Engineer, the Designer, and the EPD as required in the NPDES permit GAR 100002 (Current Address: Northwest Georgia Regional Office, Ga. Environmental Protection Division, Suite 114, 4244 International Parkway, Atlanta, GA 30354). The County reserves the right to use its own resources to duplicate monitoring and verify the work required by the Contractor in this section.

3.03 REMOVAL OF TEMPORARY SEDIMENT CONTROL STRUCTURES

A. At such time that temporary erosion and control structures are no longer required under this item, the Contractor shall notify the Engineer of its intent and schedule for the removal of the temporary structures, and obtain the Engineer's approval in writing prior to removal. Once the Contractor has received such written approval from the Engineer, the Contractor shall remove, as approved, the temporary structures and all sediments accumulated at the removed structure shall be returned upgrade. In areas where temporary control structures are removed, the site shall be left in a condition that will restore original drainage. Such areas shall be evenly graded and seeded as specified in Section 02910 – Final Grading and Landscaping.

3.04 NOTICE OF TERMINATION

A. When all construction activities have ceased, final stabilization has been implemented by the Contractor, and the site is in compliance with the NPDES permit, the Contractor, together with the Engineer shall submit a Notice of Termination.

## Erosion and Sediment Control Checklist

**Instructions:** Complete this checklist at least once per week and within 24 hours of any rainfall greater than 1/2 inch. Summarize deficiencies on this page (attach additional pages if necessary). Take action to correct problems within 24 hours. Keep this form in the project file.

**Inspection Done By:**_____**Date:**_____

| Item No. | Explanation of Deficiency or Deficiencies | Corrective Action Taken | Date Completed |
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**Temporary Interceptor, Diversion and Perimeter Dikes Check List**

| Item no. | Installation or Maintenance | Explanation | N/A | Yes | No |
|---|---|---|---|---|---|
| TDK –1 | Installation | Are dikes properly placed to divert water to drainage ditches, sediment basins, or temporary or permanent channels? | | | |
| TDK –2 | Installation | Are dikes constructed of earth fill free of refuse, such as wire, brush, rocks over 6 inches in diameter, ashes, muck, etc? | | | |
| TDK –3 | Installation | Have dikes been compacted using construction equipment? | | | |
| TDK –4 | Installation | Do dikes have a top width of at least 2 feet? | | | |
| TDK –5 | Installation | Are dikes at least 18 inches above surrounding grade? | | | |
| TDK –6 | Installation | Are side slopes of dikes 2:1? | | | |
| TDK –7 | Installation | Have dikes been stabilized with vegetative cover (temporary seeding)? | | | |
| TDK –8 | Maintenance | Are dikes still 2 feet across top and at least 18 inches high even after weathering? | | | |
| TDK –9 | Maintenance | Do dikes have vegetative cover? | | | |

**Inspection Done By:_____Date:_____**

## Temporary Interceptor, Diversion, and Perimeter Ditches

| Item No. | Installation or Maintenance | Explanation | N/A | Yes | No |
|---|---|---|---|---|---|
| TDT –1 | Installation | Are ditches properly placed parallel to, contiguous to, and upslope of temporary dikes? | | | |
| TDT –2 | Installation | Do ditches have a minimum depth of one (1) foot? | | | |
| TDT –3 | Installation | Are ditch side slopes 2:1 or flatter? | | | |
| TDT –4 | Installation | Are ditch sides and bottoms free of projections, trees, brush, stumps, etc.? | | | |
| TDT –5 | Installation | Are ditches stabilized with a vegetative cover? | | | |
| TDT –6 | Maintenance | Ditch side slopes have not eroded to be steeper than 2:1? | | | |
| TDT –7 | Maintenance | Are ditches free of sediment and debris? | | | |
| TDT –8 | Maintenance | Do ditches have vegetative cover? | | | |

**Inspection Done By:_____Date:_____**

## Temporary Sediment Barriers/Silt Fence

| Item No. | Installation or Maintenance | Explanation | N/A | Yes | No |
|---|---|---|---|---|---|
| SF –1 | Installation | Is silt fence installed at proper intervals?<br>Slope — Maximum Interval (feet)<br><2% — 100<br>2% to 5% — 75<br>5% to 10% — 50<br>10% to20% — 25<br>>20% — 15 | | | |
| SF –2 | Installation | Is proper type of silt fence installed?<br>Type A- Project duration is 6 months or greater or slope is greater than 3:1<br>Type B- Project duration is less than 6 months and slope is less than 3:1<br>Type C- Where fill slopes exceed a vertical height of 20ft and the slope is greater than 3:1 | | | |
| SF –3 | Installation | Has silt fence been installed 4 to 6 inches into the ground? | | | |
| SF –4 | Installation | Has silt fence post been installed at least 18 inches into the ground? | | | |
| SF –5 | Maintenance | Has silt fence been in place less than 6 months? | | | |
| SF –6 | Maintenance | Is silt fence controlling off-site migration of sediment? | | | |
| SF –7 | Maintenance | Has sediment been removed from the up-slope side of the silt fence in the last 14 days? | | | |
| SF –8 | Maintenance | Is sediment build-up less than one-half the installed silt fence height? | | | |
| SF –9 | Maintenance | Is silt fence free of damage, including Tears and holes? | | | |
| SF –10 | Maintenance | Is silt fence horizontally tight? | | | |
| SF –11 | Maintenance | Are posts intact (unbroken and unbent)? | | | |

**Inspection Done By:**_____**Date:**_____

## Temporary Sediment Barriers-Hay or Straw Bales

| Item No. | Installation or Maintenance | Explanation | N/A | Yes | No |
|---|---|---|---|---|---|
| HB –1 | Installation | Have hay bales been installed at the toe of all slopes higher than 3 feet or steeper than 5:1? | | | |
| HB –2 | Installation | Have hay bales been installed at a maximum of 100ft intervals, if slope persist? | | | |
| HB –3 | Installation | Are hay bales wire or nylon bound and rectangular shaped? | | | |
| HB –4 | Installation | Are hay bales placed end to end with ends tightly abutting adjacent hay bale? | | | |
| HB –5 | Installation | Are hay bales embedded into the soil a minimum of 4 inches below grade? | | | |
| HB –6 | Installation | Are hay bales anchored with 1-inch x 2-inch wooden stakes or No.3 reinforced bars, with a minimum length of 24 inches? | | | |
| HB –7 | Installation | Are stakes driven in at an angle toward the previously placed hay bale? | | | |
| HB –8 | Maintenance | Are hay bales intact? | | | |
| HB –9 | Maintenance | Are stakes unbroken or unbent? | | | |
| HB –10 | Maintenance | Is sediment build up less than one half the original bale height? | | | |
| HB –11 | Maintenance | Has sediment been removed from the upslope side of hay bale in last 14 days? | | | |
| HB –12 | Maintenance | Have hay bales been installed less than one month ago? | | | |
| HB –13 | Maintenance | Are hay bales in firm contact with ground surface with no undermining of soil? | | | |

**Inspection Done By:**_____**Date:**_____

## Construction Exits

| Item No. | Installation or Maintenance | Explanation | N/A | Yes | No |
|---|---|---|---|---|---|
| CE –1 | Installation | Have construction exits been constructed prior to any construction operations at all points where traffic leaves the site to a right-of-way, street, alley, or parking area? | | | |
| CE –2 | Installation | Are construction exits a minimum of 50 feet long and a right angle to the street, alley, etc? | | | |
| CE –3 | Installation | Are construction exits a minimum of 20 feet wide? | | | |
| CE –4 | Installation | Are construction exit pads a minimum of 6 inches in depth? | | | |
| CE –5 | Installation | Have geotextile underliners been placed under the construction exit pads? | | | |
| CE –6 | Installation | Have the construction exit pads been constructed of 1-1/2- to 3-1/2-inch diameter stone? | | | |
| CE –7 | Maintenance | Are construction exit length, width, and depth being maintained? | | | |
| CE –8 | Maintenance | Have construction exits been maintained within the last 30 days? | | | |
| CE –9 | Maintenance | Is geotextile underliner still covered by stone (not visible)? | | | |

**Inspection Done By:_____Date:_____**

## Check Dams

| Item No. | Installation or Maintenance | Explanation | N/A | Yes | No |
|---|---|---|---|---|---|
| CD –1 | Installation | Were check dams constructed of appropriate materials?:<br>>2acres draining-hay bales or graded size 5 to 10 inch diameter stone<br>2 – 5 acres draining- graded size 5 to 10 inch stone<br>properly graded stone, sized from design information and based on anticipated flow velocities | | | |
| CD –2 | Installation | Is center of check dam at least 9 inches (or 6 inches if drain area between 5 and 10 acres) lower than the outer edges? | | | |
| CD –3 | Installation | Is check dam height 2 feet maximum at center of check dam? (check N/A for check dams draining between 5 and 10 acres) | | | |
| CD –4 | Installation | Are side slopes of check dam 2:1 maximum? | | | |
| CD –5 | Installation | Are check dams properly spaced in series (toe of upstream check dam at same elevation as top of downstream check dam)? | | | |
| CD –6 | Installation | Do check dams cover entire width of ditch or swale? | | | |
| CD –7 | Installation | Are check dam heights lower than channel banks? | | | |
| CD –8 | Installation | Are check dam heights lower than upstream property line elevation? | | | |
| CD –9 | Maintenance | Are check dam dimensions and slopes being maintained? | | | |
| CD –10 | Maintenance | Is sediment less than one-half the original check dam height? | | | |
| CD –11 | Maintenance | Are check dams in good contact with ground surface with no undermining of soil? | | | |

**Inspection Done By:**_____**Date:**_____

## Inlet Sediment Traps

| Item No. | Installation or Maintenance | Explanation | N/A | Yes | No |
|---|---|---|---|---|---|
| ST –1 | Installation | Are inlet sediment traps constructed around all storm drain inlets that receive runoff from disturbed areas? | | | |
| ST –2 | Installation | Are sediment traps constructed according to design? | | | |
| ST –3 | Installation | Do sediment traps provide for a minimum of 1-1/2 feet of sediment storage? | | | |
| ST –4 | Installation | Are sediment traps self draining? | | | |
| ST –5 | Installation | If gravel is used for the filtering media, is it 3 to 6 inches in diameter? | | | |
| ST –6 | Installation | If baffle box inlet filters were used, are they constructed of 2-inch x 4-inch or 4-inch x 4-inch posts and 2-inch x 4-inch boards? | | | |
| ST –7 | Maintenance | Does sediment trap have adequate storage volume for subsequent rains? | | | |
| ST –8 | Maintenance | Are sediment traps intact? | | | |
| ST –9 | Maintenance | Are wooden components unbroken? | | | |
| ST –10 | Maintenance | Is gravel overtaken with sediment? | | | |
| ST –11 | Maintenance | Are filter fabrics free of tears or holes? | | | |

**Inspection Done By:_____Date:_____**

## Temporary Sediment Basin or Inlet

| Item No. | Installation or Maintenance | Explanation | N/A | Yes | No |
|---|---|---|---|---|---|
| SB –1 | Installation | Have temporary sediment basins and inlets been located and constructed according to design? | | | |
| SB –2 | Installation | Is pool area of basin free of all trees, brush, etc.? | | | |
| SB –3 | Installation | Have embankments of basin been stabilized with vegetative cover? | | | |
| SB –4 | Maintenance | Are temporary sediment basin and inlet intact with no signs of embankment erosion? | | | |
| SB –5 | Maintenance | Do embankments have vegetative cover? | | | |
| SB –6 | Maintenance | Is sediment below the specified elevation? | | | |

**Inspection Done By:_____Date:_____**

**Temporary Soil Erosion Stabilization (Vegetative)**

| Item No. | Installation or Maintenance | Explanation | N/A | Yes | No |
|---|---|---|---|---|---|
| VS –1 | Installation | Have disturbed areas been stabilized with temporary vegetation and mulched within 24 hours of completion? | | | |
| VS –2 | Installation | Have disturbed areas awaiting permanent stabilization cover, where suitable growing season is not available, been stabilized with temporary vegetation and/or mulch? | | | |
| VS –3 | Installation | Was surface prepared for seeding (by scarifying soil a minimum of 1 inch deep)? | | | |
| VS –4 | Installation | Has seeding been performed according to growing seasons and required mixtures of seed and fertilizer? | | | |
| VS –5 | Installation | Has mulch been loosely applied, after seeding, to a thickness of 1-1/2 to 2-1/2 inches? | | | |
| VS –6 | Installation | Has mulch been retained using an asphaltic emulsion or mechanically tacked? | | | |
| VS –7 | Installation | For areas which have not received temporary vegetation and have received mulch only:<br>Has dry straw or hay mulch been applied to a thickness of 6 to 10 inches?<br>Has wood waste been applied to a thickness of 2 to 3 inches? | | | |
| VS –8 | Maintenance | Are stabilized areas intact with no signs of eroded areas? | | | |
| VS –9 | Maintenance | Do disturbed areas that have been stabilized with mulch have the proper thickness of mulch? | | | |
| VS –10 | Maintenance | Are previously stabilized areas intact and not in need of touch up seeding or mulching? | | | |

**Inspection Done By:**_____**Date:**_____

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# SECTION 02500

# SURFACE RESTORATION

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Provide all labor, equipment, and materials necessary for final grading, topsoil placement, and miscellaneous site work not included under other Sections but required to complete the work as shown on the Drawings and specified herein.

## PART 2 -- MATERIALS

### 2.01 TOPSOIL

A. Topsoil shall meet the requirements of Section 02200 – Earthwork.

## PART 3 – EXECUTION

### 3.01 FINAL GRADING

A. Following approval of rough grading the subgrade shall be prepared as follows:

1. For riprap, bare soil 24 inches below finish grade or as directed by Engineer.

2. For topsoil, scarify 2 inches deep at 4 inches below finish grade.

### 3.02 TOPSOIL PLACEMENT

A. Topsoil shall be placed over all areas disturbed during construction under any contract except those areas which will be paved, graveled or rip rapped.

B. Topsoil shall be spread in place for lawn and road shoulder seed areas at a 4-inch consolidated depth and at a sufficient quantity for plant beds and backfill for shrubs and trees.

C. Topsoil shall not be placed in a frozen or muddy condition.

D. Final surface shall be hand or mechanically raked to an even finished surface to finish grade as shown on Drawings.

E. All stones and roots over 4 inches and rubbish and other deleterious materials shall be removed and disposed of.

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# SECTION 02510

# PAVING AND SURFACING

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. The Contractor shall furnish all labor, equipment, and materials and perform all operations in connection with the construction of asphalt concrete pavement, asphalt concrete overlay, reinforced concrete pavement, gravel roads, concrete curb and gutter, repair and reconstruction of existing asphalt concrete pavement, repair of existing gravel roads, and pavement markings complete as specified herein and as detailed on the Drawings.

B. All new roads including the replacement of portions of the existing roads shall be to the limits, grades, thicknesses, and types as shown on the Drawings. Patches for pipe crossings and areas damaged during the construction work shall be asphalt and/or gravel, depending upon the material encountered, unless otherwise indicated.

C. Contractor shall provide quality control in accordance with Section 01400 – Quality Control, Article 1.05.

### 1.02 STANDARD SPECIFICATIONS

A. Except as otherwise provided in the Specifications or on the plans, all work shall be in accordance with the Georgia Department of Transportation (GDOT) Standard Specifications for Construction, Roads, and Bridges, latest revision except that any reference to “GDOT”, “Department”, or “Unit” shall mean the “Owner”. When reference to these Specifications is intended, the description will be GDOT Specifications.

B. Except with the approval of the Engineer, the placing of concrete or asphalt concrete surface paving shall be subject to the Seasonal and Weather Restrictions set forth in GDOT Specifications.

## PART 2 -- MATERIALS

### 2.01 SELECT FILL

A. The Contractor shall place select fill as necessary to complete the embankments, shoulders, subgrade foundation and replacement for removed unsuitable material in accordance with GDOT Specifications and Section 02200 – Earthwork.

### 2.02 GRAVEL

A. All work, including materials, associated with gravel shall be in accordance with Section 02207 – Aggregate Materials and GDOT Specifications.

### 2.03 AGGREGATE STABILIZATION

A. All work, including materials, associated with Aggregate Stabilization shall be in accordance

with Section 02207 – Aggregate Materials and GDOT Specifications.

2.04 GRADED AGGREGATE BASE COURSE (GAB)

A. All work, including materials, associated with Graded Aggregate Base shall be in accordance with Section 02207 – Aggregate Materials and GDOT Specifications.

2.05 ASPHALT CONCRETE BINDER COURSE

A. All work, including materials, associated with asphalt concrete binder course shall be in accordance with GDOT Specifications.

B. The job mix formulas shall be delivered to the Engineer at least two (2) weeks prior to beginning paving operations.

2.06 ASPHALT CONCRETE SURFACE COURSE

A. All work, including materials, associated with asphalt concrete surface course shall be in accordance with GDOT Specifications.

B. The job mix formulas shall be delivered to the Engineer at least two (2) weeks prior to beginning paving operations.

2.07 RIGID PORTLAND CEMENT CONCRETE PAVEMENT

A. All work, including materials associated with rigid concrete pavement shall be in accordance with Section 03300 – Cast-In-Place Concrete. Class A concrete shall be used. Placement shall be in accordance with Section 03300 – Cast-In-Place Concrete and GDOT Specifications.

2.08 RIGID CONCRETE PAVEMENT REINFORCING

A. Reinforcing, if specified, shall be as shown on the Structural Drawings and as specified under Section 03200 – Reinforcing Steel.

2.09 CONCRETE CURB AND GUTTERS

A. Concrete shall be Class B in accordance with the requirements of Section 03300 – Cast-In-Place Concrete, except that concrete shall be air-entrained to provide an air content of 6 percent ± 1.5 percent.

B. Premolded expansion joint filler for expansion joints shall conform to ASTM D 1751 and shall be 1/2-inch thick, minimum.

2.10 ASPHALT TACK COAT

A. All work, including materials, associated with asphalt tack coat shall be in accordance with GDOT Specifications.

PART 3 -- EXECUTION

3.01 EMBANKMENT

A. The embankment shall be constructed in accordance with Section 02200 – Earthwork.

3.02 SUBGRADE

A. The subgrade, where shown on the Drawings, shall be aggregate stabilized by the addition and mixing of coarse aggregate with the top 3 inches of subgrade in accordance with GDOT Specifications. Aggregate stabilization shall be applied to the subgrade at a rate of 300 pounds per square yard. Following the application of stabilizer aggregate, the subgrade shall be formed true to crown and grade, and shall be compacted with a minimum of four (4) passes of a 15-ton vibratory roller to conform to the maximum densities determined by AASHTO T99 Standard Specifications. Subgrade shall be proof-rolled per Section 02200 – Earthwork.

3.03 BASE COURSE

A. The finished base course of all paving shall be GAB and shall be of the thickness shown on the Drawings, formed true to crown and grade. Gravel roads, including repair to existing gravel roads shall be GAB and shall be of the thicknesses shown on the Drawings, formed true to crown and grade. No fill material except new GAB shall be placed on top of existing gravel. Compaction shall be as specified in Section 02200 – Earthwork.

3.04 ASPHALT CONCRETE BINDER COURSE

A. Asphalt Concrete Binder Course shall be placed and compacted on the aggregate base course in layers not to exceed 2 inches and at the rate of 110 pounds per square yard per inch. Thicknesses shall be as shown on the Drawings.

3.05 ASPHALT CONCRETE SURFACE COURSE

A. Prior to placement of the asphalt concrete surface course, the base/intermediate course shall be inspected for damage or defects and repaired to the satisfaction of the Engineer. The surface of the base/intermediate course shall be approved by the Engineer.

B. The asphalt tack coat shall be applied to the surface of the approved base/binder course as described in GDOT Specifications and on the Standard Details. Equipment for applying the tack coat shall be power-oriented pressure spraying or distributing equipment suitable for the materials to be applied and approved by the Engineer.

C. The Asphalt Concrete Surface Course shall be placed and compacted on the base/binder course in layers not to exceed 2 inches and at the rate of 110 pounds per square yard per inch. Thicknesses shall be as shown on the Drawings. Rolling shall continue until all roller marks are eliminated and a density of 92 percent of the measured maximum density determined in accordance with ASTM D2041 has been obtained.

3.06 RIGID PORTLAND CEMENT CONCRETE

A. The subgrade and base course beneath portland cement concrete pavement shall be prepared in accordance with the applicable Sections of these Specifications, Standard

Details, and referenced Standard Specifications, except that the Contractor shall use an approved automatically controlled fine grading machine to produce final subgrade and base surfaces meeting the lines, grades, and cross sections (thicknesses) shown on the Drawings or established by the Engineer.

B. The surface of the base shall be damp at the time the concrete is placed. The Contractor shall sprinkle the base when necessary to provide a damp surface. The Contractor shall satisfactorily correct all soft areas in the subgrade or base prior to placing concrete.

C. Hauling over the base course shall not be allowed except where specifically permitted by and in writing by the Engineer. The Engineer may allow equipment dumping concrete to operate on the base to the extent and under the conditions the Engineer deems necessary to facilitate placing and spreading the concrete.

D. Installation of the rigid concrete pavement shall be in accordance with the details shown on the Drawings and Section 03300 – Cast-in-Place Concrete. The rigid concrete pavement shall cure a minimum of ten (10) calendar days and until the concrete has attained a minimum flexural strength of 550 psi as indicated by flexural strength testing. The Contractor shall coordinate and pay for all flexural strength testing with a minimum of four (4) 6-inch by 6-inch by 20-inch beams for every fifty (50) cubic yards of pavement concrete installed.

E. Contraction joints shall be spaced at intervals as shown on the Drawings. Transverse contraction joints shall be formed by an approved joint insert. Expansion joints shall be placed when the pavement abuts a structure using 1-inch expansion joint material (filler) and sealant as specified herein.

## 3.07 CONCRETE CURB AND GUTTER

A. The expansion joint filler for concrete curb and gutters shall be cut to conform with the cross section of the curb. Expansion joints shall be spaced at intervals of not more than 25 feet. Formed control joints shall be installed at intervals not exceeding 10 feet. Depth of joint shall be 1/3 the thickness. Curved forms shall be used where radii are indicated; straight segments shall not be permitted. Upon removal of the forms, exposed curb faces shall be immediately rubbed down to a smooth and uniform surface. No plastering shall be permitted.

## 3.08 UNDERGROUND UTILITY LINES

A. Where an underground utility line is beneath the new roadway, the backfilling shall be carried out with special care, and the final consolidation shall be accomplished by a vibratory roller. Construction of the roadway over the trench shall be deferred as long as practicable.

## 3.09 JUNCTION WITH OTHER PAVING

A. Where new asphalt concrete pavement abuts existing asphalt concrete pavement, the existing pavement shall be cut back to ensure obtaining the specified compaction of the new pavement courses and interlocking adjoining courses. Existing subbase courses shall be cut back from the subgrade level of the new pavement on a one-on-one slope into the existing pavement, and the asphalt courses of the existing pavement shall be removed for an additional 6 inches back from the slope. The edge of the existing asphalt courses shall

be saw cut straight and true. The faces between new and existing asphalt courses shall receive an application of tack coat.

B. Where new rigid concrete pavement abuts existing rigid concrete or asphalt concrete paving, the existing paving shall be saw cut straight and true. An expansion joint of a 1/2-inch minimum thickness with filler material and sealant shall be placed between the new concrete pavement and the existing rigid concrete or asphalt concrete paving.

3.10 ASPHALT CONCRETE OVERLAY

A. Where asphalt concrete is proposed to be placed over an existing asphalt or rigid concrete surface, the surfaces shall be thoroughly cleaned by power brooming and a tack coat shall be applied in accordance with GDOT Specifications, prior to installing the overlay. The overlay shall be applied in accordance with Articles 2.06 and 3.05 and Standard Details shown on the Drawings.

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# SECTION 02829

# SECURITY FENCE GATE OPERATOR

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Scope: Furnish and install a pre-wired, industrial fence gate operator for swing gates including all attachments, mounting brackets, sensors and access control devices as shown on the Drawings and specified herein.

### 1.02 WORK SPECIFIED ELSEWHERE

A. Drawings show gate sizes and mounting requirements.

B. Related work specified elsewhere in this or other technical specification sections.

### 1.03 SUBMITTALS

A. Shop Drawings and Product Data: Submit shop drawings and product data in compliance with Specification Section 01300 - Submittals. Submittal to include the following:

1. Submit drawings showing connections to adjacent construction, range of travel, and all electrical and mechanical connections to the operator.

2. Product Data for the principal components. Indicate capacities, sizes, materials of construction, performance and operating characteristics, features of control system, finishes, and similar information. Indicate any variations from specified requirements.

3. Wiring diagrams detailing wiring for power, signal and control systems differentiating clearly between manufacturer-installed wiring and field-installed wiring.

B. Operation and Maintenance Manuals: Submit operation and maintenance manuals the equipment in compliance with Specification Section 01730 Operation and Maintenance Data.

### 1.04 QUALITY ASSURANCE

A. Each operator is to bear a label indicating that the operator mechanism has been tested for full power and pressure of all hydraulics, full stress tests of all mechanical components and electrical tests of all overload devices.

B. Operators are to be built to UL325 standards and be listed by a NRTL testing laboratory.

C. Gate operators are to be designed and labeled for specific usage classes to meet current safety standards.

1.05 WARRANTY

A. Provide a five year warranty against all defects in materials or workmanship. Defective materials are to be replaced with new materials furnished by the manufacturer, at no cost to the Owner.

1.06 DELIVERY, SHIPPING, & HANDLING

A. Store products upright in the original shipping containers, covered, ventilated and protected from weather conditions.

PART 2 -- PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the requirements of this Section, the following manufacturers have the capability of performing the work in this Section:

1. HySecurity Gate Operators Model HRG 222 ST with Smart Touch Controller

2. Or Equal.

B. The naming of a manufacturer in this Section is not an indication that the manufacturer's standard equipment is acceptable in lieu of the specified component features. Naming is only an indication that the manufacturer may have the capability of engineering and supplying a system as specified.

2.02 ELECTRIC OPERATOR

A. General:

1. Gate Operator Capacity:

a. Gate Width: Up to 16 feet wide

b. Gate Weight: Up to 1,600 pounds

2. Operating Speed: 30 seconds to open/close.

3. UL Classification: Class IV, when tested in accordance with UL325.

4. Mounting: Left- or right-hand operation to provide flexibility in determining orientation either prior to or during installation.

5. Provide external sensors wired to the gate operator to reverse the gate in either direction upon sensing an obstruction to meet current safety standards.

6. Operation is to be by means of a hydraulic cylinder acting upward in a steel post assembly to cause the post and the gate panel to rotate from zero to 90 degrees without the use of articulating arms, screw drives or mechanical devices. The closing action of the gate panel is to cause the free end of the gate to be

mechanically locked in place without the use of externally operated electric or mechanical locks. The opening action of the gate panel is to allow the gate to rise approximately twelve inches and clear adjacent curbs or obstructions.

7. The post assembly is to be fully enclosed and not offer any openings for foreign material to enter.

8. Actuator assembly is to be supported on non-lubricated synthetic bearing surfaces. Bearings providing rotation and lift to the actuator assembly are to be permanently lubricated cam followers.

B. Standard mechanical components shall include as a minimum:

1. Indexing arm to allow precise closing adjustment.

2. 2-1/4" industrial quality sealed cam followers.

3. Drop bolt locking device.

4. Limit switches to limit travel in each direction.

5. Hydraulic hand-pump for emergency operation.

6. Hoses shall be 1/4", rated to 2750 working psi.

7. Hose fittings at valve block and at actuator post assembly, shall be quick disconnect type.

8. Pump motor: 2 HP, TEFC, continuous duty with a minimum service factor of 1.15. Voltage: 460-3-60 Hz.

9. Finish: actuator post is to be hot dip galvanized.

C. Electrical Components:

1. NEMA 4X, Type 316 stainless steel construction with fully hinged, dead-front door with gasket, door handle and lock for electric controls, hydraulic pump and valves. Control panel shall comply with the requirements specified in Section 16902, Electric Controls and Relays. Main power disconnect or circuit breaker to be mechanically interlocked with door so that main power must be off before door can be opened. Include terminal strip for field connections with suitable identification. Provide control panel with a heater with thermostat control.

2. Transformer: 75 VA, non-jumpered taps, for all common voltages.

3. Control unit: 24 VDC.

D. Control System: Microprocessor electronics and solid-state control board in a weatherproof housing with the following features:

1. Low-voltage control inputs to provide for connection of a full range of external devices including safety loop, exit loop, computer attachment and sensors.

2. Modular plug-in loop detector technology for safety and exit loops.

3. Outputs for sensor alarm, alarm system, and operating beacons.

4. Keyed manual disconnect switch operation (to provide release and manual operation of the gate in emergency situations) and fire department keyed manual disconnect.

5. LED indication of all input and output functions.

6. Master/Second capability to allow synchronized movement between two separate gate operators in a double gate installation at a single entrance.

7. On-board 3-push button control for close, stop, and open of gate.

8. Entrapment sensor to temporarily shut off motor upon contacting an obstruction which causes the operator to labor, followed by a slight reverse of direction away from the obstruction before shutting off the motor again resulting in a full stop of the gate.

9. Obstruction sensing providing a slight reverse/full stop if an object is contacted while opening or a complete reopen if an object is contacted while closing.

10. Internal alarm to activate whenever the gate encounters an obstruction.

11. Built in “warn before operate” system;

12. Built in timer to close;

13. Event logging EEPROM for trouble shooting diagnostics; liquid crystal display for reporting of functions.

14. RS232 port for connection to laptop or other computer peripheral and RS485 connection of Master/Slave systems.

E. Factory Testing:

1. Fully assemble and test, at the factory, each gate operator to assure smooth operation, sequencing and electrical connection integrity. Apply physical loads to the operator to simulate field conditions. Tests are to simulate physical and electrical loads equal to the fully rated capacity of the operator components.

2. Check all mechanical connections for tightness and alignment. Check all welds for completeness and continuity. Check welded corners and edges to assure they are square and straight.

3. Check all hydraulic hoses and electrical wires to assure that chafing cannot occur during shipping or operation.

2.03 KEYPAD SYSTEM

A. Furnish and install keypad access system with the following features:

1. Capable of creating random codes, displaying codes, and printing access code numbers.

2. Intelligent, stand-alone system with over 1,000 programmable access codes (PIN numbers), which have the option of being programmed in lengths of 4 to 8 digits;

3. Stand-alone (off-line) or communicating (on-line) system. Programmable anti-passback functions;

4. Advanced logic module stores all programming and decision criteria such as ill status, time zones, and issue levels;

5. Simple programming/data retrieval with a menu-driven handheld computer;

6. Printer interface for reports, programming information, and transaction messages.

B. Gooseneck Operating Stand for Keypad:

1. Dual-height style for both vehicular and truck traffic using the system.

2. Constructed from heavy gauge 2-inch square aluminum tubing finished with yellow powder coat paint and 90 degree curvature to provide easy motorist access.

3. Provide with square mounting plate with tapped holes and fitted cover over base mounting flange for finished appearance.

2.04 LOOP DETECTORS

A. Flexible, pave-over loop vehicle detectors designed and configured to handle a drive-thru system. Provide with sensitivity meter to optimize the proper sensitivity setting to detect all vehicles including motorcycles, and indicates delay timing, extension timing, power, and loop faults. Provide with sensitivity boost function to help prevent dropouts during the passage of high bed vehicles.

## PART 3 -- INSTALLATION

3.01 INSTALLATION

A. Examination: Make sure that supporting posts or pilasters are adequate to support the gate and operator. Do not proceed with installation if supports are inadequate.

B. Locate concrete mounting pad in accordance with approved shop drawings.

C. Install gate operator in accordance with the manufacturers printed instructions, current at the time of installation. Coordinate locations of operators with contract drawings; other trades and shop drawings. Mount directly to concrete pad, firmly secured, plumb, and level.

D. Anchor bolts are to be fully concealed in the finished installation.

E. Wire in accordance with Division 16 requirements. Tag and identify all cable runs.

F. Test, adjust, and inspect all new equipment for proper operation. Test gate operators through ten full cycles and adjust for operation without binding, scraping or uneven motion.

G. Lubricate operating parts of systems, as recommended by manufacturers.

H. Train owner's personnel in the general maintenance of the gate operator and accessories.

- END OF SECTION -

# SECTION 02910

# FINAL GRADING AND LANDSCAPING

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Furnish all labor, equipment, and materials necessary for final grading, topsoiling, seeding, and miscellaneous site work not included under other Sections, but required to complete the work as shown on the Drawings and specified herein. Under this Section, all areas of the project site disturbed by excavation, materials storage, temporary roads, etc., shall be reseeded as specified herein.

### 1.02 SUBMITTALS

A. Submit the following in accordance with Section 01300 – Submittals:

1. Product Data.

2. Hydroseed mix and application rates for seed, lime, fertilizer, and wood cellulose fiber mulch.

3. Certification of all materials.

4. Three (3) copies of composition and germination certification and of test results for grass seed.

## PART 2 -- PRODUCTS

### 2.01 CONTRACTOR'S RESPONSIBILITIES

A. Furnish and submit certification for the materials used as specified in the General Conditions, Division 1 – General Requirements and Division 2 – Sitework.

### 2.02 TOPSOIL

A. Upon completion and approval of the rough grading, the Contractor shall place the topsoil over all areas disturbed during construction under any contract except those areas which will be paved, graveled, or rip rapped. Topsoil shall not be placed in a frozen or muddy condition and shall contain no toxic materials harmful to grass growth. Topsoil shall be as defined under Section 02200 – Earthwork.

### 2.03 WATER

A. Water shall be furnished to the Contractor by the Owner from existing facilities as directed by the Engineer.

B. The Contractor shall furnish all hoses and connections necessary to complete the landscaping work.

## 2.04 FERTILIZER

A. Fertilizer shall be a complete commercial fertilizer with components derived from commercial sources. Fertilizer analysis shall be determined from field soil sampling in appropriate number taken by the Contractor and analyzed by the Georgia Department of Agriculture or other independent laboratory. Contractor shall furnish fertilizer in accordance with the recommendations of the Georgia Department of Agriculture.

B. One-quarter of the Nitrogen shall be in the form of nitrates, one-quarter in the form of ammonia salts, and one-half in the form of natural organic Nitrogen. Available Phosphoric Acid shall be free from superphosphate, bone, or tankage. Potash shall be Sulphate of Potash. Elements shall conform to the standards of Association of Official Agricultural Chemists.

C. Fertilizer shall be delivered in standard size bags marked with the weight, analysis of contents, and the name of the manufacturer. Fertilizer shall be stored in weatherproof storage areas and in such a manner that its effectiveness will not be impaired. The fertilizer shall be applied for a full one year after startup and during construction of the proposed booster station.

## 2.05 LIME

A. At least 50% shall pass a No. 200 U.S.S. mesh sieve. At least 90% shall pass a No. 100 U.S.S. mesh sieve, and 100% shall pass a No. 10 U.S.S. mesh sieve. Total carbonates shall not be less than 80% or 44.8% Calcium Oxide equivalent. For the purpose of calculation, total carbonates shall be considered as Calcium Carbonate.

## 2.06 GRASS SEED

A. The Contractor shall furnish the kinds and amounts of seed to be seeded in all areas disturbed by the construction work. All seed shall be labeled to show that it meets the requirements of the Georgia Seed Law, as amended. All seed must have been tested within six (6) months immediately preceding the planting of such material on the job.

B. The inoculant for treating legume seed shall be a pure culture of nitrogen-fixing bacteria prepared specifically for the species. Inoculants shall not be used later than the date indicated on the container.

C. Seed mix shall be as shown in the Grassing Schedule located on the Contract Drawings.

## 2.07 WOOD CELLULOSE FIBER MULCH

A. For use in hydroseeding grass seed in combination with fertilizers and other approved additions, shall consist of especially prepared wood cellulose fibers such as “Conwed”, “Silva-Fiber”, or equal, and have no growth or germination inhibiting factors, and be dyed green.

B. The wood cellulose fiber shall have the additional characteristic of dispersing rapidly in water to form a homogeneous slurry and remain in such state when agitated in the hydraulic mulching unit, or adequate equal, with the specified materials.

C. When applied, the wood cellulose fiber with additives will form an absorptive mat but not a plant inhibiting membrane, which will allow moisture, natural or mechanical, to percolate into underlying soil.

D. The mulch shall be supplied, compressed in packages containing 50 pounds of material having an equilibrium air dry moisture content at time of manufacture of 12 percent plus or minus 2 percent. Wood cellulose fiber mulch shall be stored in a weatherproof storage area and in such a manner that effectiveness will not be impaired.

2.08 STRAW MULCH

A. Straw used for mulch shall be small grain hay. Hay shall be undamaged, air dry, threshed straw, free of undesirable weed seed. Straw mulch is not required for seeded areas treated with a temporary soil stabilizer.

2.09 TEMPORARY SOIL STABILIZER

A. The temporary agent for soil erosion control shall consist of an especially prepared highly concentrated powder which, when mixed with water, forms a thick liquid such as “Terra Mulch Terra Blend with Tacking Agent 3”, “Curasol AH”, “Aerospray 70”, or equal, and having no growth or germination inhibiting factors. The agent shall be used for hydroseeding grass seed in combination with other approved amendments resulting in a highly viscous slurry which, when sprayed directly on the soil, forms a gelatinous crust.

2.10 DITCH EROSION RETENTION BLANKET

A. The blanket shall be as specified in Section 02276 – Erosion and Sedimentation Control.

2.11 RIPRAP AND HERBICIDES

A. Furnish and install sufficient quantity of landscape gravel or riprap to cover over the ground to a minimum 4-inch depth for gravel and 24-inch depth for riprap, unless otherwise noted, or indicated on the Drawings. Also furnish and apply an approved herbicide to the subgrade surface just prior to installing the landscape gravel or riprap.

B. During placing, the stone shall be graded so that the smaller stones are uniformly distributed through the mass. The Contractor may place the stone by mechanical methods, augmented by hand placing where necessary or ordered by the Engineer. The placed riprap shall form a properly graded, dense, neat layer of stone.

C. All topsoil and vegetative matter shall be removed from the subgrade surfaces prior to the application of the weed killer (herbicide) and to the placement of landscape gravel or riprap. Apply commercial-type herbicide as preemergence control of miscellaneous grasses and broadleaf weeds in granular or liquid form such as “Treflan”, “Dymid”, or equal. Methods and rates of application shall be in strict compliance to manufacturer’s directions and acceptable to the Engineer.

D. The herbicide selected shall be safe for use around ornamental plantings, have long-lasting weed control, and shall be resistant to leaching away under excessive rainfall.

E. A second application of the herbicide shall be made on the surface of the landscape gravel or riprap sometime after the first six (6) months, but not later than twelve (12) months.

Same methods and rates apply as specified previously.

## PART 3 -- EXECUTION

### 3.01 GRADING

A. After approval of the rough grading, the Contractor shall commence his preparations of the subgrade for the various major conditions of the work as follows:

1. Bare soil for riprap area at subgrade (24 inches below final grade, or as directed by the Engineer).

2. Topsoil for lawn and road shoulder seed area - scarify 2-inch depth of subgrade (4 inches below final grade) prior to placing topsoil.

B. Final surface grading of the topsoiled, landscape graveled, and riprapped areas shall be mechanically raked or hand raked to an even finished surface alignment.

### 3.02 TOPSOIL

A. Topsoil shall be spread in place for quantity required for lawn and road shoulder seed areas at 4-inch consolidated depth, and sufficient quantity for certain plant beds and backfill for shrubs and trees as specified.

### 3.03 HYDROSEEDING AND GRASS

A. The Contractor shall grow a stand of grass by hydroseeding method on all disturbed areas. The Contractor shall be responsible for the satisfactory growth of grass throughout the period of the one-year guarantee.

B. The Contractor's work shall include the preparation of the topsoil and bare soil seed bed, application of fertilizer, limestone, mulching, inoculant, temporary soil stabilizer, watering, and all other operations necessary to provide a satisfactory growth of sod at the end of the one-year maintenance period. Areas without satisfactory sod at the end of one (1) year shall be replanted until satisfactory growth is obtained and acceptable to the Engineer.

C. All areas to be seeded shall be done by the hydraulic seeding method including all additives and amendments required. A "Reinco", "Finn", or "Bowie" type hydromulcher with adjustable nozzles and extension hoses, or equal, shall be utilized. General capacity of tank should range from 500 to 2,500 gallons, or as approved by the Engineer.

D. Hydraulic seeding shall be carried out in three steps. Step one shall consist of the application of lime. In step two the seed mixture shall be mixed with the fertilizer, wood cellulose fiber mulch, and any required inoculants and applied to the seed bed. Step three shall consist of application of top dressing during the first spring or fall, whichever comes first, after step two.

E. Top dressing shall consist of a commercial grade fertilizer plus Nitrogen or other analysis as may be recommended by soil testing. Types and application rates of seed mixtures, lime, fertilizer, and wood cellulose fiber mulch, shall be as shown in the Grassing Schedule located on the Contract Drawings.

F. Ingredients for the mixture and steps should be dumped into a tank of water and thoroughly mixed to a homogeneous slurry and sprayed out under a minimum of 300-350 pounds pressure, in suitable proportions to accommodate the type and capacity of the hydraulic machine to be used. Applications shall be evenly sprayed over the ground surface. The Contractor shall free the topsoil of stones, roots, rubbish, and other deleterious materials and dispose of same off the site. The bare soil, except existing steep embankment area, shall be rough raked to remove stones, roots, and rubbish over 4 inches in size, and other deleterious materials and dispose of same off the site.

G. No seeding should be undertaken in windy or unfavorable weather, when the ground is too wet to rake easily, when it is in a frozen condition, or too dry. Any bare spots shown in two to three weeks shall be recultivated, fertilized at half the rate, raked, seeded, and mulched again by mechanical or hand broadcast method acceptable to the Engineer.

H. Areas that have been seeded with a temporary seed mixture shall be mowed to a height of less than 2 inches and scarified prior to seeding with the permanent seed mixture.

I. The Contractor shall provide, at his own expense, protection for all seeded areas against trespassing and damage at all times until acceptance of the work. Slopes shall be protected from damage due to erosion, settlement, and other causes and shall be repaired promptly at the Contractor's expense.

J. The Contractor shall water newly seeded areas of the lawn and road shoulder mix once a week until the grasses have germinated sufficiently to produce a healthy turf, or unless otherwise directed by the Engineer. Each watering shall provide three (3) gallons per square yard. The Contractor shall furnish all necessary hoses, sprinklers, and connections.

K. The first and second cutting of the lawn grasses only shall be done by the Contractor. All subsequent cuttings will be done by the Owner's forces in a manner specified by the Contractor.

3.04 DITCH AND SWALE EROSION PROTECTION

A. All ditches and swales indicated on the Drawings shall be lined with an erosion control blanket of single width. The area to be covered shall be properly graded and hydroseeded before the blanket is applied. Installation shall be in accordance with Section 02276 – Erosion and Sedimentation Control.

3.05 MAINTENANCE

A. The Contractor shall be responsible for maintaining all seeded areas through the end of his warranty period. Maintenance shall include but not be limited to, annual fertilization, mowing, repair of seeded areas, irrigation, and weed control. The Contractor shall provide, at his own expense, protection for all seeded areas against trespassing and damage at all times until acceptance of the work. Slopes shall be protected from damage due to erosion, settlement, and other causes and shall be repaired promptly at the Contractor's expense.

B. Annual fertilization shall consist of an application of 500#/acre of 10-10-10 commercial grade fertilizer, or its equivalent and 60#/acre of nitrogen in early fall, or other analysis as may be determined by soil test. Annual fertilization shall be in addition to top dressing and

shall be performed by the Contractor each fall season after planting until the work is substantially complete.

C. Mowing shall be scheduled so as to maintain a minimum stand height of 4-inches or as directed by the Engineer. Stand height shall be allowed to reach 8 to 10-inches prior to mowing.

D. All seeded areas shall be inspected on a regular basis and any necessary repairs or reseedings made within the planting season, if possible. If the stand should be over 60% damaged, it shall be re-established following the original seeding recommendations.

E. Weed growth shall be maintained mechanically and/or with herbicides. When chemicals are used, the Contractor shall follow the current Georgia Agricultural Experiment Stations' weed control recommendations and adhere strictly to the instructions on the label of the herbicide. No herbicide shall be used without prior approval of the Engineer.

3.06 CLEANUP

A. The Contractor shall remove from the site all subsoil excavated from his work and all other debris including, but not limited to, branches, paper, and rubbish in all landscape areas, and remove temporary barricades as the work proceeds.

B. All areas shall be kept in a neat, orderly condition at all times. Prior to final acceptance, the Contractor shall clean up the entire landscaped area to the satisfaction of the Engineer.

- END OF SECTION -

# SECTION 03100

# CONCRETE FORMWORK

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Provide materials, labor, and equipment required for the design and construction of all concrete formwork, bracing, shoring and supports in accordance with the provisions of the Contract Documents.

### 1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03200 - Reinforcing Steel

B. Section 03250 - Concrete Accessories

C. Section 03290 - Joints in Concrete

D. Section 03300 - Cast-in-Place Concrete

### 1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. Georgia State Minimum Standard Building Code

2. ACI 318 - Building Code Requirements for Structural Concrete

3. ACI 301 - Specifications for Structural Concrete for Buildings

4. ACI 347 - Recommended Practice for Concrete Formwork

5. U.S. Product Standard for Concrete Forms, Class I, PS 1

6. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials

### 1.04 SUBMITTALS

A. Submit the following in accordance with Section 01300, Submittals.

1. Manufacturer's data on proposed form release agent

2. Manufacturer's data on proposed formwork system including form ties

1.05 QUALITY ASSURANCE

A. Concrete formwork shall be in accordance with ACI 301, ACI 318, and ACI 347.

PART 2 -- PRODUCTS

2.01 FORMS AND FALSEWORK

A. All forms shall be smooth surface forms unless otherwise specified.

B. Wood materials for concrete forms and falsework shall conform to the following requirements:

1. Lumber for bracing, shoring, or supporting forms shall be Douglas Fir or Southern Pine, construction grade or better, in conformance with U.S. Product Standard PS20. All lumber used for forms, shoring or bracing shall be new material.

2. Plywood for concrete formwork shall be new, waterproof, synthetic resin bonded, exterior type Douglas Fir or Southern Pine high density overlaid (HDO) plywood manufactured especially for concrete formwork and shall conform to the requirements of PS1 for Concrete Forms, Class I, and shall be edge sealed. Thickness shall be as required to support concrete at the rate it is placed, but not less than 5/8-inch thick.

C. Other form materials such as metal, fiberglass, or other acceptable material that will not adversely affect the concrete and will facilitate placement of concrete to the shape, form, line and grade indicated may be submitted to the Engineer for approval, but only materials that will produce a smooth form finish equal or better than the wood materials specified will be considered.

2.02 FORMWORK ACCESSORIES

A. Form ties shall be provided with a plastic cone or other suitable means for forming a conical hole to insure that the form tie may be broken off back of the face of the concrete. The maximum diameter of removable cones for rod ties, or of other removable form-tie fasteners having a circular cross-section, shall not exceed 7/8-inch, and all such fasteners shall be such as to leave holes of regular shape for reaming.

B. Form ties for water-retaining structures shall have integral waterstops. Removable taper ties may be used when acceptable to the Engineer. A preformed neoprene or polyurethane tapered plug sized to seat at the center of the wall shall be inserted in the hole left by the removal of the taper tie.

C. Form release agent shall be a blend of natural and synthetic chemicals that employs a chemical reaction to provide quick, easy and clean release of concrete from forms. It shall not stain the concrete and shall leave the concrete with a paintable surface. Formulation of the form release agent shall be such that it would minimize formation of “bug holes” in cast-in-place concrete.

## PART 3 -- EXECUTION

### 3.01 FORM DESIGN

A. Forms and falsework shall be designed for total dead load, plus all construction live load as outlined in ACI 347. Design and engineering of formwork and safety considerations during construction shall be the responsibility of the Contractor.

B. Forms shall be of sufficient strength and rigidity to maintain their position and shape under the loads and operations incident to placing and vibrating the concrete. The maximum deflection of facing materials reflected in concrete surfaces exposed to view shall be 1/240 of the span between structural members.

C. All forms shall be designed for predetermined placing rates per hour, considering expected air temperatures and setting rates.

### 3.02 CONSTRUCTION

A. The type, size, quality, and strength of all materials from which forms are made shall be subject to the approval of the Engineer. No falsework or forms shall be used which are not clean and suitable. Deformed, broken or defective falsework and forms shall be removed from the work.

B. Forms shall be smooth and free from surface irregularities. Suitable and effective means shall be provided on all forms for holding adjacent edges and ends of panels and sections tightly together and in accurate alignment so as to prevent the formation of ridges, fins, offsets, or similar surface defects in the finished concrete. Joints between the forms shall be sealed to eliminate any irregularities. The arrangement of the facing material shall be orderly and symmetrical, with the number of seams kept to a practical minimum.

C. Forms shall be true to line and grade, and shall be sufficiently rigid to prevent displacement and sagging between supports. Curved forms shall be used for curved and circular structures. Straight panels joined at angles will not be acceptable for forming curved structures. Forms shall be properly braced or tied together to maintain their position and shape under a load of freshly-placed concrete. Facing material shall be supported with studs or other backing which shall prevent both visible deflection marks in the concrete and deflections beyond the tolerances specified.

D. Forms shall be mortar tight so as to prevent the loss of water, cement and fines during placing and vibrating of the concrete. Specifically, the bottom of wall forms that rest on concrete footings or slabs shall be provided with a gasket to prevent loss of fines and paste during placement and vibration of concrete. Such gasket may be a 1 to 1-1/2 inch diameter polyethylene rod held in position to the underside of the wall form.

E. All vertical surfaces of concrete members shall be formed, and side forms shall be provided for all footings, slab edges and grade beams, except where placement of the concrete against the ground is called for on the Drawings. Not less than 1-inch of concrete shall be added to the thickness of the concrete member as shown where concrete is permitted to be placed against trimmed ground in lieu of forms. Such permission will be granted only for members of comparatively limited height and where the character of the ground is such that it can be trimmed to the required lines and will stand securely without caving or sloughing until the concrete has been placed.

F. All forms shall be constructed in such a manner that they can be removed without hammering or prying against the concrete. Wood forms shall be constructed for wall openings to facilitate loosening and to counteract swelling of the forms.

G. Adequate clean-out holes shall be provided at the bottom of each lift of forms. Temporary openings shall be provided at the base of column forms and wall forms and at other points to facilitate cleaning and observation immediately before the concrete is deposited. The size, number and location of such clean-outs shall be as acceptable to the Engineer.

H. Construction joints shall not be permitted at locations other than those shown or specified, except as may be acceptable to the Engineer. When a second lift is placed on hardened concrete, special precautions shall be taken in the way of the number, location and tightening of ties at the top of the old lift and bottom of the new to prevent any unsatisfactory effect whatsoever on the concrete. For flush surfaces at construction joints exposed to view, the contact surface of the form sheathing over the hardened concrete in the previous placement shall be lapped by not more than 1 inch. Forms shall be held against hardened concrete to prevent offset or loss of mortar at construction joints and to maintain a true surface.

I. The formwork shall be cambered to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete and due to construction loads. Set forms and intermediate screed strips for slabs accurately to produce the designated elevations and contours of the finished surface. Ensure that edge forms and screed strips are sufficiently strong to support vibrating screeds or roller pipe screeds if the nature of the finish specified requires the use of such equipment. When formwork is cambered, set screeds to a like camber to maintain the proper concrete thickness.

J. Positive means of adjustment (wedges or jacks) for shores and struts shall be provided and all settlement shall be taken up during concrete placing operation. Shores and struts shall be securely braced against lateral deflections. Wedges shall be fastened firmly in place after final adjustment of forms prior to concrete placement. Formwork shall be anchored to shores or other supporting surfaces or members to prevent upward or lateral movement of any part of the formwork system during concrete placement. If adequate foundation for shores cannot be secured, trussed supports shall be provided.

K. Runways shall be provided for moving equipment with struts or legs. Runways shall be supported directly on the formwork or structural member without resting on the reinforcing steel.

3.03 TOLERANCES

A. Unless otherwise indicated in the Contract Documents, formwork shall be constructed so that the concrete surfaces will conform to the tolerance limits listed in ACI 117.

B. Structural framing of reinforced concrete around elevators and stairways shall be accurately plumbed and located within 1/4 in. tolerance from established dimensions.

C. The Contractor shall establish and maintain in an undisturbed condition and until final completion and acceptance of the project, sufficient control points and bench marks to be used for reference purposes to check tolerances. Plumb and string lines shall be installed before concrete placement and shall be maintained during placement. Such lines shall be used by Contractor's personnel and by the Engineer and shall be in sufficient number and properly installed. During concrete placement, the Contractor shall continually monitor plumb and string line form positions and immediately correct deficiencies.

D. Regardless of the tolerances specified, no portion of the building shall extend beyond the legal boundary of the building.

3.04 FORM ACCESSORIES

A. Suitable moldings shall be placed to bevel or round all exposed corners and edges of beams, columns, walls, slabs, and equipment pads. Chamfers shall be 3/4 inch unless otherwise noted.

B. Form ties shall be so constructed that the ends, or end fasteners, can be removed without causing appreciable spalling at the faces of the concrete. After ends, or end fasteners of form ties have been removed, the embedded portion of the ties shall terminate not less than 2 inches from the formed face of the concrete that is exposed to wastewater or enclosed surfaces above the wastewater, and not less than 1 inch from the formed face of all other concrete. Holes left by the removal of form tie cones shall be reamed with suitable toothed reamers so as to leave the surface of the holes clean and rough before being filled with mortar as specified in Section 03350 - Concrete Finishing. No form-tying device or part thereof, other than metal, shall be left embedded in the concrete. Ties shall not be removed in such manner as to leave a hole extending through the interior of the concrete member. The use of snap-ties which cause spalling of the concrete upon form stripping or tie removal will not be permitted. No snap ties shall be broken off until the concrete is at least three days old. If steel panel forms are used, rubber grommets shall be provided where the ties pass through the form in order to prevent loss of cement paste.

3.05 APPLICATION - FORM RELEASE AGENT

A. Forms for concrete surfaces that will not be subsequently waterproofed shall be coated with a form release agent. Form release agent shall be applied on formwork in accordance with manufacturer's recommendations.

3.06 INSERTS AND EMBEDDED ITEMS

A. Sleeves, pipe stubs, inserts, anchors, expansion joint material, waterstops, and other embedded items shall be positioned accurately and supported against displacement prior to concreting. Voids in sleeves, inserts, and anchor slots shall be filled temporarily with readily removable material to prevent the entry of concrete into the voids.

3.07 FORM CLEANING AND REUSE

A. The inner faces of all forms shall be thoroughly cleaned prior to concreting. Forms may be reused only if in good condition and only if acceptable to the Engineer. Light sanding between uses will be required wherever necessary to obtain uniform surface texture. Unused tie rod holes in forms shall be covered with metal caps or shall be filled by other methods acceptable to the Engineer.

## 3.08 FORM REMOVAL AND SHORING

A. Forms shall not be disturbed until the concrete has attained sufficient strength. Sufficient strength shall be demonstrated by structural analysis considering proposed loads, strength of forming and shoring system, and concrete strength data. Shoring shall not be removed until the supported member has acquired sufficient strength to support its weight and the load upon it. Members subject to additional loads during construction shall be adequately shored to sustain all resulting stresses. Forms shall be removed in such manner as not to impair safety and serviceability of the structure. All concrete to be exposed by form removal shall have sufficient strength not to be damaged thereby.

B. Provided the strength requirements specified above have been met and subject to the Engineer's approval, forms may be removed at the following minimum times. The Contractor shall assume full responsibility for the strength of all such components from which forms are removed prior to the concrete attaining its full design compressive strength. Shoring may be required at the option of the Engineer beyond these periods.

**Ambient Temperature (°F.) During Concrete Placement**

| | **Over 95°** | **70°-95°** | **60°-70°** | **50°-60°** | **Below 50°** |
|---|---|---|---|---|---|
| Walls | 5 days | 2 days | 2 days | 3 days | Do not remove until directed by Engineer (7 days minimum) |
| Columns | 7 days | 2 days | 3 days | 4 days | |
| Beam Soffits | 10 days | 7 days | 7 days | 7 days | |
| Elevated Slabs | 12 days | 7 days | 7 days | 7 days | |

C. When, in the opinion of the Engineer, conditions of the work or weather justify, forms may be required to remain in place for longer periods of time.

D. An accurate record shall be maintained by the Contractor of the dates of concrete placings and the exact location thereof and the dates of removal of forms. These records shall be available for inspection at all times at the site, and two copies shall be furnished the Engineer upon completion of the concrete work.

## 3.09 RESHORING

A. When reshoring is permitted or required the operations shall be planned in advance and subjected to approval by the Engineer.

B. Reshores shall be placed after stripping operations are complete but in no case later than the end of the working day on which stripping occurs.

C. Reshoring for the purpose of early form removal shall be performed so that at no time will large areas of new construction be required to support their own weight. While reshoring is under way, no construction or live loads shall be permitted on the new construction. Reshores shall be tightened to carry their required loads but they shall not be overtightened so that the new construction is overstressed. Reshores shall remain in place until the concrete has reached its specified 28-day strength, unless otherwise specified.

D. For floors supporting shores under newly placed concrete, the original supporting shores shall remain in place or reshores shall be placed. The shoring or reshoring system shall have a capacity sufficient to resist the anticipated loads and in all cases shall have a capacity equal to at least one-half of the capacity of the shoring system above. Reshores shall be located directly under a reshore position above unless other locations are permitted.

E. In multi-story buildings, reshoring shall extend over a sufficient number of stories to distribute the weight of newly placed concrete, forms, and construction live loads so the design superimposed loads of the floors supporting shores are not exceeded.

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# SECTION 03200

# REINFORCING STEEL

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENTS

A. Provide all concrete reinforcing including all cutting, bending, fastening and any special work necessary to hold the reinforcing steel in place and protect it from injury and corrosion in accordance with the requirements of this section.

B. Provide deformed reinforcing bars to be grouted into reinforced concrete masonry walls.

### 1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03100 - Concrete Formwork

B. Section 03250 - Concrete Accessories

C. Section 03300 - Cast-in-Place Concrete

D. Section 03400 - Precast Concrete

### 1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. Georgia State Minimum Standard Building Code
2. CRSI - Concrete Reinforcing Institute Manual of Standard Practice
3. ACI SP66 - ACI Detailing Manual
4. ACI 315 - Details and Detailing of Concrete Reinforcing
5. ACI 318 - Building Code Requirements for Structural Concrete
6. WRI - Manual of Standard Practice for Welded Wire Fabric
7. ASTM A 185 - Standard Specification for Welded Steel Wire Fabric for Concrete Reinforcing

8. ASTM A 615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcing

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01300, Submittals.

1. Detailed placing and shop fabricating drawings, prepared in accordance with ACI 315 and ACI Detailing Manual - (SP66), shall be furnished for all concrete reinforcing. These drawings shall be made to such a scale as to clearly show joint locations, openings, and the arrangement, spacing and splicing of the bars.

2. Mill test certificates - 3 copies of each.

3. Description of the reinforcing steel manufacturer's marking pattern.

4. Requests to relocate any bars that cause interferences or that cause placing tolerances to be violated.

5. Proposed supports for each type of reinforcing.

6. Request to use splices not shown on the Drawings.

7. Request to use mechanical couplers along with manufacturer's literature on mechanical couplers with instructions for installation, and certified test reports on the couplers' capacity.

8. Request for placement of column dowels without the use of templates.

9. Request and procedure to field bend or straighten partially embedded reinforcing.

1.05 QUALITY ASSURANCE

A. If requested by the Engineer, the Contractor shall provide samples from each load of reinforcing steel delivered in a quantity adequate for testing. Costs of initial tests will be paid by the Owner. Costs of additional tests due to material failing initial tests shall be paid by the Contractor.

PART 2 -- PRODUCTS

2.01 REINFORCING STEEL

A. Bar reinforcing shall conform to the requirements of ASTM A 615 for Grade 60 Billet Steel reinforcing. All reinforcing steel shall be from domestic mills and shall have the manufacturer's mill marking rolled into the bar which shall indicate the producer, size, type and grade.

B. Welded wire fabric reinforcing shall conform to the requirements of ASTM A 185 and the details shown on the Drawings.

C. A certified copy of the mill test on each load of reinforcing steel delivered showing physical and chemical analysis shall be provided, prior to shipment. The Engineer reserves the right to require the Contractor to obtain separate test results from an independent testing laboratory in the event of any questionable steel. When such tests are necessary because of failure to comply with this Specification, such as improper identification, the cost of such tests shall be borne by the Contractor.

D. Field welding of reinforcing steel will not be allowed.

E. Use of coiled reinforcing steel will not be allowed.

2.02 ACCESSORIES

A. Accessories shall include all necessary chairs, slab bolsters, concrete blocks, tie wires, dips, supports, spacers and other devices to position reinforcing during concrete placement. Slab bolsters shall have gray plastic-coated legs.

B. Concrete blocks (dobies), used to support and position bottom reinforcing steel, shall have the same or higher compressive strength as specified for the concrete in which it is located.

2.03 MECHANICAL COUPLERS

A. Mechanical couplers shall develop a tensile strength which exceeds 125 percent of the yield strength of the reinforcing bars being spliced at each splice. The reinforcing steel and coupler used shall be compatible for obtaining the required strength of the connection.

B. Where the type of coupler used is composed of more than one component, all components required for a complete splice shall be supplied.

C. Hot-forged sleeve type couplers shall not be used. Acceptable mechanical couplers are Richmond Dowel Bar Splicer System by Richmond Screw Anchor Company, Fort Worth, Texas. Mechanical couplers shall only be used where shown on the Drawings or where specifically approved by the Engineer.

2.04 DOWEL ADHESIVE SYSTEM

A. Where shown on the Drawings, reinforcing bars anchored into hardened concrete with a dowel adhesive system shall use a two-component adhesive mix which shall be injected with a static mixing nozzle following manufacturer's instructions. Thoroughly clean drill holes of all debris and drill dust with wire brush prior to installation of adhesive and reinforcing bar. The embedment depth of the bar shall be per manufacturer's recommendations, so as to provide a minimum allowable bond strength that is equal to 125 percent of the yield strength of the bar, unless noted otherwise on the Drawings. The adhesive system shall be "Epcon System A7, C6 or G5" as manufactured by ITW Ramset/Redhead, or "HIT HY-150 or RE-500 Injection Adhesive Anchor System" as manufactured by Hilti, Inc. or "SET/ET Epoxy-Tie" or "AT Acrylic-Tie" as manufactured by Simpson Strong-Tie Co., or equal. Engineer's approval is required for use of this system in locations other than those shown on the Drawings.

PART 3 -- EXECUTION

3.01 TEMPERATURE REINFORCING

A. Unless otherwise shown on the Drawings or in the absence of the concrete reinforcing being shown, the minimum cross sectional area of horizontal and vertical concrete reinforcing in walls shall be 0.0033 times the gross concrete area and the minimum cross sectional area of reinforcing perpendicular to the principal reinforcing in slabs shall be 0.0020 times the gross concrete area. Temperature reinforcing shall not be spaced further apart than five times the slab or wall thickness, nor more than 18 inches.

3.02 FABRICATION

A. Reinforcing steel shall be accurately formed to the dimensions and shapes shown on the Drawings and the fabricating details shall be prepared in accordance with ACI 315 and ACI 318, except as modified by the Drawings.

B. The Contractor shall fabricate reinforcing bars for structures in accordance with the bending diagrams, placing lists and placing Drawings.

C. No fabrication shall commence until approval of Shop Drawings has been obtained. All reinforcing bars shall be shop fabricated unless approved by the Engineer to be bent in the field. Reinforcing bars shall not be straightened or rebent in a manner that will injure the material. Heating of bars will not be permitted.

D. Welded wire fabric with longitudinal wire of W9.5 size or smaller shall be either furnished in flat sheets or in rolls with a core diameter of not less than 10 inches. Welded wire fabric with longitudinal wires larger than W9.5 size shall be furnished in flat sheets only.

3.03 DELIVERY, STORAGE AND HANDLING

A. All reinforcing shall be neatly bundled and tagged for placement when delivered to the job site. Bundles shall be properly identified for coordination with mill test reports.

B. Reinforcing steel shall be stored above ground on platforms or other supports and shall be protected from the weather at all times by suitable covering. It shall be stored in an orderly manner and plainly marked to facilitate identification.

C. Reinforcing steel shall at all times be protected from conditions conducive to corrosion until concrete is placed around it.

D. The surfaces of all reinforcing steel and other metalwork to be in contact with concrete shall be thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar and other foreign substances immediately before the concrete is placed. Where there is delay in depositing concrete, reinforcing shall be reinspected and if necessary recleaned.

3.04 PLACING

A. Reinforcing steel shall be accurately positioned as shown on the Drawings and shall be supported and wired together to prevent displacement, using annealed iron wire ties or suitable clips at intersections. All reinforcing steel shall be supported by concrete, plastic or

metal supports, spacers or metal hangers which are strong and rigid enough to prevent any displacement of the reinforcing steel. Where concrete is to be placed on the ground, supporting concrete blocks (or dobies) shall be used in sufficient numbers to support the reinforcing bars without settlement. In no case shall concrete block supports be continuous.

B. The portions of all accessories in contact with the formwork shall be made of plastic or steel coated with a 1/8 inch minimum thickness of plastic which extends at least 1/2 inch from the concrete surface. Plastic shall be gray in color.

C. Tie wires shall be bent away from the forms in order to provide the specified concrete coverage.

D. Reinforcing bars additional to those shown on the Drawings, which may be found necessary or desirable by the Contractor for the purpose of securing reinforcing in position, shall be provided by the Contractor at no additional cost to the Owner.

E. Reinforcing placing, spacing, and protection tolerances shall be within the limits specified in ACI 318 except where in conflict with the Building Code, unless otherwise specified.

F. Reinforcing bars may be moved within one bar diameter as necessary to avoid interference with other concrete reinforcing, conduits, or embedded items. If bars are moved more than one bar diameter, or enough to exceed placing tolerances, the resulting arrangement of bars shall be as acceptable to the Engineer.

G. Welded wire fabric shall be supported on slab bolsters spaced not less than 30 inches on centers, extending continuously across the entire width of the reinforcing mat and supporting the reinforcing mat in the plane shown on the Drawings.

H. Reinforcing shall not be straightened or rebent unless specifically shown on the drawings or authorized in writing by the Engineer. Bars with kinks or bends not shown on the Drawings shall not be used. Coiled reinforcement shall not be used.

3.05 SPLICING

A. Reinforcing bar splices shall only be used at locations shown on the Drawings. When it is necessary to splice reinforcing at points other than where shown, the splice shall be as acceptable to the Engineer.

B. The length of lap for reinforcing bars, unless otherwise shown on the Drawings shall be in accordance with ACI 318 for a class B splice.

C. Laps of welded wire fabric shall be in accordance with ACI 318. Adjoining sheets shall be securely tied together with No. 14 tie wire, one tie for each 2 running feet. Wires shall be staggered and tied in such a manner that they cannot slip.

D. Mechanical splices shall be used only where shown on the drawings or when approved by the Engineer.

E. Couplers which are located at a joint face shall be a type which can be set either flush or recessed from the face as shown on the Drawings. The couplers shall be sealed during concrete placement to completely eliminate concrete or cement paste from entering. After the concrete is placed, couplers intended for future connections shall be plugged and

sealed to prevent any contact with water or other corrosive materials. Threaded couplers shall be plugged with plastic plugs which have an O-ring seal.

3.06 INSPECTION

A. The Contractor shall advise the Engineer of his intentions to place concrete and shall allow him adequate time to inspect all reinforcing steel before concrete is placed.

B. The Contractor shall advise the Engineer of his intentions to place grout in masonry walls and shall allow him adequate time to inspect all reinforcing steel before grout is placed.

- END OF SECTION -

# SECTION 03250

# CONCRETE ACCESSORIES

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Furnish all materials, labor and equipment required to provide all concrete accessories including waterstops, expansion joint material, joint sealants, expansion joint seals, contraction joint inserts, and epoxy bonding agent.

### 1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03100 - Concrete Formwork

B. Section 03290 - Joints in Concrete

C. Section 03300 - Cast-in-Place Concrete

D. Section 07900 - Joint Fillers, Sealants, and Caulking

### 1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1 Federal Specification TT-S-00227 E (3)

2. ASTM C881 Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete

3. ASTM D412 Standard Tests for Rubber Properties in Tension

4. ASTM D 624 Standard Test method for Rubber Property - Tear Resistance

5. ASTM D 638 Standard Test Method for Tensile Properties of Plastics

6. ASTM D1751 Standard Specifications for Preformed Expansion Joint fillers for Concrete Paving and Structural Construction (nonextruding and resilient bituminous types)

7. ASTM D 1752 Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01300, Submittals.

1. Manufacturer's literature on all products specified herein including material certifications.

2. Proposed system for supporting PVC waterstops in position during concrete placement

3. Samples of products if requested by the Engineer.

PART 2 -- PRODUCTS

2.01 EXPANDING RUBBER WATERSTOP

A. Expanding rubber waterstop shall be Adeka Ultra Seal MC-2010M by Asahi Denka Koygokik, SikaSwell Profile by Sika Corporation, Hydrotite CJ-1020-2K by Greenstreak Plastic Products, or equal.

B. Waterstop shall be a chemically modified natural rubber product with a hydrophilic agent.

2.02 WATERSTOP ADHESIVE

A. Adhesive between waterstops and existing concrete shall be 20+F Contact Cement by Miracle Adhesives Corporation, Neoprene Adhesive 77-198 by JGF Adhesives, Sikadur 31 Hi-Mod Gel by Sika Corporation, DP-605 NS Urethane Adhesive by 3M Adhesive Systems, or equal.

2.03 JOINT SEALANTS

A. Joint sealants shall comply with Section 07900, Joint Fillers, Sealants, and Caulking.

2.04 EXPANSION JOINT MATERIAL

A. Preformed expansion joint material shall be non-extruding, and shall be of the following types:

1. Type I - Sponge rubber, conforming to ASTM D1752, Type I.

2. Type II - Cork, conforming to ASTM D1752, Type II.

3. Type III - Self-expanding cork, conforming to ASTM D1752, Type III.

4. Type IV - Bituminous fiber, conforming to ASTM Designation D1751.

2.05 EXPANSION JOINT SEAL

A. Expansion Joint Seal System shall consist of a preformed neoprene profile, installed using the same dimensions as the joint gap, bonded with a two-component epoxy adhesive and pressurized during the adhesive cure time.

B. The expansion joint system shall be Hydrozo/Jeene Structural Sealing joint system by Hydrozo/Jeene, Inc, or equal.

2.06 CONTRACTION JOINT INSERTS

A. Contraction joint inserts shall be Transverse-Control Joints by Greenstreak Plastic Products, or equal.

2.07 EPOXY BONDING AGENT

A. Epoxy bonding agent shall conform to ASTM C881 and shall be Sikadur 32 Hi-Mod, Sika Corporation, Lyndhurst, N.J.; Euco #452 Epoxy System, Euclid Chemical Company, Cleveland, OH, or equal.

2.08 EPOXY RESIN BINDER

A. Epoxy resin binder shall conform to the requirements of ASTM C-881, Type III, Grade 3, Class B and C for epoxy resin binder and shall be Sikadur 23, Low-Mod-Gel, manufactured by the Sika Corporation, Lyndhurst, N.J., Fleocrete Gel manufactured by Tamms Industries Co., or equal.

PART 3 -- EXECUTION

3.01 HYPALON RUBBER AND EXPANDING RUBBER WATERSTOPS

A. Waterstops shall be installed only where shown on the Drawings.

B. Waterstops shall be installed in strict accordance with manufacturer's recommendations.

3.02 WATERSTOP ADHESIVE

A. Adhesive shall be applied to both contact surfaces in strict accordance with manufacturer's recommendations.

B. Adhesive shall be used where waterstops are attached to existing concrete surfaces.

3.03 INSTALLATION OF EXPANSION JOINT MATERIAL AND SEALANTS

A. Type I, II, or III shall be used in all expansion joints in structures and concrete pavements unless specifically shown otherwise on the Drawings. Type IV shall be used in sidewalk and curbing and other locations specifically shown on the Drawings.

B. All expansion joints exposed in the finish work, exterior and interior, shall be sealed with the specified joint sealant. Expansion joint material and sealants shall be installed in accordance with manufacturer's recommended procedures and as shown on the Drawings.

C. Expansion joint material that will be exposed after removal of forms shall be cut and trimmed to ensure a neat appearance and shall completely fill the joint except for the space required for the sealant. The material shall be held securely in place and no concrete shall be allowed to enter the joint or the space for the sealant and destroy the proper functions of the joint.

D. A bond breaker shall be used between expansion joint material and sealant. The joint shall be thoroughly clean and free from dirt and debris before the primer and the sealant are applied. Where the finished joint will be visible, masking of the adjoining surfaces shall be carried out to avoid their discoloration. The sealant shall be neatly tooled into place and its finished surfaces shall present a clean and even appearance.

E. Type 1 joint sealant shall be used in all expansion and contraction joints in concrete, except where Type 7 or Type 8 is required as stated below, and wherever else specified or shown on the Drawings. It shall be furnished in pour grade or gun grade depending on installation requirements. Primers shall be used as required by the manufacturer. The sealant shall be furnished in colors as directed by the Engineer.

F. Type 8 joint sealant shall be used in all concrete pavements and floors subject to heavy traffic and wherever else specified or shown on the Drawings.

G. Type 7 joint sealant shall be used for all joints in chlorine contact tanks and wherever specified or shown on the Drawings.

3.04 EXPANSION JOINT SEAL

A. The expansion joint seal system shall be installed as shown on the Drawings in strict accordance with the manufacturer's recommendations.

3.05 CONTRACTION JOINT INSERTS

A. For contraction joints in slabs, inserts shall be floated in fresh concrete during finishing.

B. For contraction joints in walls, inserts shall be secured in place prior to casting wall.

C. Inserts shall be installed true to line at the locations of all contraction joints as shown on the Drawings.

D. Inserts shall extend into concrete sufficient depth as indicated on the Drawings or specified in Section 03290, Joints in Concrete.

E. Inserts shall not be removed from concrete until concrete has cured sufficiently to prevent chipping or spalling of joint edges due to inadequate concrete strength.

3.06 EPOXY BONDING AGENT

A. The Contractor shall use an epoxy bonding agent for bonding fresh concrete to existing concrete as shown on the Drawings.

B. Bonding surface shall be clean, sound and free of all dust, laitance, grease, form release agents, curing compounds, and any other foreign particles.

C. Application of bonding agent shall be in strict accordance with manufacturer's recommendations.

D. Fresh concrete shall not be placed against existing concrete if epoxy bonding agent has lost its tackiness.

## 3.07 EPOXY RESIN BINDER

A. Epoxy resin binder shall be used to seal all existing rebar cut and burned off during demolition operations. Exposed rebar shall be burned back 1/2-inch minimum into existing concrete and the resulting void filled with epoxy resin binder.

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# SECTION 03290

# JOINTS IN CONCRETE

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENTS

A. Provide all materials, labor and equipment required for the construction of all joints in concrete specified herein and shown on the Drawings.

B. Types of joints in concrete shall be as follows:

1. Construction Joints - Joints between adjacent concrete placements continuously connected with reinforcement.

2. Expansion Joints - Joints in concrete which allow thermal expansion and contraction of concrete. Reinforcement terminates within concrete on each side of joint.

3. Contraction Joints - Joints formed in concrete to provide a weakened plane in concrete section to control formation of shrinkage cracks.

### 1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03100 - Concrete Formwork

B. Section 03250 - Concrete Accessories

C. Section 03300 - Cast-in-Place Concrete

D. Section 07900 - Joint Fillers, Sealants and Caulking

### 1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. ACI 301 - Specifications for Structural Concrete for Buildings

2. ACI 318 - Building Code Requirements for Structural Concrete

3. ACI 350 – Code Requirements for Environmental Engineering Concrete Structures

### 1.04 SUBMITTALS

A. Submit the following in accordance with Section 01300, Submittals.

1. Layout drawings showing location and type of all joints to be placed in each structure.

2. Details of proposed joints in each structure.

## PART 2 -- MATERIALS

### 2.01 MATERIALS

A. All materials required for joint construction shall comply with Section 03250 - Concrete Accessories, and Section 07900 - Joint Fillers, Sealants and Caulking.

## PART 3 -- EXECUTION

### 3.01 CONSTRUCTION JOINTS

A. Construction joints shall be as shown on the Drawings. Otherwise, Contractor shall submit description of the joint and its location to Engineer for approval.

B. Unless noted otherwise on the Drawings, construction joints shall be located near the middle of the spans of slabs, beams, and girders unless a beam intersects a girder at this point. In this case, the joints in the girders shall be offset a distance equal to twice the width of the beam. Joints in walls and columns shall be at the underside of floors, slabs, beams, or girders and the top of footings or floor slabs unless noted otherwise on Drawings. Beams, girders, brackets, column capitals, haunches, and drop panels shall be placed at the same time as slabs. Joints shall be perpendicular to the main reinforcement.

C. Maximum distance between horizontal joints in slabs and vertical joints in walls shall be 45’-0”. For exposed walls with fluid or earth on the opposite side, the spacing between vertical and horizontal joints shall be a maximum of 25’-0”.

D. All corners shall be part of a continuous placement, and should a construction joint be required, the joint shall not be located closer than five feet from a corner.

E. All reinforcing steel and welded wire fabric shall be continued across construction joints. Keys and inclined dowels shall be provided as shown on the Drawings or as directed by the Engineer. Longitudinal keys shall be provided in all joints in walls and between walls and slabs or footings, except as specifically noted otherwise on the Drawings. Size of keys shall be as shown on the Drawings.

F. All joints in water bearing structures shall have a waterstop. All joints below grade in walls or slabs which enclose an accessible area shall have a waterstop.

### 3.02 EXPANSION JOINTS

A. Size and location of expansion joints shall be as shown on the Drawings.

B. All expansion joints in water-bearing structures shall have a center-bulb type waterstop. All expansion joints below grade in walls or slabs which enclose an accessible area shall have

a center-bulb type waterstop. Waterstop shall be as shown on Drawings and specified in Section 03250, Concrete Accessories.

3.03 CONTRACTION JOINTS

A. Location of contraction joints shall be as shown on the Drawings.

B. Contraction joints shall be formed with contraction joint inserts as specified in Section 03250, Concrete Accessories.

C. Sawcutting of contraction joints in lieu of forming will not be allowed unless otherwise noted on the Drawings. Where sawcutting is allowed, joints shall be sawed as soon as the concrete can support foot traffic without leaving any impression, normally the same day as concrete is placed and in no case longer than 24 hours after concrete is placed.

D. Unless noted otherwise on Drawings, depth of contraction joints shall be 1-1/2 inches in reinforced concrete and 1/3 of concrete thickness in unreinforced concrete.

3.04 JOINT PREPARATION

A. No concrete shall be allowed to enter the joint or the space for the sealant and destroy the proper functions of the joint.

B. The surface of the concrete at all joints shall be thoroughly cleaned and all laitance removed by wire brushing, air or light sand blasting.

C. The joint shall be thoroughly clean and free from dirt and debris before the primer and the sealant are applied. Where the finished joint will be visible, masking of the adjoining surfaces shall be carried out to avoid their discoloration. The sealant shall be neatly tooled into place and its finished surface shall present a clean and even appearance.

D. All joints shall be sealed as shown on the Drawings and specified in Section 03250, Concrete Accessories.

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# SECTION 03300

# CAST-IN-PLACE CONCRETE

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Provide all labor, equipment, materials and services necessary for the manufacture, transportation and placement of all plain and reinforced concrete work, as shown on the Drawings or as ordered by the Engineer.

B. The requirements in this section shall apply to the following types of concrete:

1. Structural Concrete: Normal weight concrete to be used in all structures, sidewalks, pavements, and underground duct bank encasement, except where noted otherwise in the Contract Documents. Structural concrete is also referenced as Class A concrete.

   a. Tremie Concrete: Structural concrete indicated to be placed underwater.

   b. Pea Gravel Concrete: Concrete to be used only where specifically shown on Drawings. Pea gravel concrete is identical to structural concrete except that coarse aggregate specified in Article 2.05 below shall be Size #78M in accordance with ASTM C33.

2. Class B Concrete: Concrete to be used for curbs, gutters, catch basins, fence and guard post embedment, and all other concrete appurtenant to electrical facilities unless otherwise shown or noted on the Drawings. Concrete to be used for thrust blocks, pipe trench cut-off blocks and cradles, mudmats, and concrete fills where the preceding items are detailed on the Drawings as unreinforced. Concrete to be used as protective cover for dowels intended for future connection.

### 1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03100 - Concrete Formwork

B. Section 03200 - Reinforcing Steel

C. Section 03250 - Concrete Accessories

D. Section 03290 - Joints in Concrete

E. Section 03350 - Concrete Finishes

F. Section 03370 - Concrete Curing

G. Section 03600 - Grout

## 1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the Specifications, all work herein shall conform to or exceed the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. Georgia State Minimum Standard Building Code

| | | |
|---|---|---|
| 2. | ACI 214 | Recommended Practice for Evaluation of Strength Test Results of Concrete |
| 3. | ACI 301 | Specifications for Structural Concrete for Buildings |
| 4. | ACI 304 | Guide for Measuring, Mixing, Transporting, and Placing Concrete |
| 5. | ACI 305 | Hot Weather Concreting |
| 6. | ACI 306 | Cold Weather Concreting |
| 7. | ACI 309 | Recommended Practice for Consolidation of Concrete |
| 8. | ACI 318 | Building Code Requirements for Structural Concrete |
| 9. | ACI 350 | Code Requirements for Environmental Engineering Concrete Structures |
| 10. | ASTM C 31 | Standard Methods of Making and Curing Concrete Test Specimens in the Field |
| 11. | ASTM C 33 | Standard Specification for Concrete Aggregates |
| 12. | ASTM C 39 | Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens |
| 13. | ASTM C42 | Obtaining and Testing Drilled Cores and Sawed Beams of Concrete |
| 14. | ASTM C 88 | Standard Test Method for Soundness of Aggregates by use of Sodium Sulfate or Magnesium Sulfate |
| 15. | ASTM C 94 | Standard Specification for Ready-Mixed Concrete |
| 16. | ASTM C 114 | Standard Test Method for Chemical Analysis of Hydraulic Cement |
| 17. | ASTM C 136 | Standard Method for Sieve Analysis of Fine and Coarse Aggregate |
| 18. | ASTM C 138 | Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete |

19. ASTM C 143 Standard Test Method for Slump of Portland Cement Concrete

20. ASTM C 150 Standard Specification for Portland Cement

21. ASTM C 172 Standard Method of Sampling Fresh Concrete

22. ASTM C 192 Standard Method of Making and Curing Concrete Test Specimens in the Laboratory

23. ASTM C 231 Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method

24. ASTM C 260 Standard Specification for Air-Entraining Admixtures for Concrete

25. ASTM C 295 Standard Guide for Petrographic Examination of Aggregates for Concrete

26. ASTM C 457 Standard Recommended Practice for Microscopical Determination of Air-Void Content and Parameters of the Air-Void System in Hardened Concrete

27. ASTM C 494 Standard Specification for Chemical Admixtures For Concrete

28. ASTM C 595 Standard Specification for Blended Hydraulic Cements

29. ASTM C 618 Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete

30. ASTM C 989 Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars

31. ASTM C1077 Recommended Practice for Labs Testing Concrete

32. ASTM C 1260 Standard Test Method for Potential Alkali Activity of Aggregates (Mortar-Bar Method)

## 1.04 SUBMITTALS

A. Submit the following in accordance with Section 01300, Submittals.

1. Sources of all materials and certifications of compliance with specifications for all materials.

2. Certified current (less than 1 year old) chemical analysis of the Portland Cement or Blended Cement to be used.

3. Certified current (less than 1 year old) chemical analysis of fly ash or ground granulated blast furnace slag to be used.

4. Aggregate test results showing compliance with required standards, i.e., sieve analysis, aggregate soundness tests, etc.

5. Manufacturer's data on all admixtures stating compliance with required standards.

6. Concrete mix design.

7. Field experience records and/or trial mix data for the proposed concrete mix.

1.05 QUALITY ASSURANCE

A. Tests on materials used in the production of concrete shall be required as specified in PART 2 -- PRODUCTS. These tests shall be performed by an independent testing laboratory approved by the Engineer at no additional cost to the Owner.

B. Trial concrete mixes shall be tested when required in accordance with Article 3.01 at no additional cost to the Owner.

C. Field quality control tests, as specified in Article 3.10, unless otherwise stated, will be performed by a testing laboratory employed by the Owner. However, the Contractor shall be charged for the cost of any additional tests and investigation on work performed which does not meet the Specifications. Any individual who samples and tests concrete to determine if the concrete is being produced in accordance with this Specification shall be certified as a Concrete Field Testing Technician, Grade I, in accordance with ACI CP-2. Testing laboratory shall conform to requirements of ASTM C-1077.

PART 2 -- PRODUCTS

2.01 HYDRAULIC CEMENT

A. Portland Cement

1. Portland Cement shall be Type II conforming to ASTM C 150. Type I cement may be used provided either fly ash or ground granulated blast furnace slag is also included in the mix in accordance with Articles 2.02 or 2.03 respectively.

2. For concrete mixed with only Portland Cement, the total alkalies in the cement (calculated as the percentage of $NA_2O$ plus 0.658 times the percentage of $K_2O$) shall not exceed 0.40% unless aggregates to be used meet the requirements for non-reactivity with alkalies stated in Article 2.05.

3. For concrete mixed with Portland Cement and an appropriate amount of fly ash (Article 2.02) or ground granulated blast furnace slag (Article 2.03) the total alkalies in the Portland Cement (calculated as the percentage of $NA_2O$ plus 0.658 times the percentage of $K_2O$) shall not exceed 0.85% unless aggregates to be used meet the requirements for non-reactivity with alkalies stated in Article 2.05.

B. Blended Cement

1. Blended cements shall be Type IP (Portland Fly Ash Cement) or Type IS (Portland Blast Furnace Slag Cement) conforming to ASTM C 595.

2. Type IP cement shall be an interground blend of Portland Cement and fly ash in which the fly ash constituent is between 15% and 25% of the weight of the total blend.

3. Type IS cement shall be an interground blend of Portland Cement and ground granulated blast furnace slag in which the slag constituent is between 35% and 50% of the weight of the total blend.

4. Fly ash and ground granulated blast furnace slag used in the production of blended cements shall meet the requirements of Articles 2.02 and 2.03, respectively.

5. For concrete mixed with Type IP or IS cement, the blended cement combination shall exhibit mean mortar bar expansion of 0.08% or less when tested at 16 days in accordance with ASTM C 1260. The tests shall be made with aggregates proposed for use on the job.

C. Different types of cement shall not be mixed nor shall they be used alternately except when authorized in writing by the Engineer. Different brands of cement or the same brand from different mills may be used alternately. A resubmittal will be required if different cements are proposed during the Project.

D. Cement shall be stored in a suitable weather-tight building so as to prevent deterioration or contamination. Cement which has become caked, partially hydrated, or otherwise damaged will be rejected.

2.02 FLY ASH

A. Fly ash shall meet the requirements of ASTM C 618 for Class F, except that the loss on ignition shall not exceed 4%. Fly ash shall also meet the optional physical requirements for uniformity as shown in Table 3 of ASTM C 618.

B. For fly ash to be used in the production of type IP cement, the Pozzolan Activity Index shall be greater than 75% as specified in Table 3 of ASTM C 595.

C. Where fly ash is included in the concrete mix to waive the 0.4% alkali requirement of the Portland Cement, the fly ash constituent shall be between 15% and 25% of the total weight of the combined Portland Cement and fly ash. The percentage of fly ash shall be set so that the mean mortar bar expansion of the cement-fly ash mix shall be 0.08% or less when tested at 16 days in accordance with ASTM C 1260. The Portland Cement and aggregates used in the mix for this test shall be the Portland Cement and aggregates submitted for use on the job.

D. Additional fly ash shall not be included in concrete mixed with Type IS or IP cement.

2.03 GROUND GRANULATED BLAST FURNACE SLAG

A. Ground granulated blast furnace slag shall meet the requirements of ASTM C 989 including tests for effectiveness of slag in preventing excessive expansion due to alkali-aggregate reactivity as described in Appendix X-3 of ASTM C 989.

B. Where ground granulated blast furnace slag is included in the concrete mix to waive the 0.4% alkali requirement of the Portland Cement, the ground granulated blast furnace slag

constituent shall be between 35% and 40% of the total weight of the combined Portland Cement and slag. The percentage of ground granulated blast furnace slag shall be set so that the mean mortar expansion of the cement-slag mix shall be 0.08% or less when tested at 16 days in accordance with ASTM C 1260. The Portland Cement and aggregates used in the mix for this test shall be the Portland Cement and aggregates submitted for use on the job.

C. Additional ground granulated blast furnace slag shall not be included in concrete mixed with type IS or IP cement.

2.04 WATER

A. Water used for mixing concrete shall be clear, potable and free from deleterious substances such as objectionable quantities of silty organic matter, alkali, salts and other impurities.

B. Water shall not contain more than 100 PPM chloride.

C. Water shall not contain more than 500 PPM dissolved solids.

D. Water shall have a pH in the range of 4.5 to 8.5.

2.05 AGGREGATES

A. All aggregates used in normal weight concrete shall conform to ASTM C 33.

B. Fine Aggregate (Sand) in the various concrete mixes shall consist of natural or manufactured siliceous sand, clean and free from deleterious substances, and graded within the limits of ASTM C 33.

C. Coarse aggregates shall consist of hard, clean, durable gravel, crushed gravel or crushed rock, and shall be size #57 or #67 as graded within the limits given in ASTM C 33.

D. Aggregates shall be tested for gradation by sieve analysis tests in conformance with ASTM C 136.

E. Aggregates shall be tested for soundness in accordance with ASTM C 88. The loss resulting after five cycles shall not exceed 10 percent for fine or coarse aggregate when using magnesium sulfate.

F. When aggregates which are non-reactive with alkalies are desired in order to waive the alkali content requirement of cement as stated in Article 2.01, the following tests shall be performed:

1. A petrographic analysis in accordance with ASTM C295 shall be performed to identify the constituents of the fine and coarse aggregate. Aggregates containing more than the following quantities of constituents shall be considered potentially reactive:

(1) Optically strained, microfractured, or microcrystalline quartz exceeding 5.0%.

(2) Chert or chalcedony exceeding 3.0%.

(3) Tridymite or cristobalite exceeding 1.0%.

(4) Opal exceeding 0.5%.

(5) Natural volcanic glass in volcanic rocks exceeding 3.0%.

2. Aggregate shall be evaluated by ASTM C-1260. Aggregate sources which exhibit mean mortar bar expansions at 16 days greater than .08% shall be considered potentially reactive. Tests shall be made with cement proposed for use on the job.

G. Aggregates which have a lithology which is essentially similar to that of sources in the same region which have been found to be reactive in service shall be considered potentially reactive and the alkali content requirement of cement in Article 2.01 shall apply regardless of the results of the tests above.

H. Contractor shall submit a new trial mix to the Engineer for approval whenever a different aggregate or gradation is proposed.

I. Lightweight aggregate shall conform to ASTM C330 and shall be Stalite by Carolina Stalite Company or equivalent approved expanded slate produced by the rotary kiln method. Maximum aggregate size shall be 1/2 inch.

2.06 SYNTHETIC FIBERS

A. Nylon fibers shall be Caprolan-RC by Allied Signal, Inc., or equal.

B. 100% virgin polypropylene fibers shall be Micro Fiber by W.R. Grace Company, or equal.

2.07 ADMIXTURES

A. Air entraining agent shall be added to all concrete unless noted otherwise. The agent shall consist of a neutralized vinsol resin solution or a purified hydrocarbon with a cement catalyst which will provide entrained air in the concrete in accordance with ASTM C 260. The admixture proposed shall be selected in advance so that adequate samples may be obtained and the required tests made. Air content of concrete, when placed, shall be within the ranges given in the concrete mix design.

B. Other admixtures shall be required at the Engineer's discretion or, if not required, may be added upon approval of the Engineer at the Contractor's option to control the set, effect water reduction, and increase workability. In either case, the addition of an admixture shall be at no additional cost to the Owner. Admixtures permitted shall conform to the requirements of ASTM C 494. Admixtures shall be non-toxic after 30 days and shall be compatible with and made by the same manufacturer as the air entraining admixtures.

1. Set controlling admixture shall be either with or without water-reducing properties. Where the air temperature at the time of placement is expected to be consistently over 90°F., a water-reducing retarder may be used. Where the air temperature at the time of placement is expected to be consistently under 40°F., a non-corrosive, non-chloride accelerator may be used.

2. Low range water reducing admixture shall be in conformance with ASTM C 494 Type A or D. The admixtures shall be used in strict accordance with manufacturer's

recommendations.

3. High range water reducer shall be sulfonated polymer conforming to ASTM C 494, Type F or G. The high range water reducer shall be added to the concrete at the job site and shall be used in conjunction with a low range water reducer. The high range water reducing admixture shall be accurately measured and pressure injected into the mixer as a single dose by an experienced technician. A standby system shall be provided and tested prior to each day's operation of the job site system. Concrete shall be mixed at mixing speed for a minimum of 100 mixer revolutions after the addition of the high range water reducer.

C. Admixtures containing calcium chloride, thiocyanate or more than 0.05 percent chloride ions are not permitted. The addition of admixtures to prevent freezing is not permitted.

D. The Contractor shall submit manufacturer's data including the chloride ion content of each admixture and certification from the admixture manufacturer that all admixtures utilized in the design mix are compatible with one another and properly proportioned prior to mix design review by the Engineer.

2.08 CONCRETE MIX DESIGN

A. The proportions of cement, aggregates, admixtures and water used in the concrete mixes shall be based on the results of field experience or laboratory trial mixes in conformance with Section 5.3. "Proportioning on the Basis of Field Experience and/or Trial Mixtures" of ACI 318. When trial mixes are used they shall also conform to Article 3.01 of this Section of the Specifications. Field experience records and/or trial mix data used as the basis for the proposed concrete mix design shall be submitted to the Engineer along with the proposed mix.

B. Structural concrete shall conform to the following requirements. Cementitious materials refers to the total combined weight of all cement, fly ash, and ground granulated blast furnace slag contained in the mix.

| | | |
|---|---|---|
| 1. | Compressive strength (28-Day) | 4500 psi (for concrete mixed with only Portland Cement)<br><br>4000 psi (for concrete mixed with blended cement or mix of Portland Cement and fly ash or slag) |
| 2. | Maximum water/cementitious materials ratio, by weight | 0.45 |
| 3. | Slump range | 4" nominal unless high range water reducing admixture is used.<br>3" max. before addition of high range water reducing admixture. |
| 4. | Air Content | |
| | a. All structural concrete not otherwise noted | 6% ±1.5% |

b. Structural concrete which is to receive a hardened finish (Type G in accordance with Section 03350) 3% Max

C. Class B concrete shall not be air-entrained unless otherwise indicated. The minimum compressive strength (28-day) of these types of concrete shall be 2500 psi.

D. Lightweight concrete shall be composed of cement, lightweight aggregate, sand, synthetic fibers, water, and admixtures, and shall conform to the following requirements:

| | | |
|---|---|---|
| 1. | Compressive Strength (28-Day) | 4500 psi |
| 2. | Minimum Cementitious Materials Content | 550 lb/cy |
| 3. | Air Content | 6% ±1.5% |
| 4. | Maximum Slump | 4” |
| 5. | Maximum Unit Weight | 115 PCF |

6. Lightweight aggregate shall be presoaked for 48 hours prior to mixing concrete.

7. Fiber Content 1 lb/cy
Add to wet concrete at batch plant per manufacturer’s recommendations.

## PART 3 -- EXECUTION

### 3.01 TRIAL MIX

A. When field experience records are inadequate to confirm the quality of a proposed concrete mix in accordance with Section 5.3, “Proportioning on the Basis of Field Experience and/or Trial Mixtures” of ACI 318, or when required by the Engineer, an independent testing laboratory designated by the Contractor and acceptable to the Engineer shall test a trial batch of each of the preliminary concrete mixes submitted by the Contractor. The trial batch shall be prepared using the aggregates, cement and admixtures proposed for the project. The trial batch materials shall be of a quantity such that the testing laboratory can obtain enough samples to satisfy requirements stated below. Tests on individual materials stated in PART 2 -- PRODUCTS should already be performed before any trial mix is done. The cost of laboratory trial batch tests for each specified concrete mix will be borne by the Contractor and the Contractor shall furnish and deliver the materials to the testing laboratory at no cost to the Owner.

B. An independent testing laboratory shall observe the preparation of the trial batch, and they shall prepare a minimum of fifteen (15) standard test cylinders in accordance with ASTM C 31 in addition to conducting slump (ASTM C 143), air content (C 231) and unit weight (C 138) tests. Compressive strength test on the cylinders shall subsequently be performed by the same laboratory in accordance with ASTM C 39 as follows: Test 3 cylinders at age 7 days; test 3 cylinders at age 21 days; test 3 cylinders at age 28 days and test 3 cylinders at 56 days. The cylinders shall be carefully identified as “Trial Mix, Contract No. _____, Product _____.” If the average 28-day compressive strength of the trial mix is less than that specified, or if any single cylinder falls below the required strength by more than

500 psi, the mix shall be corrected, another trial batch prepared, test cylinders taken, and new tests performed as before. Any such additional trial batch testing required shall be performed at no additional cost to the Owner. Adjustments to the mix shall be considered refinements to the mix design and shall not be the basis for extra compensation to the Contractor.

3.02 PRODUCTION OF CONCRETE

A. All concrete shall be machine mixed. Hand mixing of concrete will not be permitted. The Contractor may supply concrete from a ready mix plant or from a site mixed plant. In selecting the source for concrete production the Contractor shall carefully consider its capability for providing quality concrete at a rate commensurate with the requirements of the placements so that well bonded, homogenous concrete, free of cold joints, is assured.

B. Ready-Mixed Concrete

1. At the Contractor's option, ready-mixed concrete may be used meeting the requirements for materials, batching, mixing, transporting, and placing as specified herein and in accordance with ASTM C 94.

2. Truck mixers shall be equipped with electrically-actuated counters by which the number of revolutions of the drum or blades may be readily verified. The counter shall be of the resettable, recording type, and shall be mounted in the driver's cab. The counters shall be actuated at the time of starting mixers at mixing speeds.

3. Each batch of concrete shall be mixed in a truck mixer for not less than 100 revolutions of the drum or blades at the rate of rotation designated by the manufacturer of equipment. Additional mixing, if any, shall be at the speed designated by the manufacturer of the equipment as agitating speed. All materials including mixing water shall be in the mixer drum before actuating the revolution counter for determining the number of revolutions of mixing.

4. Truck mixers and their operation shall be such that the concrete throughout the mixed batch, as discharged, is within acceptable limits of uniformity with respect to consistency, mix and grading. If slump tests taken at approximately the 1/4 and 3/4 points of the load during discharge give slumps differing by more than one inch when the specified slump is 3 inches or less, or if they differ by more than 2 inches when the specified slump is more than 3 inches, the mixer shall not be used on the work unless the causing condition is corrected and satisfactory performance is verified by additional slump tests. All mechanical details of the mixer, such as water measuring and discharge apparatus, condition of the blades, speed of rotation, general mechanical condition of the unit and clearance of the drum, shall be checked before a further attempt to use the unit will be permitted.

5. Ready-mixed concrete shall be delivered to the site for the work and discharge shall be completed before the drum has been revolved 300 revolutions and within the time requirements stated in Article 3.03 of this Section.

6. Each and every concrete delivery shall be accompanied by a delivery ticket containing at least the following information:

a. Date and truck number

b. Ticket number
c. Mix designation of concrete
d. Cubic yards of concrete
e. Cement brand, type and weight in pounds
f. Weight in pounds of fine aggregate (sand)
g. Weight in pounds of coarse aggregate (stone)
h. Air entraining agent, brand, and weight in pounds and ounces
i. Other admixtures, brand, and weight in pounds and ounces
j. Water, in gallons, stored in attached tank
k. Water, in gallons, maximum that can be added without exceeding design water/cement ratio
l. Water, in gallons, actually used (by truck driver)
m. Time of loading
n. Time of delivery to job (by truck driver)

7. Any truck delivering concrete to the job site, which is not accompanied by a delivery ticket showing the above information will be rejected and such truck shall immediately depart from the job site.

8. The use of non-agitating equipment for transporting ready-mixed concrete will not be permitted. Combination truck and trailer equipment for transporting ready-mixed concrete will not be permitted. The quality and quantity of materials used in ready-mixed concrete and in batch aggregates shall be subject to continuous inspection at the batching plant by the Engineer.

C. Site Mixed Concrete

1. Scales for weighing concrete ingredients shall be accurate when in use within ±0.4 percent of their total capacities. Standard test weights shall be available to permit checking scale accuracy.

2. Operation of batching equipment shall be such that the concrete ingredients are consistently measured within the following tolerances:

| | | |
|---|---|---|
| a. | Cement, fly ash, or slag | ± 1 percent |
| b. | Water | ± 1 percent |
| c. | Aggregates | ± 2 percent |
| d. | Admixtures | ± 3 percent |

3. Each batch shall be so charged into the mixer that some water will enter in advance of the cement and aggregates. Water shall continue for a period which may extend to the end of the first 25 percent of the specified mixing time. Controls shall be provided to prevent batched ingredients from entering the mixer before the previous batch has been completely discharged.

4. The concrete shall be mixed in a batch mixer capable of thoroughly combining the aggregates, cement, and water into a uniform mass within the specified mixing time, and of discharging the concrete without harmful segregation. The mixer shall bear a manufacturer's rating plate indicating the rate capacity and the recommended revolutions per minute and shall be operated in accordance therewith.

5. Mixers with a rate capacity of 1 cu.yd. or larger shall conform to the requirements of

the Plant Mixer Manufacturers' Division of the Concrete Plant Manufacturers' Bureau.

6. Except as provided below, batches of 1 cu. yd. or less shall be mixed for not less than 1 minute. The mixing time shall be increased 15 seconds for each cubic yard or fraction thereof of additional capacity.

7. Shorter mixing time may be permitted provided performance tests made in accordance with of ASTM C 94 indicate that the time is sufficient to produce uniform concrete.

8. Controls shall be provided to insure that the batch cannot be discharged until the required mixing time has elapsed. At least three-quarters of the required mixing time shall take place after the last of the mixing water has been added.

9. The interior of the mixer shall be free of accumulations that will interfere with mixing action. Mixer blades shall be replaced when they have lost 10 percent of their original height.

10. Air-entraining admixtures and other chemical admixtures shall be charged into the mixer as solutions and shall be measured by means of an approved mechanical dispensing device. The liquid shall be considered a part of the mixing water. Admixtures that cannot be added in solution may be weighed or may be measured by volume if so recommended by the manufacturer.

11. If two or more admixtures are used in the concrete, they shall be added separately to avoid possible interaction that might interfere with the efficiency of either admixture or adversely affect the concrete.

12. Addition of retarding admixtures shall be completed within 1 minute after addition of water to the cement has been completed, or prior to the beginning of the last three-quarters of the required mixing, whichever occurs first. Retarding admixtures shall not be used unless approved by the Engineer.

13. Concrete shall be mixed only in quantities for immediate use and within the time and mixing requirements of ASTM C 94.

## 3.03 CONCRETE PLACEMENT

A. No concrete shall be placed prior to approval of the concrete mix design. Concrete placement shall conform to the recommendations of ACI 304.

B. Prior to concrete placement, all reinforcement shall be securely and properly fastened in its correct position. Formwork shall be clean, oiled and form ties at construction joints shall be retightened. All bucks, sleeves, castings, hangers, pipe, conduits, bolts, anchors, wire, and any other fixtures required to be embedded therein shall be in place. Forms for openings to be left in the concrete shall be in place and anchored by the Contractor. All loose debris in bottoms of forms or in keyways shall be removed and all debris, water, snow, ice and foreign matter shall be removed from the space to be occupied by the concrete. The Contractor shall notify the Engineer in advance of placement, allowing sufficient time for a concurrent inspection and for any corrective measures which are subsequently required.

C. On horizontal joints where concrete is to be placed on hardened concrete, a slush coat of cement grout 1/2-inch to 1-inch thick with slump less than 6 inches, made of the same materials as the concrete, but without the coarse aggregate, shall be worked well into the irregularities of the hard surface just ahead of the concrete placement. The compressive strength of the cement grout shall be equal to the strength of the concrete.

D. All concrete shall be placed during the daylight hours except with the consent of the Engineer. If special permission is obtained to carry on work during the night, adequate lighting must be provided.

E. When concrete arrives at the project with slump below that suitable for placing, as indicated by the Specifications, water may be added to bring the concrete within the specified slump range provided that the design water-cement ratio is not exceeded. The water shall be incorporated by additional mixing equal to at least half of the total mixing required. Water may be added only to full trucks. On-site tempering shall not relieve the Contractor from furnishing a concrete mix that meets all specified requirements.

F. Concrete shall be conveyed as rapidly as practicable to the point of deposit by methods which prevent the separation or loss of the ingredients. It shall be so deposited that rehandling will be unnecessary. Discharge of the concrete to its point of deposit shall be completed within 90 minutes after the addition of the cement to the aggregates. In hot weather, or under conditions contributing to quick stiffening of the concrete, the time between the introduction of the cement to the aggregates and discharge shall not exceed the requirements stated in Article 3.09 of this Section.

G. Where concrete is conveyed to position by chutes, a practically continuous flow in the chute shall be maintained. The angle and discharge arrangement of the chute shall be such as to prevent segregation of the concrete ingredients. The delivery end of the chute shall be as close as possible to the point of deposit and in no case shall the free pour from the delivery end of the chute exceed five feet.

H. Special care must be exercised to prevent splashing of forms or reinforcement with concrete, and any such splashes or accumulations of hardened or partially hardened concrete on the forms or reinforcement above the general level of the concrete already in place must be removed before the work proceeds. Concrete shall be placed in all forms in such way as to prevent any segregation.

I. Placing of concrete shall be so regulated that the pressure caused by the wet concrete shall not exceed that used in the design of the forms.

J. All concrete for walls shall be placed through openings in the form spaced at frequent intervals or through tremies (heavy duct canvas, rubber, etc.), equipped with suitable hopper heads. Tremies shall be of variable lengths so that the free fall shall not exceed five (5) feet and a sufficient number shall be placed in the form to insure the concrete being kept level at all times.

K. When placing concrete which is to be exposed, sufficient illumination shall be provided in the interior of the forms so that the concrete, at places of deposit, is visible from deck and runways.

L. Concrete shall be placed so as to thoroughly embed all reinforcement, inserts, and fixtures.

M. When forms are removed, surfaces shall be even and dense, free from aggregate pockets or honeycomb. To achieve this, concrete shall be consolidated using mechanical vibration, supplemented by forking and spading by hand in the corners and angle of forms and along form surfaces while the concrete is plastic under the vibratory action. Consolidation shall conform to ACI 309.

N. Mechanical vibration shall be applied directly to the concrete, unless otherwise approved by the Engineer. The bottom of vibrators used on floor slabs must not be permitted to ride the form supporting the slab. Vibration shall be applied at the point of deposit and in the area of freshly placed concrete by a vertical penetration of the vibrator. Vibrators shall not be used to move concrete laterally within the forms.

O. The intensity of vibration shall be sufficient to cause settlement of the concrete into place and to produce monolithic joining with the preceding layer. It shall be of sufficient duration to accomplish thorough compaction and complete embedment of reinforcement and fixtures with a vibrator transmitting not less than 7,500 impulses per minute. Since the duration of vibration per square foot of surface is dependent on the frequency (impulses per minute), size of vibrator, and slump of concrete, the length of time must therefore be determined in the field. Vibration, however, shall not be continued in any one location to the extent that pools of grout are formed.

P. Care shall be taken to prevent cold joints when placing concrete in any portion of the work. The concrete placing rate shall be such as to ensure that each layer is placed while the previous layer is soft or plastic, so that the two layers can be made monolithic by penetration of the vibrators. Maximum thickness of concrete layers shall be 18 inches. The surface of the concrete shall be level whenever a run of concrete is stopped.

Q. To prevent featheredges, construction joints that are located at the tops of horizontal lifts near sloping exposed concrete surfaces shall be inclined near the exposed surface, so that the angle between such inclined surface and the exposed concrete surface will be not less than 50°.

R. In placing unformed concrete on slopes, the concrete shall be placed ahead of a non-vibrated slip-form screed extending approximately 2-1/2 feet back from its leading edge. The method of placement shall provide a uniform finished surface with the deviation from the straight line less than 1/8 inch in any concrete placement. Concrete ahead of the slip-form screed shall be consolidated by internal vibrators so as to ensure complete filling under the slip-form. Prior to placement of concrete on sloped walls or slabs, the Contractor shall submit a plan specifically detailing methods and sequence of placements, proposed concrete screed equipment, location of construction joints and waterstops, and/or any proposed deviations from the aforementioned to the Engineer for review and approval.

S. Concrete shall not be placed during rains sufficiently heavy or prolonged to wash mortar from coarse aggregate on the forward slopes of the placement. Once placement of concrete has commenced in a block, placement shall not be interrupted by diverting the placing equipment to other uses.

3.04 PLACING FLOOR SLABS ON GRADE

A. The subgrade for slabs on ground shall be well drained and of adequate and uniform loadbearing nature. The in-place density of the subgrade soils shall be at least the minimum required by the specifications. No foundation, slab, or pavement concrete shall be

placed until the depth and character of the foundation soils have been inspected and approved by the Engineer.

B. The subgrade shall be free of frost before concrete placing begins. If the temperature inside a building where concrete is to be placed is below freezing it shall be raised and maintained above 50° long enough to remove all frost from the subgrade.

C. The subgrade shall be moist at the time of concreting. If necessary, it shall be dampened with water in advance of concreting, but there shall be no free water standing on the subgrade nor any muddy or soft spots when the concrete is placed.

D. Thirty-pound felt paper shall be provided between edges of slab-on-grade and vertical and horizontal concrete surfaces, unless otherwise indicated on the Drawings.

E. Contraction joints shall be provided in slabs-on-grade at locations indicated on the Drawings. Contraction joints shall be installed as per Section 03290 - Joints in Concrete.

F. Floor slabs shall be screeded level or pitched to drain as indicated on the Drawings. Finishes shall conform with requirements of Section 03350 - Concrete Finishes.

3.05 PLACING CONCRETE UNDERWATER (TREMIE CONCRETE)

A. Placing concrete underwater will be permitted only when shown on the Drawings. Concrete deposited under water shall be carefully placed in a compacted mass in final position by means of a tremie, a closed bottom dump bucket or other approved method. Care must be exercised to maintain still water at the point of deposit. Concrete shall not be placed in running water. Underwater formwork shall be watertight. The consistency of the concrete shall be regulated to prevent segregation of materials. The method of depositing concrete shall be regulated such that the concrete enters the mass of the previously placed concrete from within, displacing water with a minimum disturbance to the surface of the concrete.

B. Tremie shall consist of a tube having a diameter of not less than 10 inches and constructed in sections having flanged couplings fitted with gaskets. The tremie shall be supported to permit free movement of the discharge and over the entire top surface of the work and shall permit rapid lowering when necessary to choke off or retard the flow. The discharge end shall be entirely sealed at all times and the tremie tube kept full to the bottom of the hopper. When a batch is dumped into the hopper, the tremie shall be slightly raised, but not out of the concrete at the bottom, until the batch discharges to the bottom of the hopper. The flow shall then be stopped by lowering the tremie. The flow shall be continuous until the placement has been completed.

3.06 PLACING CONCRETE UNDER PRESSURE (PUMPING)

A. Where concrete is conveyed and placed by mechanically applied pressure, the equipment shall have the capacity for the operation. The operation of the pump shall be such that a continuous stream of concrete without air pockets is produced. To obtain the least line resistance, the layout of the pipeline system shall contain a minimum number of bends with no change in pipe size. If two sizes of pipe must be used, the smaller diameter should be used at the pump end and the larger at the discharge end. When pumping is completed, the concrete remaining in the pipelines, if it is to be used, shall be ejected in such a manner that there will be no contamination of the concrete or separation of the ingredients.

B. No aluminum parts shall be in contact with the concrete during the entire placing of concrete under pressure at any time.

C. Prior to placing concrete under pressure, the Contractor shall submit the concrete mix design together with test results from a recognized testing laboratory proving the proposed mix meets all requirements. In addition, an actual pumping test under field conditions is required prior to acceptance of the mix. This test requires a duplication of anticipated site conditions from beginning to end. The batching and truck mixing shall be the same as will be used; the same pump and operator shall be present and the pipe and pipe layouts will reflect the maximum height and distance contemplated. All submissions shall be subject to approval by the Engineer.

D. If the pumped concrete does not produce satisfactory end results, the Contractor shall discontinue the pumping operation and proceed with the placing of concrete using conventional methods.

E. The pumping equipment must have two cylinders and be designed to operate with one cylinder only in case the other one is not functioning. In lieu of this requirement, the Contractor may have a standby pump on the site during pumping.

F. The minimum diameter of the hose (conduits) shall be four inches.

G. Pumping equipment and hoses (conduits) that are not functioning properly shall be replaced.

H. Concrete samples for quality control in accordance with Article 3.10 will be taken at the placement (discharge) end of the line.

3.07 ORDER OF PLACING CONCRETE

A. In order to minimize the effects of shrinkage, the concrete shall be placed in units as bounded by construction joints shown on the Drawings and maximum lengths as indicated on Drawings. Where required on the Drawings and wherever else practical, the placing of such units shall be done in an alternating or checkerboard pattern.

3.08 CONCRETE WORK IN COLD WEATHER

A. Cold weather concreting procedures shall conform to the requirements of ACI 306.

B. The Engineer may prohibit the placing of concrete at any time when air temperature is 40°F. or lower. If concrete work is permitted, the concrete shall have a minimum temperature, as placed, of 55°F. for placements less than 12” thick, 50°F. for placements 12” to 36” thick, and 45°F. for placements greater than 36” thick. The temperature of the concrete as placed shall not exceed the aforementioned minimum values by more than 20°F, unless otherwise approved by the Engineer.

C. All aggregate and water shall be preheated. Precautions shall be taken to avoid the possibility of flash set when aggregate or water are heated to a temperature in excess of 100°F. in order to meet concrete temperature requirements. The addition of admixtures to the concrete to prevent freezing is not permitted. All reinforcement, forms, and concrete accessories with which the concrete is to come in contact shall be defrosted by an approved method. No concrete shall be placed on frozen ground.

## 3.09 CONCRETE WORK IN HOT WEATHER

A. Hot weather concreting procedures shall conform to the requirements of ACI 305.

B. When air temperatures exceed 85°F., or when extremely dry conditions exist even at lower temperatures, particularly if accompanied by high winds, the Contractor and his concrete supplier shall exercise special and precautionary measures in preparing, delivering, placing, finishing, curing and protecting the concrete mix. The Contractor shall consult with the Engineer regarding such measures prior to each day's placing operation and the Engineer reserves the right to modify the proposed measures consistent with the requirements of this Section of the Specifications. All necessary materials and equipment shall be on hand an in position prior to each placing operation.

C. Preparatory work at the job site shall include thorough wetting of all forms, reinforcing steel and, in the case of slab pours on ground or subgrade, spraying the ground surface on the preceding evening and again just prior to placing. No standing puddles of water shall be permitted in those areas which are to receive the concrete.

D. The temperature of the concrete mix when placed shall not exceed 90°F.

E. Temperature of mixing water and aggregates shall be carefully controlled and monitored at the supplier's plant, with haul distance to the job site being taken into account. Stockpiled aggregates shall, if necessary, be shaded from the sun and sprinkled intermittently with water. If ice is used in the mixing water for cooling purposes, it must be entirely melted prior to addition of the water to the dry mix.

F. Delivery schedules shall be carefully planned in advance so that concrete is placed as soon as practical after it is properly mixed. For hot weather concrete work (air temperature greater than 85°F), discharge of the concrete to its point of deposit shall be completed within 60 minutes from the time the concrete is batched.

G. The Contractor shall arrange for an ample work force to be on hand to accomplish transporting, vibrating, finishing, and covering of the fresh concrete as rapidly as possible.

## 3.10 QUALITY CONTROL

A. Field Testing of Concrete

1. The Contractor shall coordinate with the Engineer's project representative the on-site scheduling of the testing firm's personnel as required for concrete testing.

2. Concrete for testing shall be supplied by the Contractor at no additional cost to the Owner, and the Contractor shall provide assistance to the testing laboratory in obtaining samples. The Contractor shall dispose of and clean up all excess material.

B. Consistency

1. The consistency of the concrete will be checked by the Engineer by standard slump cone tests. The Contractor shall make any necessary adjustments in the mix as the Engineer may direct and shall upon written order suspend all placing operations in

the event the consistency does not meet the intent of the specifications. No payment shall be made for any delays, material or labor costs due to such eventualities.

2. Slump tests shall be made in accordance with ASTM C 143. Slump tests will be performed as deemed necessary by the Engineer and each time compressive strength samples are taken.

3. Concrete with a specified nominal slump shall be placed having a slump within 1" (higher or lower) of the specified slump. Concrete with a specified maximum slump shall be placed having a slump less than the specified slump.

C. Unit Weight

1. Samples of freshly mixed concrete shall be tested for unit weight by the Engineer in accordance with ASTM C 138.

2. Unit weight tests will be performed as deemed necessary by the Engineer and each time compressive strength samples are taken.

D. Air Content

1. Samples of freshly mixed concrete will be tested for entrained air content by the Engineer in accordance with ASTM C 231.

2. Air content tests will be performed as deemed necessary by the Engineer and each time compressive strength samples are taken.

3. In the event that test results are outside the limits specified, additional tests will be run. Admixture quantity adjustments shall be made immediately upon discovery of incorrect air entrainment.

E. Compressive Strength

1. Samples of freshly mixed concrete will be taken by the Engineer and tested for compressive strength in accordance with ASTM C 172, C 31 and C 39, except as modified herein.

2. In general, one sampling shall be taken for each placement in excess of five (5) cubic yards, with a minimum of one (1) sampling for each day of concrete placement operations, or for each one hundred (100) cubic yards of concrete, whichever is greater.

3. Each sampling shall consist of at least five (5) cylinders. Each cylinder shall be identified by a tag, which shall be hooked or wired to the side of the container. The Engineer will fill out the required information on the tag, and the Contractor shall satisfy himself that such information shown is correct.

4. The Contractor shall be required to furnish labor to the Owner for assisting in preparing test cylinders for testing. The Contractor shall provide approved curing boxes for storage of cylinders on site. The insulated curing box shall be of sufficient size and strength to contain all the specimens made in any four consecutive working

days and to protect the specimens from falling over, being jarred or otherwise disturbed during the period of initial curing. The box shall be erected, furnished and maintained by the Contractor. Such box shall be equipped to provide the moisture and to regulate the temperature necessary to maintain the proper curing conditions required by ASTM C 31. Such box shall be located in an area free from vibration such as pile driving and traffic of all kinds. No concrete requiring inspection shall be delivered to the site until such storage curing box has been provided. Specimens shall remain undisturbed in the curing box until ready for delivery to the testing laboratory but not less than sixteen hours.

5. When transported, the cylinders shall not be thrown, dropped, allowed to roll, or be damaged in any way.

6. Compression tests shall be performed in accordance with ASTM C 39. Two test cylinders will be tested at seven days and two at 28 days. The remaining cylinder will be held to verify test results, if needed.

F. Evaluation and Acceptance of Concrete

1. Evaluation and acceptance of the compressive strength of concrete shall be according to the requirements of ACI 214 and ACI 318.

2. The strength level of concrete will be considered satisfactory if all of the following conditions are satisfied.

   a. The average of 28-day cylinder tests for any three consecutive samplings shall meet or exceed the strength required for the mix specified (see Article 2.08).

   b. No more than 20 percent of the compressive tests have strengths less than that specified.

   c. No individual compressive strength test results falls below the specified strength by more than 500 psi.

3. In the event that any of the conditions listed above are not met, the mix proportions shall be corrected for the next concrete placing operation.

4. In the event that condition 2C is not met, additional tests in accordance with Article 3.10, paragraph G shall be performed.

5. When a ratio between 7-day and 28-day strengths has been established by these tests, the 7-day strengths shall subsequently be taken as a preliminary indication of the 28-day strengths. Should the 7-day test strength from any sampling be more than 10% below the established strength, the Contractor shall:

   a. Immediately provide additional periods of curing in the affected area from which the deficient test cylinders were taken.

   b. Maintain or add temporary structural support as required.

c. Correct the mix for the next concrete placement operation, if required to remedy the situation.

6. All concrete which fails to meet the ACI requirements and these specifications is subject to removal and replacement at no additional cost to the Owner.

G. Additional Tests

1. When ordered by the Engineer, additional tests on in-place concrete shall be provided and paid for by the Contractor.

2. In the event that the 28-day test cylinders fail to meet the strength requirements as outlined in Article 3.10, paragraph F, the Contractor shall have concrete core specimens obtained and tested from the affected area immediately.

a. Three cores shall be taken for each sample in which the strength requirements were not met.

b. The drilled cores shall be obtained and tested in conformance with ASTM C 42. The tests shall be conducted by an independent testing laboratory to be selected by the Engineer.

c. The location from which each core is taken shall be approved by the Engineer. Each core specimen shall be located, when possible, so that its axis is perpendicular to the concrete surface and not near formed joints or obvious edges of a unit of deposit.

d. The core specimens shall be taken, if possible, so that no reinforcing steel is within the confines of the core.

e. The diameter of core specimens should be at least 3 times the maximum nominal size of the course aggregate used in the concrete, but must be at least 2-inches in diameter.

f. The length of specimen, when capped, shall be at least twice the diameter of the specimen.

g. The core specimens shall be taken to the laboratory and when transported, shall not be thrown, dropped, allowed to roll, or damaged in any way.

h. Two (2) copies of test results shall be mailed directly to the Engineer. The concrete in question will be considered acceptable if the average of the test results on core specimens taken from a given area equal or exceed 85% of the specified 28-day strength and if the lowest core strength is greater than 75% of the specified 28-day strength.

3. In the event that concrete placed by the Contractor is suspected of not having proper air content, the Contractor shall engage an independent test laboratory to be selected by the Engineer, to obtain and test samples for air content in accordance with ASTM Specification C 457.

## 3.11 CARE AND REPAIR OF CONCRETE

A. The Contractor shall protect all concrete against injury or damage from excessive heat, lack of moisture, overstress, or any other cause until final acceptance by the Owner. Particular care shall be taken to prevent the drying of concrete and to avoid roughening or otherwise damaging the surface. Care shall be exercised to avoid jarring forms or placing any strain on the ends of projecting reinforcing bars. Any concrete found to be damaged, or which may have been originally defective, or which becomes defective at any time prior to the final acceptance of the completed work, or which departs from the established line or grade, or which, for any other reason, does not conform to the requirements of the Contract Documents, shall be satisfactorily repaired or removed and replaced with acceptable concrete at no additional cost to the Owner.

B. Areas of honeycomb shall be chipped back to sound concrete and repaired as directed by the Engineer.

C. Concrete formwork blowouts or unacceptable deviations in tolerances for formed surfaces due to improperly constructed or misaligned formwork shall be repaired as directed by the Engineer. Bulging or protruding areas, which result from slipping or deflecting forms shall be ground flush or chipped out and redressed as directed by the Engineer.

D. Areas of concrete in which cracking, spalling, or other signs of deterioration develop prior to final acceptance shall be removed and replaced, or repaired as directed by the Engineer. This stipulation includes concrete that has experienced cracking due to drying or thermal shrinkage of the concrete.

E. Concrete which fails to meet the strength requirements as outlined in Article 3.10, paragraph F, will be analyzed by the Engineer as to its adequacy based upon loading conditions, resultant stresses and exposure conditions for the particular area of concrete in question. If the concrete in question is found unacceptable based upon this analysis, that portion of the structure shall be strengthened or replaced by the Contractor at no additional cost to the Owner. The method of strengthening or extent of replacement shall be directed by the Engineer.

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# SECTION 03350

# CONCRETE FINISHES

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Furnish all materials, labor, and equipment required to provide finishes of all concrete surfaces specified herein and shown on the Drawings.

### 1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03100 - Concrete Formwork

B. Section 03300 - Cast-in-Place Concrete

C. Section 03600 - Grout

### 1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. ACI 301 - Specifications for Structural Concrete for Buildings

2. ACI 318 - Building Code Requirements for Structural Concrete

### 1.04 SUBMITTALS

A. Submit the following in accordance with Section 01300 - Submittals.

1. Manufacturer's literature on all products specified herein.

## PART 2 -- PRODUCTS

### 2.01 CONCRETE FLOOR SEALER

A. Floor sealer shall be Kure-N-Seal by Sonneborn, Cure & Seal by Conspec, Aqua-Cure VOX by Euclid Chemical, or equal.

### 2.02 NON-SLIP SHAKE-ON AGGREGATE

A. Shake-on aggregate for non-slip floors shall be non-metallic. Shake-on aggregate shall be Frictex NS by Sonneborn, A-H Alox by Anti-Hydro, Non-Slip by Euclid Chemical, or equal.

PART 3 -- EXECUTION

3.01 FINISHES ON FORMED CONCRETE SURFACES

A. After removal of forms, the finishes described below shall be applied in accordance with Article 3.05 - Concrete Finish Schedule. Unless the finish schedule specifies otherwise, all surfaces shall receive at least a Type I finish. The Engineer shall be the sole judge of acceptability of all concrete finish work.

1. Type I - Rough: All fins, burrs, offsets, marks and all other projections left by the forms shall be removed. Projections, depressions, etc. below finished grade required to be removed will only be those greater than ¼-inch. All holes left by removal of ends of ties, and all other holes, depressions, bugholes, air/blow holes or voids shall be filled solid with cement grout after first being thoroughly wetted and then struck off flush. The only holes below grade to be filled will be tie holes and any other holes larger than ¼-inch in any dimension. Honeycombs shall be chipped back to solid concrete and repaired as directed by the Engineer. All holes shall be filled with tools, such as sponge floats and trowels, that will permit packing the hole solidly with cement grout. Cement grout shall consist of one part cement to three parts sand, epoxy bonding agent (for tie holes only) and the amount of mixing water shall be as little as consistent with the requirements of handling and placing. Color of cement grout shall match the adjacent wall surface.

2. Type II - Grout Cleaned: Where this finish is required, it shall be applied after completion of Type I finish. After the concrete has been predampened, a slurry consisting of one part cement (including an appropriate quantity of white cement in order to produce a color matching the surrounding concrete) and 1-1/2 parts sand passing the No. 16 sieve, by damp loose volume, shall be spread over the surface with clean burlap pads or sponge rubber floats. Mix proportions shall be submitted to the Engineer after a sample of the work is established and accepted. Any surplus shall be removed by scraping and then rubbing with clean burlap.

3. Type III - Smooth Rubbed: Where this finish is required, it shall be applied after the completion of the Type I finish. No rubbing shall be done before the concrete is thoroughly hardened and the mortar used for patching is firmly set. A smooth, uniform surface shall be obtained by wetting the surface and rubbing it with a carborundum stone to eliminate irregularities. Unless the nature of the irregularities require it, the general surface of the concrete shall not be cut into. Corners and edges shall be slightly rounded by the use of the carborundum stone. Brush finishing or painting with grout or neat cement will not be permitted. A 100 square foot example shall be established at the beginning of the project to establish acceptability.

3.02 SLAB AND FLOOR FINISHES

A. The finishes described below shall be applied to floors, slabs, flow channels and top of walls in accordance with Article 3.05 - Concrete Finish Schedule. The Engineer shall be the sole judge of acceptability of all such finish work.

1. Type “A” - Screeded: This finish shall be obtained by placing screeds at frequent intervals and striking off to the surface elevation required. When a Type “F” finish is subsequently to be applied, the surface of the screeded concrete shall be roughened with a stiff brush, jitter bug or rake prior to final set.

2. Type “B” - Wood or Magnesium Floated: This finish shall be obtained after completion of a Type “A” finish by working a previously screeded surface with a wood or magnesium float or until the desired texture is reached. Floating shall begin when the water sheen has disappeared and when the concrete has sufficiently hardened so that a person’s foot leaves only a slight imprint. If wet spots occur, water shall be removed with a squeegee. Care shall be taken to prevent the formation of laitance and excess water on the finished surface. All edges shall be edged with an 1/8-inch tool as directed by the Engineer. The finished surface shall be true, even, and free from blemishes and any other irregularities.

3. Type “C” - Cork Floated: This finish shall be similar to Type “B” but slightly smoother than that obtained with a wood float. It shall be obtained by power or band floating with cork floats.

4. Type “D” - Steel Troweled: This finish shall be obtained after completion of a Type “B” finish. When the concrete has hardened sufficiently to prevent excess fine material from working to the surface, the surface shall be compacted and smoothed with not less than two thorough and complete steel troweling operations. In areas which are to receive a floor covering such as tile, resilient flooring, or carpeting, the applicable Specification Sections and Contract Drawings shall be reviewed for the required finishes and degree of flatness. In areas that are intermittently wet such as pump rooms, only one troweling operation is required to provide some trowel marks for slip resistance. All edges shall be edged with an 1/8-inch tool as directed by the Engineer. The finish shall be brought to a smooth, dense surface, free from defects and blemishes.

5. Type “E” - Broom or Belt: This finish shall provide the surface with a transverse scored texture by drawing a broom or burlap belt across the surface immediately after completion of a Type “B” finish. All edges shall be edged with an 1/8-inch tool as directed by the Engineer.

6. Type “F” - Swept in Grout Topping: This finish shall be applied after a completion of a Type “A” finish. The concrete surface shall be properly cleaned, washed, and coated with a mixture of water and Portland Cement. Cement grout in accordance with Section 03600 shall then be plowed and swept into neat conformance with the blades or arms of the apparatus by turning or rotating the previously positioned mechanical equipment. Special attention shall be paid to true grades, shapes and tolerances as specified by the manufacturer of the equipment. Before beginning this finish, the Contractor shall notify the Engineer and the equipment manufacturer of the details of the operation and obtain approval and recommendations.

7. Type “H” - Non-Slip Finish: This finish shall be provided by applying a non-slip shake-on aggregate concurrently with the application of a Type “D” finish. Application procedure shall be in accordance with manufacturer’s instructions.

8. Type “J” - Raked Finish: This finish shall be provided by raking the surface as soon as the condition of the concrete permits by making depressions of ±1/4 inch.

## 3.03 SEALING OF CONCRETE FLOOR

A. After installation of all equipment and piping, and after completion of other related construction activities, all floor slabs which are to remain unpainted and not intended to be immersed shall be sealed with a floor sealer unless stated otherwise. Remove all dirt, droppage, oil, grease, asphalt or other foreign matter with caustics and detergents as required prior to application. Sealer shall be applied in accordance with the manufacturer’s recommendations. The Owner shall be given a color selection from the full range of colors offered from the manufacturer.

## 3.04 FINISHES ON EQUIPMENT PADS

A. Formed surfaces of equipment pads shall receive a Type III finish.

B. Top surfaces of equipment pads, except those surfaces subsequently required to receive grout and support equipment bases, shall receive a Type “D” finish, unless otherwise noted. Surfaces which will later receive grout shall, before the concrete takes its final set, be made rough by removing the sand and cement that accumulates on the top to the extent that the aggregate will be exposed with irregular indentations in the surface up to 1/2 inch deep.

## 3.05 CONCRETE FINISH SCHEDULE

| **Item** | **Type of Finish** |
|---|---|
| Inner face of walls of tanks, flow channels, wet wells, perimeter walls, and miscellaneous concrete structures: | |
| From 1 feet below water surface to bottom of wall | II |
| From top of wall to 1 feet below water surface | II |
| Exterior concrete walls below grade | I |
| Exterior exposed concrete walls, ceilings, beams, manholes, hand holes, miscellaneous structures and columns (including top of wall) to one foot below grade. All other exposed concrete surfaces not specified elsewhere | II |
| Floors of process equipment tanks or basins, wetwells, flow channels and slabs to receive roofing material or waterproof membranes | B |
| Exterior concrete sidewalks, steps, ramps, decks, slabs on grade and landings exposed to weather | E |

- END OF SECTION –

# SECTION 03370

# CONCRETE CURING

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Protect all freshly deposited concrete from premature drying and from the weather elements. The concrete shall be maintained with minimal moisture loss at a relatively constant temperature for a period of time necessary for the hydration of the cement and proper hardening of the concrete in accordance with the requirements specified herein.

### 1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03100 - Concrete Formwork

B. Section 03300 - Cast-In-Place Concrete

C. Section 03350 - Concrete Finishes

### 1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. ACI 301 - Specifications for Structural Concrete for Buildings

2. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete

3. ACI 305 - Hot Weather Concreting

4. ACI 306 - Cold Weather Concreting

5. ACI 308 - Standard Practice for Curing Concrete

6. ASTM C171 - Standard Specifications for Sheet Materials for Curing Concrete

7. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

8. Federal Specification TT-C-800

### 1.04 SUBMITTALS

A. Submit the following in accordance with Section 01300, Submittals.

1. Proposed procedures for protection of concrete under wet weather placement conditions.

2. Proposed normal procedures for protection and curing of concrete.

3. Proposed special procedures for protection and curing of concrete under hot and cold weather conditions.

4. Proposed method of measuring concrete surface temperature changes.

5. Manufacturer's literature and material certification for proposed curing compounds.

## PART 2 -- PRODUCTS

### 2.01 LIQUID MEMBRANE-FORMING CURING COMPOUND

A. Curing compound shall comply with ASTM C-309 Type I, Class B.

B. Minimum solids content of curing compound shall be 30%.

C. Moisture loss from concrete surface receiving compound shall not exceed 0.03 grams per square centimeter when applied at 300 square feet per gallon.

D. The curing compound shall be an emulsion which is freeze-thaw stable and displays a white color that disappears when dry.

E. Curing compound shall be SureCure 30 by Kaufman Products, Inc., Cure and Seal 30 Plus by Symons Corporation, Sealtight CS-309-30 by W. R. Meadows, or equal.

### 2.02 EVAPORATION REDUCER

A. Evaporation reducer shall be Master Builders, "Confilm", Euclid Chemical "Euco-Bar", or equal.

## PART 3 -- EXECUTION

### 3.01 PROTECTION AND CURING

A. All freshly placed concrete shall be protected from the elements, flowing water and from defacement of any nature during construction operations.

B. As soon as the concrete has been placed and horizontal top surfaces have received their required finish, provision shall be made for maintaining the concrete in a moist condition for at least a 5-day period thereafter except for high early strength concrete, for which the period shall be at least the first three days after placement. Horizontal surfaces shall be kept covered, and intermittent, localized drying will not be permitted.

C. Walls that will be exposed on one side with either fluid or earth backfill on the opposite side shall be continuously wet cured for a minimum of five days. Use of a curing compound will not be acceptable for applications of this type.

D. The Contractor shall use one of the following methods to insure that the concrete remains in a moist condition for the minimum period stated above.

1. Ponding or continuous fogging or sprinkling.

2. Application of mats or fabric kept continuously wet.

3. Continuous application of steam (under 150°F).

4. Application of sheet materials conforming to ASTM C171.

5. If approved by the Engineer, application of a curing compound in accordance with Article 3.04.

E. The Contractor shall keep absorbent wood forms wet until they are removed. After form removal, the concrete shall be cured by one of the methods in paragraph C.

F. Any of the curing procedures used in Paragraph 3.01-C may be replaced by one of the other curing procedures listed in Paragraph 3.01-C after the concrete is one-day old. However, the concrete surface shall not be permitted to become dry at any time.

3.02 CURING CONCRETE UNDER COLD WEATHER CONDITIONS

A. Suitable means shall be provided for a minimum of 72 hours after placing concrete to maintain it at or above the minimum as placed temperatures specified in Section 03300, Cast-In-Place Concrete, for concrete work in cold weather. During the 72-hour period, the concrete surface shall not be exposed to air more than 20°F above the minimum as placed temperatures.

B. Stripping time for forms and supports shall be increased as necessary to allow for retardation in concrete strength caused by colder temperatures. This retardation is magnified when using concrete made with blended cements or containing fly ash or ground granulated blast furnace slag. Therefore, curing times and stripping times shall be further increased as necessary when using these types of concrete.

C. The methods of protecting the concrete shall be approved by the Engineer and shall be such as will prevent local drying. Equipment and materials approved for this purpose shall be on the site in sufficient quantity before the work begins. The Contractor shall assist the Engineer by providing holes in the forms and the concrete in which thermometers can be placed to determine the adequacy of heating and protection. All such thermometers shall be furnished by the Contractor in quantity and type which the Engineer directs.

D. Curing procedures during cold weather conditions shall conform to the requirements of ACI 306.

3.03 CURING CONCRETE UNDER HOT WEATHER CONDITIONS

A. When air temperatures exceed 85°F, the Contractor shall take extra care in placing and finishing techniques to avoid formation of cold joints and plastic shrinkage cracking. If ordered by the Engineer, temporary sun shades and/or windbreakers shall be erected to guard against such developments, including generous use of wet burlap coverings and fog sprays to prevent drying out of the exposed concrete surfaces.

B. Immediately after screeding, horizontal surfaces shall receive an application of evaporation reducer. Apply in accordance with manufacturer's instructions. Final finish work shall begin as soon as the mix has stiffened sufficiently to support the workmen.

C. Curing and protection of the concrete shall begin immediately after completion of the finishing operation. Continuous moist-curing consisting of method 1 or 2 listed in paragraph 3.01C is mandatory for at least the first 24 hours. Method 2 may be used only if the finished surface is not marred or blemished during contact with the coverings.

D. At the end of the initial 24-hour period, curing and protection of the concrete shall continue for at least four (4) additional days using one of the methods listed in paragraph 3.01C.

E. Curing procedures during hot weather conditions shall conform to the requirements of ACI 305.

3.04 USE OF CURING COMPOUND

A. Curing compound shall be used only where specifically approved by the Engineer. Curing compound shall not be used on surfaces to receive subsequent coatings. Curing compound shall never be used for curing exposed walls with fluid or earth backfill on the opposite side. A continuous wet cure for a minimum of five days is required for these applications. Curing compound shall not be used on surfaces exposed to water in potable water storage tanks and treatment plants unless curing compound is certified in accordance with ANSI/NSF Standard 61.

B. When permitted, the curing compound shall maintain the concrete in a moist condition for the required time period, and the subsequent appearance of the concrete surface shall not be affected.

C. The compound shall be applied in accordance with the manufacturer's recommendations after water sheen has disappeared from the concrete surface and after finishing operations. The rate of application shall not exceed 300 square feet per gallon. For rough surfaces, apply in two directions at right angles to each other.

3.05. EARLY TERMINATION OF CURING

A. Moisture retention measures may be terminated earlier than the specified times only when at least one of the following conditions is met:

1. The strength of the concrete reaches 85 percent of the specified 28-day compressive strength in laboratory-cured cylinders representative of the concrete in place, and the temperature of the in-place concrete has been constantly maintained at 50 degrees Fahrenheit or higher.

2. The strength of concrete reaches the specified 28-day compressive strength as determined by accepted nondestructive methods or laboratory-cured cylinder test results.

- END OF SECTION -

# SECTION 03600

# GROUT

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Furnish all materials, labor, and equipment required to provide all grout used in concrete work and as bearing surfaces for base plates, in accordance with the Contract Documents.

### 1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01300 - Submittals

B. Section 03350 - Concrete Finishes

C. Section 03370 - Concrete Curing

### 1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

| | | |
|---|---|---|
| 1. | CRD-C 621 | Corps of Engineers Specification for Non-shrink Grout |
| 2. | ASTM C 109 | Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 inch or 50 mm cube Specimens) |
| 3. | ASTM C 531 | Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts and Monolithic Surfacings |
| 4. | ASTM C 579 | Test Method for Compressive Strength of Chemical-Resistant Mortars and Monolithic Surfacings |
| 5. | ASTM C 827 | Standard Test Method for Early Volume Change of Cementitious Mixtures |
| 6. | ASTM C 144 | Standard Specification for Aggregate for Masonry Mortar |
| 7. | ASTM C 1107 | Standard Specification for Packaged Dry, Hydraulic Cement Grout (Nonshrink) |

### 1.04 SUBMITTALS

A. Submit the following in accordance with Section 01300, Submittals.

1. Certified test results verifying the compressive strength and shrinkage and expansion requirements specified herein.

2. Manufacturer's literature containing instructions and recommendations on the mixing, handling, placement and appropriate uses for each type of grout used in the work.

1.05 QUALITY ASSURANCE

A. Field Tests

1. Compression test specimens will be taken during construction from the first placement of each type of grout and at intervals thereafter as selected by the Engineer to insure continued compliance with these Specifications. The specimens will be made by the Engineer or its representative.

a. Compression tests and fabrication of specimens for cement grout and non-shrink grout will be performed as specified in ASTM C 109 at intervals during construction as selected by the Engineer. A set of three specimens will be made for testing at seven (7) days, twenty-eight (28) days and any additional time period as appropriate.

b. Compression tests and fabrication of specimens for epoxy grout will be performed as specified in ASTM C 579, Method B, at intervals during construction as selected by the Engineer. A set of three specimens will be made for testing at seven days and any other time period as appropriate.

2. The cost of all laboratory tests on grout will be borne by the Owner, but the Contractor shall assist the Engineer in obtaining specimens for testing. The Contractor shall be charged for the cost of any additional tests and investigation on work performed which does not meet the specifications. The Contractor shall supply all materials necessary for fabricating the test specimens, at no additional cost to the Owner.

3. All grout, already placed, which fails to meet the requirements of these Specifications, is subject to removal and replacement at no additional cost to the Owner.

PART 2 -- PRODUCTS

2.01 MATERIALS

A. Cement Grout

1. Cement grout shall be composed of Portland Cement and sand in the proportion specified in the Contract Documents and the minimum amount of water necessary to obtain the desired consistency. If no proportion is indicated, cement grout shall consist of one part Portland Cement to three parts sand. Water amount shall be as required to achieve desired consistency without compromising strength requirements. White portland cement shall be mixed with the Portland Cement as required to match color of adjacent concrete.

2. The minimum compressive strength at 28 days shall be 4,000 psi.

3. For beds thicker than 1-1/2 inch and/or where free passage of grout will not be obstructed by coarse aggregate, 1-1/2 parts of coarse aggregate having a top size of 3/8 inch should be added. This stipulation does not apply for grout being swept in by a mechanism. These applications shall use a plain cement grout without coarse aggregate regardless of bed thickness.

4. Sand shall conform to the requirements of ASTM C144.

B. Non-Shrink Grout

1. Non-shrink grout shall conform to CRD-C 621 and ASTM C 1107, Grade B or C when tested at a max. fluid consistency of 30 seconds per CDC 611/ASTM C939 at temperature extremes of 45°F and 90°F and an extended working time of 15 minutes. Grout shall have a min. 28-day strength of 7,000 psi. Non-shrink grout shall be, “Euco N-S” by the Euclid Chemical Company, “Masterflow 713” by Master Builders, “Sikagrout 212” by Sika Corporation, or equal.

C. Epoxy Grout

1. Epoxy grout shall be “Sikadur 32 Hi-Mod” by Sika Corporation, “Duralcrete LV” by Tamms Industries, “Euco #452” by Euclid Chemical, or equal.

2. Epoxy grout shall be modified as required for each particular application with aggregate per manufacturer’s instructions.

2.02 CURING MATERIALS

A. Curing materials shall be as specified in Section 03370, Concrete Curing, for cement grout and as recommended by the manufacturer for prepackaged grouts.

## PART 3 -- EXECUTION

3.01 GENERAL

A. The different types of grout shall be used for the applications stated below unless noted otherwise in the Contract Documents. Where grout is called for in the Contract Documents which does not fall under any of the applications stated below, non-shrink grout shall be used unless another type is specifically referenced.

1. Cement grout shall be used for grout toppings and for patching of fresh concrete.

2. Non-shrink grout shall be used for grouting beneath base plates of equipment and structural metal framing.

3. Epoxy grout shall be used for bonding new concrete to hardened concrete.

4. Epoxy base plate grout shall be used for precision seating of base plates including base plates for all equipment such as engines, mixers, pumps, vibratory and heavy impact machinery, etc.

B. New concrete surfaces to receive cement grout shall be as specified in Section 03350, Concrete Finishes, and shall be cleaned of all dirt, grease and oil-like films. Existing concrete surfaces shall likewise be cleaned of all similar contamination and debris, including chipping or roughening the surface if a laitance or poor concrete is evident. The finish of the grout surface shall match that of the adjacent concrete. Curing and protection of cement grout shall be as specified in Section 03370, Concrete Curing.

C. All mixing, surface preparation, handling, placing, consolidation, and other means of execution for prepackaged grouts shall be done according to the instructions and recommendations of the manufacturer.

D. The Contractor, through the manufacturer of a non-shrink grout and epoxy grout, shall provide on-site technical assistance upon request, at no additional cost to the Owner.

3.02 CONSISTENCY

A. The consistency of grouts shall be that necessary to completely fill the space to be grouted for the particular application. Dry pack consistency is such that the grout is plastic and moldable but will not flow.

3.03 MEASUREMENT OF INGREDIENTS

A. Measurements for cement grout shall be made accurately by volume using containers. Shovel measurement shall not be allowed.

B. Prepackaged grouts shall have ingredients measured by means recommended by the manufacturer.

3.04 GROUT INSTALLATION

A. Grout shall be placed quickly and continuously, shall completely fill the space to be grouted and be thoroughly compacted and free of air pockets. The grout may be poured in place, pressure grouted by gravity, or pumped. The use of pneumatic pressure or dry-packed grouting requires approval of the Engineer. For grouting beneath base plates, grout shall be poured form one side only and thence flow across to the open side to avoid air-entrapment.

- END OF SECTION -

# SECTION 04100

# MORTAR AND MASONRY GROUT

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Furnish labor, materials, equipment and appliances required for complete execution of Work shown on Drawings and specified herein.

B. Principal items of work include:

1. Mortar for unit masonry work.

2. Grout for grouting masonry.

3. Mortar for pointing and touchup.

### 1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 04150 - Masonry Accessories

B. Section 04200 - Unit Masonry

### 1.03 SUBMITTALS

A. In accordance with the procedures and requirements set forth in Section 01300 - Submittals, submit the following:

1. Manufacturer's data and mixing instructions for each product.

2. Certificate of compliance with these specifications for each material specified below.

3. Test reports.

4. Samples of colored masonry mortar.

### 1.04 DELIVERY AND STORAGE

A. Deliver materials in manufacturer's original containers, bearing labels indicating product and manufacturer's name.

B. Store cementitious materials in waterproof locations to prevent damage by elements. Reject containers showing evidence of damage.

C. Store aggregates in separate bins to prevent intrusion of foreign particles. Do not use bottom 6 inches of sand or other aggregate stored in contact with the ground.

PART 2 -- PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Specifications provide products manufactured by one of the following manufacturers, or equal:

1. Blue Circle Cement, Inc., Marietta, GA.

2. Lehigh Portland Cement Company, Allentown, PA

3. Holnam, Inc., Dundee, MI

2.02 MATERIALS

A. Mortar and Grout Materials

1. Portland Cement: ASTM C-150, Type I above grade and Type II below grade.

2. Hydrated lime: ASTM C-207, Type “S”.

3. Sand: Clean, coarse, free of loam, salt, organic and foreign matter and conforming to ASTM C-144.

4. Coarse and fine aggregates for grout: ASTM C-404.

5. Masonry Cement: ASTM C 91, Type S and meet the following criteria:

a. Prepackaged masonry cement shall contain Portland Cement, hydrated lime and plasticizing admixtures or hydraulic hydrated lime. Masonry cements which contain other materials, including ground limestone, ground slag, or other cementitious and non-cementitious materials, are not acceptable.

6. Water - clean, fresh, potable and free from injurious amounts of oil, acids, alkalies, salts, organic matter or other deleterious substances.

B. Admixtures

1. Do not use calcium chloride.

2. Do not use admixtures, without written approval of Engineer.

3. Mortar shall include a water repellant admixture compatible with architectural masonry units.

C. Mortar pigment

1. Natural or synthetic iron oxide and chromium oxides meeting the requirements of ASTM C979.

2. Pigment shall not exceed 10% of the weight of portland cement. Carbon black shall not exceed 2% of portland cement.

3. Color shall be selected by the Owner from the manufacturer's full range of colors.

2.03 GROUT AND MORTAR MIXES

A. Masonry mortar shall be Type "S" according to ASTM C-270. Proportions for masonry mortar shall be one of the following:

1. Proportions by volume: 1 part Portland cement to 1/4 - 1/2 parts hydrated lime, and aggregate volume of not less than 2-1/4 or more than 3 times the sum of the volumes of cement and lime.

2. Proportions by volume: 1/2 part Portland cement to 1 part masonry cement, and aggregate volume of not less than 1-1/4 or more than 3 times the sum of the volumes of cement and lime.

B. Proportions for pointing mortar.

1. Proportions by volume: 1 part Portland cement to 1/4 part hydrated lime and 2 parts extra fine sand.

C. Masonry Grout shall conform to the requirements of ASTM C 476 and ACI 530.1/ASCE 6, Section 4. Strength of grout, tested in accordance with ASTM C 1019 shall be equal to f'm as specified in Section 04200, but not less than 2000 psi.

1. Test grout for every 5000 square feet of masonry, with a minimum of one test per structure.

PART 3 -- EXECUTION

3.01 FIELD MORTAR MIXING

A. Mixing shall be by mechanically operated batch mixer. Entirely discharge before recharging. Mix sand, lime, cement and admixtures dry for two (2) minutes minimum, add water and mix for three (3) minutes minimum. Control batching procedures by measuring materials by volume. Measurement by shovel count shall not be permitted. Mix mortar with less water than the maximum amount, consistent with workability, to provide near maximum tensile bond strength. Mix only quantity that can be used before initial set, or within the first one-half hour.

B. Mixers, wheel barrows, mortar boards, etc., shall be kept clean.

C. Retempering of mortar will not be permitted and mortar allowed to stand more than one (1) hour shall not be used.

3.02 INSTALLATION

A. Install mortar and grout in accordance with ACI 530.1/ASCE 6.

3.03 REPOINTING MORTAR

A. Prehydrate the mortar by mixing ingredients together dry, and then add only enough water to make a damp, stiff mix that will retain its form when pressed into a ball. After one to two hours, add water to bring it to the proper consistency.

- END OF SECTION -

# SECTION 04150

# MASONRY ACCESSORIES

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Furnish labor, materials, equipment and appliances required for complete execution of Work shown on Drawings and specified herein.

B. Principal items of work include:

1. Metal joint reinforcement for masonry.

2. Accessories for masonry construction.

### 1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 04100 - Mortar and Masonry Grout

B. Section 04200 - Unit Masonry

### 1.03 SUBMITTALS

A. In accordance with the procedures and requirements set forth in Section 01300, Submittals, submit the following:

1. Provide manufacturer's complete product data.

2. Provide manufacturer's certification attesting compliance of material and source of each material specified below.

## PART 2 -- PRODUCTS

### 2.01 ACCEPTABLE MANUFACTURERS FOR MASONRY REINFORCEMENT

A. Subject to compliance with the Specifications, provide products manufactured by the following manufacturers or equal:

1. AA Wire Products, Company, Chicago, IL

2. Dur-O-Wal, Inc., Arlington Heights, IL

3. Heckmann Building Products, Inc., Chicago, IL.

4. Holman and Barnard, Inc., Hauppauge, NY.

### 2.02 MATERIALS

A. Multi Wythe Joint Reinforcement

Steel truss type reinforcement with adjustable pintel and eye assembly; 3/16 inch side rods and 9 gauge continuous cross rods; manufactured with wire conforming to ASTM A 82, with widths 2-inches less than nominal wall thickness.

B. Single Wythe Joint Reinforcement

Steel truss type reinforcement with 3/16 inch side rods and 9 gauge continuous cross rods; manufactured with wire conforming to ASTM A 82, with widths 2-inches less than nominal wall thickness.

C. Anchors:

1. Wire/Strap Anchor - 1/4 inch wire or 12 gauge x 3/4 inch x length required, welded or mechanically attached to back up structure.

D. Ties

1. Triangular Flexible Tie: 3/16 inch wire, sized to suit application.

2. Adjustable Tie: Pintel and eye full tie; properly sized for application, 3/16 inch cold drawn steel.

E. Finish

1. Reinforcements, anchorages and ties shall be hot dipped galvanized, Class B-2, after fabrication in accordance with ASTM A153.

2.03 ACCESSORIES

A. Expansion and Joint Filler Material

1. Closed cell neoprene material conforming to ASTM D 1056, with a minimum compressibility of 50%. Horizontal joint filler shall be 1/4 inch thick. Expansion joints shall be a minimum 3/8" thick.

B. Weep Hole Vents

1. Open joints for concrete masonry veneer with a fluid conducting, non-absorbent polymer mesh inserted in the weep hole. Minimum height of each weep hole vent shall be 2 inches.

C. Control Joint

1. Wide flange rapid preformed neoprene gasket.

D. Hardware Cloth

1. Waterproof paper backed with 1/2 inch hardware cloth.

E. Through Wall Flashing

1. Self-sealing, fully adhering composite flashing consisting of 32 mil rubberized asphalt bonded to a 8 mil cross laminated polyethylene film to produce an overall 40 mil thickness.

2. Provide Perm-A-Barrier Wall Flashing by W.R. Grace, Flash-Bond by Wire-Bond or Poly-Barrier Wall Flashing by Polytite Manufacturing Corporation.

F. Cavity Drainage Mat

1. A fluid conducting, non-absorbent polymer mesh that is installed full-height in the airspace by CavClear or equal.

## PART 3 -- EXECUTION

### 3.01 REINFORCEMENT AND ANCHORAGE

A. In masonry wall panels, place horizontal joint reinforcement at a vertical spacing of 16 inches on center, unless otherwise noted.

B. Lap side rods at each end joint a minimum of 6 inches.

C. Install prefabricated corner and tee assemblies at each wall corner and intersection.

D. Mitre and butt end joints are prohibited.

E. Place horizontal joint reinforcement in approximate center of out-to-out wall assembly and assuring a 5/8 inch, minimum, mortar coverage on exterior face and 1/2 inch on interior face.

F. Adjustable anchor assemblies may be offset no more than that which is stated in manufacturer's published instructions. Pintles may be installed either up or down.

G. Install horizontal joint reinforcement continuous, terminating only at vertical control joints.

H. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend 24 inches minimum each side of opening.

I. Place joint reinforcement continuous and at 8 inches on center vertically above roof.

J. Place reinforcing bars supported and secured against displacement. Maintain position with ½ inch to true dimension.

K. Coordinate and verify that dowels and anchorages embedded in concrete and attached to structural steel members are properly placed.

L. Provide wall ties for masonry veneer at maximum 16 inches on center vertically and 16 inches on center horizontally. Place at maximum 8 inches on center each way around perimeter of openings, within 12 inches of openings.

M. Masonry adjacent to steel and concrete columns to be attached to the column with masonry anchors at 16 inches on center. Anchors to be attached to each face of the column which is adjacent to a masonry wall, unless otherwise noted.

3.02 BENDING, CUTTING AND SPLICING REINFORCEMENT

A. Make bends and splices in reinforcement only where indicated, or prior-approval by Engineer. Bend reinforcement only when cold, and prior to any placement in construction, forming around a steel pin of diameter at least 6 times the reinforcement size. Cut bars only by approved sawing, shearing or welding methods. Make ends of reinforcement straight, square, clean and free of defects before splicing. Do not heat or weld bends and splices at points of maximum stress. Clip and bend any tie wires as required to direct the ends away from external surfaces of masonry walls.

B. Where welding is necessary, provide materials and perform welding in accordance with AWS requirements.

C. All lap splices to be 48 bar diameters, unless otherwise noted.

3.03 THROUGH WALL FLASHING

A. Clean areas to receive flashing. Surface shall be free of voids, spalled areas, or sharp protrusions. Concrete surfaces shall be cured a minimum of 7 days.

B. Apply Primer as recommended by manufacturer.

C. Apply flashing in strict accordance with manufacturer's instructions and recommendations. Sidelaps shall be a minimum of 2½ inches. End laps shall have a 6" minimum lap. Provide end dams at ends of lintels and other interruptions.

D. Seal flashing where vertical reinforcing penetrates flashing with a mastic approved for use by manufacturer.

3.04 CAVITY DRAINAGE MAT

A. Install Cavity Drainage Mat continuously full-height in exterior masonry cavities during construction of exterior wythe; follow manufacturer's installation instructions. Verify that airspace width is no more than 3/8 inch greater than masonry cavity drainage mat thickness. Install horizontally between joints reinforcement. Stagger end joints in adjacent rows. Fit to perimeter construction and penetrations without voids.

3.05 WEEP HOLE VENTS

A. Place Weep Vents in head joints at exterior wythe of cavity wall located immediately above ledges and flashing, spaced 32 inches on center, unless otherwise shown. Install with notched side down. Leave the side of the masonry units forming the vent space unbuttered and clear form mortar. Slide vent material into joint once the two masonry units forming the weep vent are in place. Install the Weep Vents as the wall is being erected so joints do not become filled with mortar or debris.

- END OF SECTION –

# SECTION 04200

# UNIT MASONRY

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Furnish labor, materials, equipment and appliances required for complete execution of Work shown on Drawings and specified work.

1. Principal items of work include:

a. Exterior masonry wall construction.

b. Installation of masonry reinforcement and accessories.

c. Masonry unit lintels.

d. Installing dampproofing, insulation, flashing and work required to be built into masonry work.

e. Building into masonry work all anchors, inserts,

f. Pointing and cleaning of exposed masonry surfaces.

### 1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 04100 - Mortar and Masonry Grout

B. Section 04150 - Masonry Accessories

### 1.03 TESTING

A. Tests: The Owner reserves the right to test materials for compliance with these specifications. Sampling and testing will be done in accordance with the ASTM standard, by an independent testing agency employed by the Owner. Materials that fail to meet requirements are considered defective. Subsequent tests to establish compliance (of the same or new materials) shall be paid for by the Contractor.

### 1.04 SUBMITTALS

A. In accordance with the procedures and requirements set forth in Section 01300 – Submittals, submit the following:

1. Samples of each material to be used showing full range of colors.

2. Manufacturer's specifications and certifications of compliance to the Specifications, including results of tests on masonry units showing such compliance, for each type of masonry. Provide handling, storage, and

installation instructions along with protection instructions. Indicate by transmittal that installer has received copies of each instruction.

3. Cold and/or hot weather construction procedures in accordance with ACI 530.1/ASCE 6 sections 2.3.2.2. and 2.3.2.3.

4. Cleaning procedures and cleaner for each masonry type.

1.06 MOCK-UPS

A. Build mock-ups at the site, where directed, full thickness and approximately 4 feet x 4 feet, indicating the proposed color range, texture and workmanship for each type of masonry. Obtain Engineer's acceptance of visual qualities of the mock-up before start of masonry work. Mock-up may be part of new construction..

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in the manufacturer's original unbroken, undamaged and unopened packaging with labels bearing the name of the manufacturer and the product. Masonry units and brick shall be factory packaged and strapped, delivered to the site and stored on skids.

B. Store and handle materials to prevent inclusion of water or foreign matter and to prevent damage of any nature.

C. Distribute materials on floor slabs to prevent overloading. Designated live loads shown for floor shall not be exceeded.

PART 2 -- PRODUCTS

2.01 GENERAL

A. Provide special shape, type or size indicated or for application requiring a form, size or finish which cannot be produced from standard masonry units by sawing. Exposed masonry faces shall be factory finished to match field. Cut or non-factory finished faces are not acceptable.

2.02 MATERIALS

A. Mortar

1. In accordance with Section 04100 - Mortar and Masonry Grout

B. Concrete Masonry Units

1. Provide units conforming to ACI 530.1 unless otherwise specified.

2. Provide light weight units meeting the requirements of ASTM C90, Type II, for hollow and solid load bearing CMU.

3. Manufacture units of Portland Cement, conforming to ASTM C-150 and light weight aggregate conforming to ASTM C331 and ASTM C33. Weight of unit shall not exceed 105 lb. per cu. ft. when measured in accordance with provisions of ASTM C140. Units shall be nominally 8 inches x 16 inches x thicknesses shown or as required. Masonry units shall be manufactured not less than 30 days prior to being used and stored under cover until shipment. All units shall have true, sharp edges and corners, free from cracks or other defects. Provide half special sizes and shapes as required by the Drawings or to meet job conditions.

4. Net area compressive strength of concrete masonry units shall be a minimum of 1,900 psi when tested in accordance with ASTM C140. Compressive strength of masonry (f'm) shall be a minimum of 1,500 psi in accordance with ACI 530.1 when these units are used with the mortar specified in Section 04100.

C. Concrete Masonry Lintels

Specially formed units with reinforcing bars and mortar fill provided where shown and wherever openings in masonry are indicated without structural steel or other supporting lintels.

D. Architectural Concrete Masonry Units

1. Split-face CMU shall be manufactured by firm producing architectural concrete masonry units for a minimum of five years. Smooth-face concrete masonry units shall be manufactured to match the color of the split-face CMU.

2. Units shall conform to ASTM C-90, Type I, normal weight.

3. Provide units with integral water repellant admixture. Absorption shall not exceed 10 lbs per cubic foot.

4. Minimum compressive strength shall be 2700 psi on wet area of a single unit.

5. Colors shall match the existing pump station architectural concrete masonry units. Up to two colors shall be selected.

## PART 3 -- EXECUTION

### 3.01 GENERAL

A. Examine areas and conditions under which masonry is to be installed and notify the Engineer in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

B. Do not wet concrete masonry units.

C. Clean reinforcing, removing loose rust, ice or other coatings from bars, before placement.

D. Thickness of cavity and composite walls, and other masonry construction shall be the full thickness shown. Build single wythe walls to the actual size of masonry units.

E. Build chases and recesses as shown and as required for the work of other trades.

F. Build other work into masonry work as shown, fitting masonry units around other work and grouting to assure anchorage.

G. Cut masonry units with motor driven saw designed to cut masonry with clean, sharp, unchipped edges. Cut units as required to provide pattern shown or specified, and to fit adjoining work neatly. Cut faces shall not be exposed.

H. Cold and hot weather construction.

1. No masonry shall be erected when ambient temperature has dropped below 45°F unless it is rising and at no time when it has dropped below 40°F. Provisions shall be made for heating and drying of materials, and the complete work shall be protected in accordance with the ACI 530.1/ASCE 6 Section 2.3.2.2. Masonry shall not be laid with ice or frost on its surfaces, and no masonry shall be laid on frozen work. Any work which freezes before the mortar has set shall be removed and replaced at the Contractor's own expense. Do not use any admixtures or antifreeze in the mortar.

2. When the temperature is above 100°F or 90°F with a wind velocity greater than 8 mph, mortar beds shall be spread no more than 4 feet ahead of masonry and masonry units shall be set within one minute of spreading mortar.

3.02 CONSTRUCTION TOLERANCES

A. Variation from plumb: For vertical lines and surfaces of columns, walls and arises do not exceed 1/4" in 10', or 3/8" in a story height not to exceed 20', nor 1/2" in 40' or more. For external corners, expansion joints, control joints and other conspicuous lines, do not exceed 1/4" in any story or 20' maximum, nor 1/2" in 40' or more. For vertical alignment of head joints do not exceed plus or minus 1/4" in 10', 1/2" maximum.

B. Variation from level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines do not exceed 1/4" in any bay or 20' maximum, nor 1/2" in 40' or more. For top surface of bearing walls do not exceed 1/8" between adjacent floor elements in 10' or 1/16" within width of a single unit.

C. Variation of Linear Building Line: For position shown on plan and related portion of columns, walls, and partitions, do not exceed 1/2" in any bay or 20' maximum, nor 3/4" in 40' or more.

D. Variation in Cross Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4" nor plus 1/2".

E. Variation in Mortar Joint Thickness: Do not exceed bed joint thickness indicated by more than plus or minus 1/8", with a maximum thickness limited to 1/2". Do not exceed head joint thickness indicated by more than plus or minus 1/8".

## 3.03 LAYING MASONRY WALLS

A. Layout walls in advance for accurate spacing of surface bond patterns, with uniform joint widths and to properly locate openings, movement-type joints, returns and offsets. Avoid the use of less-than-half size units at corners, jambs, and wherever possible at other locations.

B. Lay-up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other work.

C. Pattern Bond: Lay exposed masonry in the bond pattern shown or, if not shown, lay in running bond with vertical joint in each course centered on units in courses above and below.

D. Stopping and Resuming Work: Rack back 1/2 unit length in each course; do not tooth. Clean exposed surfaces of set masonry, wet units lightly, and remove loose masonry units and mortar prior to laying fresh mortar.

E. Cover top of walls at the end of each day. Protect wall from water infiltration from the top until wall is capped.

F. Built-In Work: As work progresses, build-in items specified under this and other sections of these Specifications. Fill in solidly with masonry around built-in items.

   1. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.

   2. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of hardware cloth in the joint below and rod grout into core.

   3. Fill cores in hollow masonry units with grout 3 courses (24”) under bearing plates, beams, lintels, posts and similar items, unless otherwise noted.

   4. Seal masonry tight around wall penetrations such as beams, joists, pipes, ducts, and conduit by cutting masonry units to fit as tightly as possible, then closing final gap all around with mortar, or joint filler and caulking as necessary.

## 3.04 MORTAR BEDDING AND JOINTING

A. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head joints.

B. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells; also bed webs with mortar in starting courses on footing or floors, and where adjacent cells are to be reinforced or filled with grout. For starting courses where cells are not grouted, spread full mortar bed including areas under cells.

C. Maintain joint widths of 3/8”, except for minor variations required to maintain bond alignment.

D. Tooling: Joints shall be tooled to a uniform concave joint. Head joints first and then the bed joints.

E. Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners and jambs to shift adjacent stretcher units which have been set in position. If adjustments are required, remove units, clean and reset in fresh mortar.

3.05 JOINT REINFORCING

A. Use continuous horizontal joint reinforcement installed in horizontal mortar joints not more than 16” o.c. vertically.

B. Reinforced masonry openings greater than 12” wide, with horizontal joint reinforcing placed in 2 horizontal joints immediately above the lintel and immediately below the sill. Extend reinforcements 2’-0” beyond jambs of the opening except at control joints.

C. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

D. Provide continuity at corners and wall intersections by use of prefabricated “L” and “T” sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, pipe enclosures and other special conditions.

E. Intersecting Load-bearing Walls: Provide rigid steel anchors at not more than 2’-0” o.c vertically. Embed ends in mortar-filled cores.

F. Non-load bearing Interior Partitions: Build full height of story to underside of solid floor or structure above, unless shown otherwise. Fill joint with mortar after dead load deflection of structure above approaches final position.

3.06 CAVITY WALLS

A. Keep cavity clean of mortar droppings and other materials during construction. Install cavity drainage mat continuously full height in the exterior masonry wall cavities during construction of the exterior wythe.

B. Tie exterior wythe to back-up wythe of masonry with horizontal joint reinforcement at 16” o.c. vertically.

C. Coordinate placement of dampproofing, insulation board, and cavity drainage mat work to ensure there are no gaps or air spaces between pieces of insulation board.

D. Weep joints shall be placed in exterior wythe of cavity wall, spaced a maximum of 32” o.c. horizontally, immediately above ledges, at lintels over openings, and as shown. Provide weep hole vents for all weep joints.

3.07 CONTROL AND EXPANSION JOINTS

A. General: Provide vertical and horizontal expansion, control and isolation joints in masonry where shown, or where not shown as recommended by concrete masonry unit manufacturer. Build-in related items as the masonry work progresses.

3.08 LINTELS

A. Install galvanized steel lintels where indicated. Paint galvanized steel lintels after installation in accordance with specification 09900.

B. Provide masonry lintels where shown and wherever openings of more than 8” for brick size units and 1’-4” for block size units are shown without structural steel or other supporting lintels. Reuse existing precast or poured-in-place masonry lintels. Cure precast lintels before handling and installation. Temporarily support formed-in-place lintels.

C. Provide minimum bearing of 8” at each jamb unless noted otherwise.

3.09 FLASHING

A. Provide flashing as shown and as specified in Section 04150, Masonry Accessories.

3.10 REINFORCED UNIT MASONRY

A. Vertical reinforcement shall be held in place by means of frames or other suitable means. Place horizontal joint reinforcement as masonry work progresses. Provide minimum clear distance between longitudinal bars equal to nominal diameter of bar. Minimum thickness of mortar or grout between masonry and reinforcement shall be 1/4”, except 6 gage or smaller wires may be laid in 3/8” mortar joints. Collar joints which contain both horizontal and vertical reinforcement shall have a minimum width of 1/2” larger than the diameter of the horizontal and vertical reinforcement.

B. Bar splices shall be contact lap splices. Length of splice shall be a minimum of 24” for #4 bars and 30” for #5 bars.

C. Low lift grouting shall be used when grout space is less than 2” in width. Place grout at maximum intervals of 24” in lifts of 6 to 8 inches as the work progresses. Cores to be grouted shall be clean of mortar, mortar dropping and debris. Agitate grout to assure complete filling and coverage of reinforcement. Hold grout 1 1/2 inches below to top of masonry if work is discontinued for more than a hour.

D. High lift grouting may be used when the grout space is greater than 2”. Grout shall not be placed in lifts greater than 4 feet. Grout core shall be kept clean of mortar, mortar dripping and debris. Provide cleanout holes as required for inspection and cleaning. Replace cleanout plugs after inspection and acceptance. Do not place grout until entire wall has been in place a minimum of 3 days. Hold grout 1 1/2 inches below top of masonry if work is discontinued for more than a hour.

E. Forms and shoring shall be substantial and tight to prevent leakage of mortar or grout. Brace and shore forms to maintain position and shape. Do not remove forms or shoring until masonry gains enough strength to sufficiently carry its own weight and any other loads, temporary or permanent, placed on it during construction.

3.11 PROTECTION OF WORK

A. Exposed masonry surfaces shall be protected from staining. Tops of wall shall be covered with nonstaining waterproof coverings when work is not in progress. Installed material shall be secure in high winds.

B. Protection shall be provided for all openings in the walls to prevent damage to sills, jambs, etc., from all causes. Aluminum or steel frames and other finish materials shall be protected from damage during masonry work.

3.12 REPAIR, POINTING AND CLEANING

A. Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing of Masonry: At the completion of the masonry work, all holes in exposed masonry shall be pointed. Defective joints shall be cut out and tuckpointed solidly with mortar. Pointing and tuckpointing shall be done with a pre-hydrated mortar. The mortar cement shall be controlled so that, after curing of the mortar, no difference in texture or color exists with that of adjacent masonry.

C. Masonry Cleaning: While laying masonry units, good workmanship and job housekeeping practices shall be used so as to minimize the need for cleaning the masonry work. Protect the base of the wall from mud splashes and mortar droppings. The technique for laying masonry shall be such that mortar does not run down the face of the wall or smear onto the face.

1. After the joints are tooled, cut off mortar failings with the trowel and brush excess mortar burrs and dust from the face of the masonry, use a bricklayer's brush made with medium soft hair.

2. Remove all large mortar particles with a hardwood scraper.

3. If, after using the above outlined techniques, additional cleaning of the walls is found necessary, allow the walls to cure one month prior to initiating further cleaning processes.

D. Clean masonry to comply with the masonry manufacturer's directions and applicable NCMA "Tek" bulletins or BIA technical notes and the following requirements.

1. Saturate the wall with clean water. The wall shall be thoroughly saturated prior to and at the time the cleaning solution is applied.

2. Clean masonry with an approved cleaning solution for each type of masonry applied with a brush, starting at the top of the wall. Approved cleaners shall be composed primarily of detergents, wetting agents, buffering agents, and a maximum of 10% muriatic acid. Do not use acids on masonry surfaces that will be damaged by use of an acid cleaner. The use of any of the above cleaning agents shall first be approved in writing by the manufacturer of the masonry being cleaned and the Engineer. The concentration, method of application of the cleaning solution, and method of scraping shall be as outlined on the container by the manufacturer.

3. High pressure water and sandblasting shall not be used for cleaning except with the recommendation of the masonry manufacturer and the written approval of the Engineer.

4. Immediately after cleaning a small area, the wall shall be rinsed thoroughly with quantities of water.

5. Protect adjacent surfaces and materials during masonry cleaning operations.

6. After the walls are cleaned, take the necessary precautions to ensure that other contractors and subcontractors do not damage or soil the walls. Mud protection around the base of walls shall be left in place until the grading work is done.

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# SECTION 05010

# METAL MATERIALS

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Metal materials not otherwise specified shall conform to the requirements of this Section.

### 1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Materials for fasteners are included in Section 05050, Metal Fastening.

B. Requirements for specific products made from the materials specified herein are included in other sections of the Specifications. See the section for the specific item in question.

### 1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. ASTM A36 Standard Specification for Structural Steel

B. ASTM A47 Standard Specification for Malleable Iron Castings

C. ASTM A48 Standard Specification for Gray Iron Castings

D. ASTM A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

E. ASTM A167 Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

F. ASTM A276 Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes

G. ASTM A307 Standard Specification for Carbon Steel Externally Threaded Standard Fasteners

H. ASTM A446 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) quality

I. ASTM A500 Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

J. ASTM A501 Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing

K. ASTM A529 Standard Specification for Structural Steel with 42 000 psi (290 Mpa) Minimum Yield Point (1/2 in. (12.7 mm) Maximum Thickness)

L. ASTM A536 Standard Specification for Ductile Iron Castings

M. ASTM A570 Standard Specification for Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality

N. ASTM A992 Standard Specification for Structural Steel Shapes

O. ASTM A666 Standard Specification for Austenitic Stainless Steel, Sheet, Strip, Plate, and Flat Bar for Structural Applications

P. ASTM B26 Standard Specification for Aluminum-Alloy Sand Castings

Q. ASTM B85 Standard Specification for Aluminum-Alloy Die Castings

R. ASTM B108 Standard Specification for Aluminum-Alloy Permanent Mold Castings

S. ASTM B138 Standard Specification for Manganese Bronze Rod, Bar, and Shapes

T. ASTM B209 Standard Specification for Aluminum-Alloy Sheet and Plate

U. ASTM B221 Standard Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

V. ASTM B308 Standard Specification for Aluminum-Alloy Standard Structural Shapes, Rolled or Extruded

W. ASTM B574 Standard Specification for Nickel-Molybdenum-Chromium Alloy Rod

X. ASTM F468 Standard Specification for Nonferrous Bolts, Hex Cap Screws, and Studs for General Use

Y. ASTM F593 Standard Specification for Stainless Steel Fasteners

1.04 SUBMITTALS

A. Material certifications shall be submitted along with any shop drawings for metal products and fabrications required by other sections of the Specifications.

1.05 QUALITY ASSURANCE

A. Owner may engage the services of a testing agency to test any metal materials for conformance with the material requirements herein. If the material is found to be in conformance with Specifications the cost of testing will be borne by the Owner. If the material does not conform to the Specifications, the cost of testing shall be paid by the Contractor and all materials not in conformance as determined by the Engineer shall be replaced by the Contractor at no additional cost to the Owner. In lieu of replacing materials the Contractor may request further testing to determine conformance, but any such testing shall be paid for by the Contractor regardless of outcome of such testing.

PART 2 -- PRODUCTS

2.01 CARBON AND LOW ALLOY STEEL

A. Material types and ASTM designations shall be as listed below:

| | | |
|---|---|---|
| 1. | Structural Fabrications | A992 |
| 2. | Sheet Steel | A 570 Grade C |
| 3. | Steel Angles and Plates | A36 |
| 4. | Bars and Rods | A 36 or A307 Grade A |
| 5. | Pipe - Structural Use | A53 Type E or S, Grade B |
| 6. | Tubes | A500 Grade B or A501 |
| 7. | Cold-Formed Structural Studs and Joists (18-22 gauge) | A 446 Grade C |
| | Cold-Formed Structural Studs and Joists (12-16 gauge) | A 446 Grade D |

2.02 STAINLESS STEEL

A. All stainless steel fabrications exposed to underwater service shall be Type 316. All other stainless steel fabrications shall be Type 304, unless noted otherwise.

B. Material types and ASTM designations are listed below:

| | | |
|---|---|---|
| 1. | Plates and Sheets | ASTM A167 or A666 Grade A |
| 2. | Structural Shapes | ASTM A276 |
| 3. | Fasteners (Bolts, etc.) | ASTM F593 |

2.03 ALUMINUM

A. All aluminum shall be alloy 6061-T6, unless otherwise noted or specified herein.

B. Material types and ASTM designations are listed below:

| | | |
|---|---|---|
| 1. | Structural Shapes | ASTM B308 |
| 2. | Castings | ASTM B26, B85, or B108 |
| 3. | Extruded Bars | ASTM B221 - Alloy 6061 |
| 4. | Extruded Rods, Shapes and Tubes | ASTM B221 - Alloy 6063 |
| 5. | Plates | ASTM B209 - Alloy 6061 |
| 6. | Sheets | ASTM B221 - Alloy 3003 |

C. All aluminum structural members shall conform to the requirements of Section 05140, Structural Aluminum.

D. All aluminum shall be provided with mill finish unless otherwise noted.

E. Where bolted connections are indicated, aluminum shall be fastened with stainless steel bolts.

F. Aluminum in contact with dissimilar materials shall be insulated with an approved dielectric.

2.04 CAST IRON

A. Material types and ASTM designations are listed below:

| | |
|---|---|
| 1. Gray | ASTM A48 Class 30B |
| 2. Malleable | ASTM A47 |
| 3. Ductile | ASTM A536 Grade 60-40-18 |

2.05 BRONZE

A. Material types and ASTM designations are listed below:

| | |
|---|---|
| 1. Rods, Bars and Sheets | ASTM B138 - Alloy B Soft |

2.06 HASTELLOY

A. All Hastelloy shall be Alloy C-276.

PART 3 -- EXECUTION

(NOT USED)

- END OF SECTION -

# SECTION 05050

# METAL FASTENING

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Furnish all materials, labor, and equipment required to provide all metal welds and fasteners not otherwise specified, in accordance with the Contract Documents.

### 1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 05010 - Metal Materials

B. Section 05120 - Structural Steel

### 1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. Georgia State Minimum Standard Building Code

| | | |
|---|---|---|
| 2. | AISC | Specification for Structural Joints Using ASTM A325 or A490 Bolts. |
| 3. | AISC | Code of Standard Practice |
| 4. | AWS D1.1 | Structural Welding Code - Steel |
| 5. | AWS D1.2 | Structural Welding Code - Aluminum |
| 6. | AWS D1.6 | Structural Welding Code – Stainless Steel |
| 7. | Aluminum Association | Specifications for Aluminum Structures |
| 8. | ASTM A572/A572M-94C | Standard Specification for High Strength Low-Alloy Columbium-Vanadium Structural Steel Grade 50 |
| 9. | ASTM A307 | Standard Specification for Carbon Steel Externally Threaded Standard Fasteners |
| 10. | ASTM A325 | Standard Specification for High-Strength Bolts for Structural Steel Joints |
| 11. | ASTM A489 | Standard Specification for Eyebolts |

| | | |
|---|---|---|
| 12. | ASTM A490 | Standard Specification for Quenched and Tempered Alloy Steel Bolts for Structural Steel Joints |
| 13. | ASTM A563 | Standard Specifications for Carbon and Alloy Steel Nuts |
| 14. | ASTM F593 | Standard Specification for Stainless Steel Bolts; Hex Cap Screws, and Studs |
| 15. | ASTM F594 | Standard Specification for Stainless Steel Nuts |
| 16. | ASTM D1785 | Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe |
| 17. | ASTM F467 | Standard Specification for Nonferrous Nuts for General Use |

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01300, Submittals.

1. Shop Drawings providing the fastener's manufacturer and type and certification of the fastener's material and capacity.

2. Copy of valid certification for each person who is to perform field welding.

3. Certified weld inspection reports, when required.

4. Welding procedures.

1.05 QUALITY ASSURANCE

A. Fasteners not manufactured in the United States shall be tested and certification provided with respect to specified quality and strength standards. Certifications of origin shall be submitted for all U.S. fasteners supplied on the project.

B. All steel welding shall be performed by welders certified in accordance with AWS D1.1. All aluminum welding shall be performed by welders certified in accordance with AWS D1.2. All stainless steel welding shall be performed by welders certified in accordance with AWS D1.6. Certifications of field welders shall be submitted prior to performing any field welds.

C. Welds and high strength bolts used in connections of structural steel will be visually inspected in accordance with Article 3.04.

D. The Owner may engage an independent testing agency to perform testing of welded connections and to prepare test reports in accordance with AWS. Inadequate welds shall be corrected or redone and retested to the satisfaction of the Engineer and/or an acceptable independent testing laboratory, at no additional cost to the Owner.

E. Provide a welding procedure for each type and thickness of weld. For welds that are not prequalified, include a Performance Qualification Report. The welding procedure shall be given to each welder performing the weld. The welding procedure shall follow the format in Annex E of AWS D1.1 with relevant information presented.

## PART 2 -- PRODUCTS

### 2.01 ANCHOR BOLTS

A. Anchor bolts shall conform to ASTM A36 or ASTM A307 Grade A except where stainless steel or other approved anchor bolts are shown on the Drawings. Anchor bolts shall have hexagonal heads and shall be supplied with hexagonal nuts meeting the requirements of ASTM A563 Grade A.

B. Where anchor bolts are used to anchor galvanized steel or are otherwise specified to be galvanized, anchor bolts and nuts shall be hot-dip galvanized in accordance with ASTM A307.

C. Where pipe sleeves around anchor bolts are shown on the Drawings, pipe sleeves shall be cut from Schedule 40 PVC plastic piping meeting the requirements of ASTM D1785.

### 2.02 HIGH STRENGTH BOLTS

A. High strength bolts and associated nuts and washers shall be in accordance with ASTM A325 or ASTM A490. Bolts, nuts and washers shall meet the requirements of AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts".

B. Where high strength bolts are used to connect galvanized steel or are otherwise specified to be galvanized, bolts, nuts, and washers shall be hot-dip galvanized in accordance with ASTM A325.

### 2.03 STAINLESS STEEL BOLTS

A. Stainless steel bolts shall conform to ASTM F-593. All underwater fasteners, fasteners in confined areas containing fluid, and fasteners in corrosive environments shall be Type 316 stainless steel unless noted otherwise. Fasteners for aluminum and stainless steel members not subject to the above conditions shall be Type 304 stainless steel unless otherwise noted.

B. Stainless steel bolts shall have hexagonal heads with a raised letter or symbol on the bolts indicating the manufacturer, and shall be supplied with hexagonal nuts meeting the requirements of ASTM F594. Nuts shall be of the same alloy as the bolts.

### 2.04 CONCRETE ANCHORS

A. Where concrete anchors are called for on the Drawings, one of the types listed below shall be used; except, where one of the types listed below is specifically called for on the Drawings, only that type shall be used. Unless otherwise noted, all concrete anchors which are submerged, or which are subject to vibration from equipment such as pumps and generators, shall be adhesive anchors. The determination of anchors equivalent to those listed below shall be on the basis of test data performed by a commercial testing

laboratory. There are two types used:

1. Expansion anchors shall be wedge, sleeve, or drop-in mechanical anchors.

2. Adhesive anchors shall be two part injection type.

B. Expansion anchors shall be Kwik Bolt 3 by Hilti, Inc., Trubolt Wedge Anchor by ITW Ramset/Redhead, “Wedge-All” by Simpson Strong-Tie Co., or equal. Sleeve anchors shall be “HLC Sleeve Anchors” by Hilti, Inc., “Dynabolt” by ITW Ramset/Redhead, “Sleeve-All” by Simpson Strong-Tie Co., or equal. Drop-in anchors shall be “HDI/HDI-L/HDI-P” by Hilti, Inc., “Multi-Set II” by ITW Ramset/Redhead, “Drop-In” by Simpson Strong-Tie Co., or equal. All anchors shall be embedded to the depths shown on the Drawings. If no embedment depth is given, the minimum embedment depth as recommended by the manufacturer shall be used.

C. Adhesive anchors shall consist of threaded rods or bolts anchored with an adhesive system into hardened concrete or grout-filled masonry. The adhesive system shall use a two-component adhesive mix and shall be injected with a static mixing nozzle following manufacturer’s instructions. Thoroughly clean drill holes of all debris and drill dust with wire brush prior to installation of adhesive and threaded rod/bolt. Wipe rod free from oil that may be present from shipping or handling. The embedment depth of the rod/bolt shall provide a minimum allowable bond strength that is equal to the allowable tensile capacity of the rod/bolt (see Table 1) unless noted otherwise on the Drawings. The adhesive system shall be “Epcon System A7, C6, or G5” as manufactured by ITW Ramset/Redhead, “HIT HY-150 or RE-500 Injection Adhesive Anchor System” as manufactured by Hilti, Inc., “SET/ET Epoxy-Tie” or “AT Acrylic-Tie” as manufactured by Simpson Strong-Tie Co., or equal.

D. Concrete anchors used to anchor steel shall be of A36 steel unless noted otherwise. Where steel to be anchored is galvanized, concrete anchors shall also be galvanized.

E. Concrete anchors used to anchor aluminum, FRP, or stainless steel shall be Type 304 stainless steel unless noted otherwise. All underwater concrete anchors shall be Type 316 stainless steel.

TABLE 1
Allowable Tensile Capacity (Kips)

| Size | A36 Threaded Rod/Bolt | SST Threaded Rod/Bolt |
|---|---|---|
| 3/8” | 2.1 | 1.9 |
| 1/2” | 3.8 | 3.5 |
| 5/8” | 5.9 | 5.6 |
| 3/4” | 8.4 | 8.2 |
| 7/8” | 11.5 | 11.4 |
| 1” | 15.0 | 15.0 |

## 2.05 MASONRY ANCHORS

A. Anchors for fastening to solid or grout-filled masonry shall be adhesive anchors as specified above for concrete anchors.

B. Anchors for fastening to hollow masonry or brick shall be adhesive anchors consisting of threaded rods or bolts anchored with an adhesive system dispensed into a screen tube inserted into the masonry. The adhesive system shall use a two-component adhesive mix and shall inject into the screen tube with a static mixing nozzle. Thoroughly clean drill holes of all debris and drill dust with nylon (not wire) brush prior to installation of adhesive and anchor. Contractor shall follow manufacturer's installation instructions. The adhesive system shall be "Epcon System A7, C6, or G5" as manufactured by ITW Ramset/Redhead, "HIT HY-20 System" as manufactured by Hilti, Inc., or "SET/ET Epoxy-Tie", "AT Acrylic-Tie" as manufactured by Simpson Strong-Tie Co., or equal.

C. Masonry anchors used to anchor steel shall be of A36 steel unless noted otherwise. Where steel to be anchored is galvanized, anchors shall also be galvanized.

D. Masonry anchors used to anchor aluminum, FRP, or stainless steel shall be Type 304 stainless steel unless noted otherwise. All underwater anchors shall be Type 316 stainless steel.

## 2.06 WELDS

A. Electrodes for welding structural steel and all ferrous steel shall comply with AWS Code, using E70 series electrodes for shielded metal arc welding (SMAW), or F7 series electrodes for submerged arc welding (SAW).

B. Electrodes for welding aluminum shall comply with the Aluminum Association Specifications and AWS D1.2.

C. Electrodes for welding stainless steel and other metals shall comply with AWS D1.6.

## 2.07 WELDED STUD CONNECTORS

A. Welded stud connectors shall conform to the requirements of AWS D1.1 Type C.

## 2.08 EYEBOLTS

A. Eyebolts shall conform to ASTM A489 unless noted otherwise.

## 2.09 HASTELLOY FASTENERS

A. Hastelloy fasteners and nuts shall be constructed of Hastelloy C-276.

## 2.10 ANTISEIZE LUBRICANT

A. Antiseize lubricant shall be Graphite 50 Anti-Seize by Loctite Corporation, 1000 Anti-Seize Paste by Dow Corning, 3M Lube and Anti-Seize by 3M, or equal.

PART 3 -- EXECUTION

3.01 MEASUREMENTS

A. The Contractor shall verify all dimensions and review the Drawings and shall report any discrepancies to the Engineer for clarification prior to starting fabrication.

3.02 BOLT INSTALLATION

A. Anchor Bolts, Concrete Anchors, and Masonry Anchors

1. Anchor bolts shall be installed in accordance with AISC "Code of Standard Practice" by setting in concrete while it is being placed and positioned by means of a rigidly held template.

2. The Contractor shall verify that all concrete and masonry anchors have been installed in accordance with the manufacturer's recommendations and that the capacity of the installed anchor meets or exceeds the specified safe holding capacity.

3. Concrete anchors shall not be used in place of anchor bolts without Engineer's approval.

4. All stainless steel threads shall be coated with antiseize lubricant.

B. High Strength Bolts

1. All bolted connections for structural steel shall use high strength bolts. High strength bolts shall be installed in accordance with AISC "Specification for Structural Joints, using A325 or A490 Bolts." All bolted joints shall be Type N, snug-tight, bearing connections in accordance with AISC Specifications unless noted otherwise on the Drawings.

C. Other Bolts

1. All dissimilar metal shall be connected with appropriate fasteners and shall be insulated with a dielectric or equal.

2. All stainless steel bolts shall be coated with antiseize lubricant.

3.03 WELDING

A. All welding shall comply with AWS Code for procedures, appearance, quality of welds, qualifications of welders and methods used in correcting welded work.

B. Welded stud connectors shall be installed in accordance with AWS D1.1.

3.04 INSPECTION

A. High strength bolting will be visually inspected in accordance with AISC "Specification for Structural Joints Using A325 or A490 Bolts." Rejected bolts shall be either replaced or retightened as required.

B. Field welds will be visually inspected in accordance with AWS Codes. Inadequate welds shall be corrected or redone as required in accordance with AWS Codes.

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# SECTION 05120

# STRUCTURAL STEEL

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Furnish all equipment, labor, materials, and services required to provide all structural steel work in accordance with the Contract Documents. The term “structural steel” shall include items as defined in the AISC “Code of Standard Practice”.

### 1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01300 – Submittals

B. Section 03600 - Grout

C. Section 05010 - Metal Materials

D. Section 05035 - Galvanizing

E. Section 05050 - Metal Fastening

F. Section 05210 – Steel Joists

G. Section 09900 - Painting

### 1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of the Specifications, all work specified herein shall conform to the applicable requirements of the following documents.

1. Georgia State Minimum Standard Building Code
2. AISC - “Code of Standard Practice”
3. AISC - “Specification for Structural Steel Buildings”
4. AISC - “Specifications for Structural Joints Using ASTM A325 or A490 Bolts”
5. AWS - “Structural Welding Code”

### 1.04 SUBMITTALS

A. Submit the following in accordance with Section 01300, Submittals.

1. Certified Mill Test Reports.
2. Affidavit of Compliance with grade specified.

3. Shop Drawings which include the following:

   a. Layout drawings indicating all structural shapes, sizes, and dimensions.

   b. Beam and column schedules.

   c. Detailed drawings indicating jointing, anchoring and connection details.

4. Structural Steel Survey.

1.05 QUALITY ASSURANCE

A. An independent testing agency approved by the Engineer shall conduct Shop and Field Special Inspections in accordance with the Georgia State Minimum Standard Building Code. The Contractor shall be charged with any additional tests and investigation on work performed which does not meet the Specifications. The Contractor shall give ample notice to the Engineer prior to the beginning of any fabrication work or structural steel erection so that inspection may be provided. The Contractor shall furnish all facilities for the inspection of materials and workmanship in the shop, and the inspectors shall be allowed free access to the necessary parts of the work. Inspectors shall have the authority to reject any materials or work which do not meet the requirements of these Specifications. Inspection at the shop is intended as a means of facilitating the work and avoiding errors, but is expressly understood that it will in no way relieve the Contractor from his responsibility for furnishing proper materials or workmanship under this Specification.

PART 2 -- PRODUCTS

2.01 MATERIALS

A. Structural Steel

1. Structural steel items other than pipe, tubing, and fasteners shall conform to ASTM A572 Grade 50 unless noted otherwise. All unidentified steel will be rejected and shall be removed from the site and replaced by the Contractor, all at the expense of the Contractor.

2. Structural steel pipe shall be ASTM A53, Type E or S, Grade B.

3. Structural tubing shall be ASTM A501, or ASTM A500, Grade B. All members shall be furnished full length without splices unless otherwise noted or accepted by the Engineer.

4. Fasteners for structural steel shall be in accordance with Section 05050, Metal Fastening.

B. Welds

1. Electrodes for welding shall be in accordance with Section 05050, Metal Fastening.

PART 3 -- EXECUTION

3.01 MEASUREMENT

A. The Contractor shall verify all dimensions and shall make any field measurements necessary and shall be fully responsible for accuracy and layout of work. The Contractor shall review the Drawings and any discrepancies shall be reported to the Engineer for clarification prior to starting fabrication.

3.02 FABRICATION

A. Fabrication shall be in accordance with the AISC "Specification for Structural Steel Buildings and AISC "Code of Standard Practice". Fabrication shall begin only after Shop Drawing approval.

B. Except where otherwise noted on the Drawings or in this Specification, all shop connections shall be welded.

C. All holes in structural steel members required for anchors, anchor bolts, bolt holes, sag rods or other members or for attachment of other work shall be provided by the fabricator and detailed on the Shop Drawings.

D. All materials shall be properly worked and match-marked for field assembly.

E. Where galvanizing of structural steel is required, it shall be done in accordance with Section 05035, Galvanizing.

3.03 DELIVERY, STORAGE AND HANDLING

A. Structural members shall be loaded in such a manner that they may be transported and unloaded without being over-stressed, deformed or otherwise damaged.

B. Structural steel members and packaged materials shall be protected from corrosion and deterioration. Material shall be stored in a dry area and shall not be placed in direct contact with the ground. Materials shall not be placed on the structure in a manner that might cause distortion or damage to the members or the supporting structures. The Contractor shall repair or replace damaged materials or structures as directed.

3.04 ERECTION

A. The erection of all structural steel shall conform to the applicable requirements of the AISC "Specification for Structural Steel Buildings" and AISC "Code of Standard Practice". All temporary bracing, guys and bolts as may be necessary to ensure the safety of the structure until the permanent connections have been made shall be provided by the Contractor.

B. Structural members shall be set accurately to the lines and elevations indicated. The various members shall be aligned and adjusted to form a part of a complete frame or structure before permanently fastened. A licensed civil engineer shall survey the structural steel during erection and shall provide a final survey indicating elevations and locations of

all major members. Necessary adjustments to compensate for discrepancies in elevations and alignments shall be performed.

C. No cutting of structural steel members in the field will be allowed except by the written approval of the Engineer.

D. Bearing surfaces and other surfaces which will be in permanent contact shall be cleaned before assembly.

E. Field welding shall not be permitted unless specifically indicated in the Drawings or approved in writing by the Engineer. All field welding shall comply with Section 05050, Metal Fastening.

F. All bolted connections shall use high strength bolts in accordance with Section 05050, Metal Fastening. Bolts shall be fully pretensioned according to the AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts".

G. All field connections shall be accurately fitted up before being bolted. Drifting shall be only such as will bring the parts into position and shall not be sufficient to enlarge the holes or to distort the metal. All unfair holes shall be drilled or reamed.

H. Misfits at Bolted Connections

1. Where misfits in erection bolting are encountered, the Engineer shall be immediately notified. The Contractor shall submit a method to remedy the misfit for review by the Engineer. The Engineer will determine whether the remedy is acceptable or if the member must be refabricated.

2. Incorrectly sized or misaligned holes in members shall not be enlarged by burning or by the use of drift pins. The Contractor shall notify the Engineer immediately and shall submit a proposed method of remedy for review by the Engineer.

3. Where misalignment between anchor bolts and bolt holes in steel members are encountered, the Engineer shall be immediately notified. The Contractor shall submit a method to remedy the misalignment for review by the Engineer.

I. Grouting of Base Plates and Bearing Plates

1. The bottom surface of the plates shall be cleaned of all foreign materials, and concrete or masonry bearing surface shall be cleaned of all foreign materials and roughened to improve bonding.

2. Accurately set all base and bearing plates to designated levels with steel wedges or leveling plates.

3. Baseplates shall be grouted with non-shrink grout to assure full uniform bearing. Grouting shall be done prior to placing loads on the structure. Non-shrink grout shall conform to Section 03600, Grout.

4. Anchor bolts shall be tightened after the supported members have been positioned and plumbed and the non-shrink grout has attained its specified strength.

J. Where finishing is required, assembly shall be completed including bolting and welding of units before start of finishing operations.

3.05 PAINTING

A. Painting shall be performed according to Section 09900, Painting, and the following additional requirements.

1. Concrete Encased Steel: Steel members which will be encased in concrete shall be cleaned but not painted prior to encasement.

2. Contact Surfaces: Contact surfaces such as at field connections, shall be cleaned and primed but not painted.

3. Finished Surfaces: Machine finished surfaces shall be protected against corrosion by a rust-inhibiting coating which is easily removed prior to erection or which has characteristics that make removal unnecessary prior to erection.

4. Surfaces Adjacent to Field Welds: Surfaces within 2 inches of any field weld location shall be free of materials that would prevent proper welding or produce objectionable fumes while welding is being done.

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# SECTION 05500

# METAL FABRICATIONS

## PART 1 -- GENERAL

### 1.01 REQUIREMENT

A. Furnish all materials, labor, and equipment required to provide all metal fabrications not specifically included in other Sections, complete and in accordance with the requirements of the Contract Documents.

B. Work shall include but may not be limited to lintels and guard posts.

### 1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 05010 - Metal Materials

B. Section 05050 - Metal Fastening

C. Certain specific items are included in other Sections of the Specifications. See the section for the specific item in question.

### 1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of other requirements of the Specifications, all work specified herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. Georgia State Minimum Standard Building Code

2. AISC - Specification for Structural Steel Buildings

3. AISI - Specifications for the Design of Cold-Formed Steel Structural Members

4. Aluminum Association Specifications for Aluminum Structures

### 1.04 SUBMITTALS

A. Submit the following in accordance with Section 01300, Submittals.

1. Complete fabrication and erection drawings of all metalwork specified herein.

2. Other submittals as required in accordance with Section 05010, Metal Materials, and Section 05050, Metal Fastening.

## PART 2 -- PRODUCTS

### 2.01 METAL MATERIALS

A. Metal materials used in metal fabrications shall conform to Section 05010, Metal Materials, unless noted otherwise.

### 2.02 METAL FASTENING

A. All welds and fasteners used in metal fabrication shall conform to Section 05050, Metal Fastening, unless noted otherwise.

### 2.03 LINTELS

A. Provide lintels as shown on the Drawings and specified herein with 8 inches minimum bearing each side unless noted otherwise.

B. All lintels shall be steel in accordance with Section 05120, Structural Steel, and shall be galvanized in accordance with Section 05035, Galvanizing, unless noted otherwise.

### 2.04 GUARD POSTS (BOLLARDS)

A. Guard posts shall be 6-inch diameter Schedule 40 galvanized steel pipe in accordance with ASTM A53. Guard posts shall receive a safety yellow color paint coating per Section 09900.

B. Guard posts shall be concrete filled and crowned, as detailed in the Drawings.

## PART 3 -- EXECUTION

### 3.01 FABRICATION

A. All measurements and dimensions shall be based on field conditions and shall be verified by the Contractor prior to fabrication. Such verification shall include coordination with adjoining work.

B. All fabricated work shall be shop fitted together as much as practicable, and delivered to the field, complete and ready for erection. All miscellaneous items such as stiffeners, fillets, connections, brackets, and other details necessary for a complete installation shall be provided.

C. All work shall be fabricated and installed in a manner that will provide for expansion and contraction, prevent shearing of bolts, screws, and other fastenings, ensure rigidity, and provide a close fit of sections.

D. Finished members shall conform to the lines, angles, and curves shown on the Drawings and shall be free from distortions of any kind.

E. All shearings shall be neat and accurate, with parts exposed to view neatly finished. Flame cutting is allowed only when performed utilizing a machine.

F. All shop connections shall be welded unless otherwise indicated on the Drawings or specified herein. Bolts and welds shall conform to Section 05050, Metal Fastening. All fastenings shall be concealed where practicable.

G. Fabricated items shall be shop painted when specified in Section 09900, Painting.

3.02 INSTALLATION

A. Assembly and installation of fabricated system components shall be performed in strict accordance with manufacturer's recommendations.

B. All miscellaneous metalwork shall be erected square, plumb and true, accurately fitted, adequately anchored in place, and set at proper elevations and positions

C. Metal work shall be field painted when as specified in accordance with Section 09900, Painting.

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# SECTION 05520

# HANDRAILS AND RAILINGS

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Furnish all materials, labor, and equipment required to provide all handrails and railings in accordance with the Contract Documents.

### 1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01300 - Submittals

B. Section 05010 - Metal Materials

C. Section 05050 - Metal Fastening

D. Section 09900 - Painting

### 1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. Georgia State Minimum Standard Building Code

2. Aluminum Association Specifications for Aluminum Structures

3. Occupational Safety and Health Administration (OSHA) Regulations

### 1.04 SUBMITTALS

A. Submit the following in accordance with Section 01300, Submittals.

1. Complete fabrication and erection drawings of all metal work specified herein.

2. Other submittals as required in accordance with Section 05010, Metal Materials, and Section 05050, Metal Fastening.

## PART 2 -- PRODUCTS

### 2.01 METAL MATERIALS

A. Metal materials used for handrails and railings shall conform to Section 05010, Metal Materials, unless noted otherwise.

2.02 METAL FASTENING

A. All welds and fasteners used in handrails and railings shall conform to Section 05050, Metal Fastening, unless noted otherwise.

2.03 HANDRAILS AND RAILINGS

A. General: Handrail systems shall consist of all railings, posts, toeboards, baseplates, anchors, and accessories required for a complete and rigid installation.

1. All handrail systems shall be fabricated from extruded aluminum alloy 6061-T6 or 6105-T5 with Aluminum Association M12C22A41 finish, unless otherwise noted.

2. All galvanized or painted steel handrail systems shall be fabricated from A36 steel and galvanized in accordance with Section 05035, Galvanizing or painted in accordance with Section 09900, Painting.

3. Metal railings shall be fabricated from 1-1/2 inch Schedule 40 pipe. Metal railing support posts shall be fabricated from 1-1/2 inch Schedule 80 pipe.

4. The centerline of the top rail shall be 42 inches above the walking surface for level rail. For stair rail, the centerline of the top rail shall be 34 inches above the leading edge of the tread nosing.

5. Posts

a. Maximum horizontal spacing between posts for level rail shall be six feet.

b. Maximum horizontal spacing between posts for stair rail shall be five feet.

6. All rail joints shall be finished flush and shall occur only at supports. Posts shall not interrupt the continuation of the top rail at any point along the railing, including corners and end terminations. The top surface of the top railing shall be smooth and shall not be interrupted by projecting fittings.

7. Toeboards

a. Toeboards shall project 4-inches above the walking surface and shall not infringe on the minimum required walkway width.

b. Aluminum toeboards shall be extruded from aluminum alloy 6063-T6 unless otherwise noted.

c. Toeboards shall have a minimum thickness of 1/8” at any point. Geometry of toeboard shall closely resemble geometry shown on Drawings.

8. Expansion joint splices shall be provided at 30 foot maximum spacing and at all expansion joints in the structure supporting the handrail.

9. The handrail system shall be designed to resist the design loads specified by both OSHA and the Georgia State Minimum Standard Building Code.

10. Provide handrail extensions at top and bottom of stairs and ramps in accordance with the Georgia State Minimum Standard Building Code.

B. For metal handrail, the Contractor shall have the option of providing a handrail system of either an all welded type construction or a component type construction.

1. With both the all welded or component type construction, the baseplates and toeboards shall be furnished as shown on the Drawings.

2. Component Type System

a. All fittings and brackets shall be designed for stainless steel concealed set screws with internal tyne type connectors.

b. Exposed fittings shall be cast or extruded aluminum, or stainless steel to match rail material, except where corrosion-resistant steel is employed as a standard fabricator's item for use.

c. Component type handrail shall be as manufactured by Thompson Fabricating Company, Inc., Hollaender Manufacturing Company, Inc., or equal.

3. Welded handrail may be field assembled using component type fittings as described herein.

4. Galvanized or Painted Steel

a. Railing support posts shall be embedded in pipe sleeves using anchoring cement. Anchoring cement shall be a non-shrink, non-metallic, pourable cementitious grout which will produce controlled expansion at time of placement. Anchoring cement shall be "Super Por- Rok" as manufactured by Minwax, "Sonnogrout" as manufacturing by Rexnard Chemical Products, or equal.

C. Handrail shall be either Type I or Type II handrail as shown on the Drawings. If no type is indicated on Drawings, handrail shall be Type I.

1. Type I handrail shall be a two-rail system. The centerline of the intermediate rail shall be 21 inches above the walking surface.

2. Type II handrail shall be a three-rail system with vertical posts spanning between the two intermediate rails.

a. The centerline of the lower intermediate rail shall be 7 inches above the walking surface.

b. The centerline of the upper intermediate rail shall be 5-3/4" below the centerline of the top rail.

c. Vertical posts spanning between the intermediate rails shall be 1/2" diameter schedule 40 pipe or fiberglass rod.

d. Spacing of vertical posts shall be as required to prevent passage of a 4-inch sphere at any point.

D. Where gates are required in handrails as shown on the Drawings, they shall be self-closing and shall be provided by the same manufacturer as the handrail. Gates shall swing away from the opening being protected by the handrail.

E. Where safety chains are required in handrails as shown on the Drawings, chains shall be constructed of the same alloy as the handrail. Chains shall be straight link style, 3/16-inch diameter, with at least twelve links per foot, and with snap hooks on each end. Snap hooks shall be boat type and eye bolts for attachment of chains shall be 3/8-inch bolts with 3/4-inch eye diameter welded to the railing posts. Two (2) chains, four inches longer than the anchorage spacing shall be supplied for each guarded area.

## PART 3 -- EXECUTION

### 3.01 FABRICATION

A. All measurements and dimensions shall be based on field conditions and shall be verified by the Contractor prior to fabrication. Such verification shall include coordination with all adjoining work.

B. All fabricated work shall be shop fitted together as much as practicable, and delivered to the field, complete and ready for erection.

C. All work shall be fabricated and installed in a manner that will provide for expansion and contraction, prevent shearing of bolts, screws, and other fastenings, ensure rigidity, and provide a close fit of sections.

D. Finished members shall conform to the lines, angles, and curves shown on the drawings and shall be free from distortions of any kind.

E. All shearings shall be neat and accurate, with parts exposed to view neatly finished. Flame cutting is allowed only when performed utilizing a machine.

F. Concrete anchors and bolts for attachment of handrail baseplates to supporting members shall conform to Section 05050, Metal Fastening.

G. All fabricated items shall be shop painted in accordance with Section 09900, Painting.

### 3.02 INSTALLATION

A. Assembly and installation of handrails and railings shall be performed in strict accordance with manufacturer's recommendations.

B. All handrails and railings shall be erected square, plumb and true, accurately fitted, adequately anchored in place, and set at proper elevations and positions.

- END OF SECTION –

# SECTION 05531

# GRATINGS AND ACCESS DOORS

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Furnish all materials, labor, and equipment required to provide all gratings, floor plates, and access doors in accordance with the Contract Documents.

### 1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 05010 - Metal Materials

B. Section 05035 - Galvanizing

C. Section 05050 - Metal Fastening

### 1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. Georgia State Minimum Standard Building Code

2. Aluminum Association Specifications for Aluminum Structures

3. Occupational Safety and Health Administration (OSHA) Regulations

### 1.04 SUBMITTALS

A. Submit the following in accordance with Section 01300, Submittals.

1. Complete fabrication and erection Drawings of all gratings and access doors specified herein.

2. Other submittals as required in accordance with Section 05010, Metal Materials, and Section 05050, Metal Fastening.

## PART 2 -- PRODUCTS

### 2.01 METAL MATERIALS

A. Metal materials used for gratings, floor plates, and access doors shall conform to Section 05010, Metal Materials, unless noted otherwise.

## 2.02 METAL FASTENING

A. All welds and fasteners used for gratings, floor plates, and access doors shall conform to Section 05050, Metal Fastening, unless noted otherwise.

## 2.03 GRATING

A. General - Grating, including support frames, fastenings, and all necessary appurtenances for a complete installation, shall be furnished as indicated on the Drawings.

1. All exposed bearing ends of grating shall be enclosed in a perimeter band of the same dimensions and material as the main bars, including ends at all cutouts.

2. Grating shall be fabricated into easily removable sections and shall be fastened at each corner and as required with fasteners provided by the grating manufacturer. No fasteners shall be permitted to project above the walking surface.

3. Grating shall be designed for a loading of 150 psf unless otherwise required by the Drawings. Minimum grating depth shall be 1-1/2 inches, unless structural requirements based on clear span require more depth.

B. Aluminum Grating

1. Aluminum grating shall be of I-bar type and shall consist of extruded bearing bars positioned and locked by crossbars. All supports, cross members, etc. shall be aluminum. Plank clips for grating holddowns or other required attachments, shall be aluminum or stainless steel. Bolts shall be stainless steel.

2. Grating shall be “I-Bar”, as manufactured by Klemp Corporation, “Swage Locked Grating” as manufactured by Borden Metal Products, I-Bar 19SGI4”, by Ohio Grating, or equal.

C. Heavy Duty Steel Grating

1. Heavy duty steel grating shall be galvanized according to Section 05035, Galvanizing.

2. Main bearing bars shall conform to ASTM A36. Cross bars shall be flush with the top of the grating.

3. Grating span shall be 36 inches maximum and shall satisfy AASHTO loading for H-20 truck.

4. Grating shall be manufactured by IKG Borden Industries, Leeds, AL, or equal.

## 2.04 ACCESS DOORS (ACCESS HATCHES)

A. General

1. Items labeled Access Hatches on the drawings are synonymous to Access Doors.

2. Access doors shall be aluminum unless otherwise noted.

3. Opening sizes, number and direction of swing of door leaves, and locations shall be as shown on the Drawings. The Drawings shall indicate the clear opening dimensions. Openings larger than 42 inches in either direction shall have double leaf doors.

4. All doors shall be provided with an automatic hold-open arm with release handle.

5. All hardware, including but not limited to, all parts of the latch and lifting mechanism assemblies, hold open arms and guides, brackets, hinges, springs, pins, and fasteners shall be stainless steel.

6. All doors shall be water-tight with a continuous gasket. All single door applications shall include a continuous EPDM odor reduction gasket.

B. Floor, Wet Well and Dry Pit Access Doors

1. Door leaves shall be 1/4 inch, minimum, diamond pattern plate with an approved raised pattern, non-skid surface. Plate shall be stiffened as required to maintain allowable stress and deflection requirements specified herein. Stiffeners shall consist of angles or bars welded to the bottom of the plate.

2. Doors shall be designed for flush mounting and for easy opening from both inside and outside.

3. All access doors as indicated on the Drawings shall be provided with recessed handles. Handle material shall be as shown on the Contract Drawings.

4. All doors shall have an enclosed compression spring assist and open to 90 degrees.

5. Door frames shall be extruded and equipped with a 1-1/2 inch minimum drain pipe located by the manufacturer. The drain pipe shall be provided by the Contractor and shall extend to the nearest point of discharge acceptable to the Engineer.

6. Access Doors shall be designed for a 300 psf live load minimum, unless noted otherwise.

7. The allowable fiber stress shall not exceed 16,000 psi. Live load deflection shall be limited to L/240 of the span, but not more than 1/4-inch.

8. Interior doors shall be “J-AL” or “JD-AL” by The Bilco Company, Type”S1S” or “S2S”, by Halliday Products Inc, Type “APS” or “APD”, by U.S. Foundry and Manufacturing Company, Type “EXK” or “EXKD” by Syracuse Castings, or equal.

9. Doors rated for H-20 Traffic Loading shall be “JAL-HD” or JDAL-HD” by The Bilco Company, Type “H1W” or “H2W”, by Halliday Products Inc, “EC-HD” or “ECD-HD” by Syracuse Castings, or equal.

C. Roof Access Doors

1. Doors shall be designed for 50 psf live load unless noted otherwise.

2. Doors for service stairs shall be Bilco Type L roof Scuttles, or equal.

3. Doors for ladder access shall be Bilco Type S or SS Roof Scuttles, or equal.

D. Fixed Ladders

1. Where the Contract Documents indicate fixed ladders are required under access doors, they shall be provided with “Ladder Up, Model LU-4” by Bilco Company, “Series L1E” by Halliday Products, “Ladder Climb out Device” by Thompson Fabricating, or equal.

2. The safety posts shall be constructed of aluminum with telescoping tubular sections that lock automatically when fully extended. All hardware shall be stainless steel.

3. Safety posts shall be assembled in strict accordance with manufacturer’s recommendations.

2.05 FALL THROUGH PREVENTION SYSTEM

A. All access doors covering openings measuring 12 inches or more in its least dimension through which persons may fall shall be equipped with a fall through prevention system, except where noted on the Contract Drawings. Access doors shall be provided with a permanent installed fall thru prevention grate system that provides continuous safety assurance in both its closed and open positions. The grate system shall be made with 6061-T6 aluminum or FRP and be designed for a 300 psf live load minimum, unless noted otherwise.

PART 3 -- EXECUTION

3.01 FABRICATION

A. All measurements and dimensions shall be based on field conditions and shall be verified by the Contractor prior to fabrication. Such verification shall include coordination with adjoining work.

B. All fabricated work shall be shop fitted together as much as practicable, and delivered to the field, complete and ready for erection. All miscellaneous items such as stiffeners, fillets, connections, brackets, and other details necessary for a complete installation shall be provided.

C. All work shall be fabricated and installed in a manner that will provide for expansion and contraction, prevent shearing of bolts, screws, and other fastenings, ensure rigidity, and provide a close fit of sections.

D. Finished members shall conform to the lines, angles, and curves shown on the Drawings and shall be free from distortions of any kind.

E. All shearings shall be neat and accurate, with parts exposed to view neatly finished. Flame cutting is allowed only when performed utilizing a machine.

F. All shop connections shall be welded unless otherwise indicated on the Drawings or specified herein. Bolts and welds shall conform to Section 05050, Metal Fastening. All fastenings shall be concealed where practicable.

3.02 INSTALLATION

A. Assembly and installation of fabricated system components shall be performed in strict accordance with manufacturer's recommendations.

B. All gratings and access doors shall be erected square, plumb and true, accurately fitted, adequately anchored in place, and set at proper elevations and positions.

C. Provide vinyl gaskets or bituminous paint system where aluminum is in contact with concrete or dissimilar metals.

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# SECTION 07150

# DAMP-PROOFING

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Furnish all labor, materials, equipment and appliances required for complete execution of work as shown on Drawings and specified herein.

B. Principal items of work include:

1. Dampproofing on exterior side of interior wythe of masonry cavity walls above grade.

### 1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 04200 - Unit Masonry

### 1.03 REFERENCE SPECIFICATIONS CODES AND STANDARDS

A. Without limiting the generality of these specifications Work shall conform to the applicable requirements of the following documents:

1. ASTM D 449 Standard Specification for Asphalt Used in Dampproofing and Waterproofing

### 1.04 SUBMITTALS

A. In accordance with the procedures and requirements set forth in the Section 01300, Submittals, submit the following:

1. Manufacturers product literature, specification data sheets and installation instructions.

### 1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's unopened containers identified with name, brand, type, grade, class and all other qualifying information.

B. Store materials in dry location to prevent damage or intrusion of foreign matter. Remove damaged materials from the job site.

## PART 2 -- PRODUCTS

### 2.01 ACCEPTABLE MANUFACTURERS

A. Subject with compliance with the Specifications provide products from one of the following manufacturers or equal:

1. Karnak Corp.

2. Tremco Co.

3. Koch Materials Co.

2.02 MATERIALS

A. Asphalt Primer: Type recommended by manufacturer.

B. Dampproofing: Non-asbestos, fibrated sprayed mastic conforming to ASTM D-4586, Type 1, compatible with cavity wall insulation.

PART 3 -- EXECUTION

3.01 EXAMINATION OF SURFACES

A. Examine all surfaces and installation of work done by other trades.

3.02 APPLICATION

A. Prime surfaces with manufacturers recommended primer. Apply dampproofing at the rate of 6 gallons per 100 square feet.

B. Apply dampproofing to substrates to provide a complete moisture resistant coating.

3.03 PROTECTION

A. Protect building from damage resulting from spillage, dripping and dropping of materials. Repair work damaged during dampproofing operations.

B. Take precautions against fire and other hazards during delivery, storage and installation of flammable materials. Comply with local ordinances and fire regulations in the installation of hazardous materials.

3.04 CLEANING

A. Clean adjacent materials and finishes which have been soiled.

- END OF SECTION -

# SECTION 07190

# VAPOR BARRIER

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Furnish labor, material, equipment and appliances required for complete execution of Work shown on Drawings and specified herein.

B. Principal items of work include:

1. Vapor barrier below structural slabs on grade.

### 1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03300 - Cast-in-Place Concrete

### 1.03 SUBMITTALS

A. In accordance with the procedures and requirements set forth in Section 01300 - Submittals, submit the following:

1. Manufacturer's data and installation instructions.

## PART 2 -- PRODUCTS

### 2.01 ACCEPTABLE MANUFACTURERS

A. Subject with compliance with specifications provide products from one of the following manufacturers or equal.

1. Raven Industries

2. Reef Industries

### 2.02 VAPOR BARRIER

A. Vapor Barrier: A reinforced laminate membrane with a minimum tensile strength of 75 lbs/in. in accordance with ASTM D-882, vapor transmission rating of 0.02 perms in accordance with E-96, and a puncture resistance of 25 lbs in accordance with ASTM D-4833.

B. Adhesive/Tape: Type approved by the Manufacturer of the vapor material.

PART 3 -- EXECUTION

3.01 VAPOR BARRIER

A. Vapor barrier shall be placed on top of 4 inches minimum of compacted structural fill stone, free of debris and protrusions, as shown on the Drawings for structural slabs.

B. Lap edges 12 inches and seal with adhesive tape. Lay with seams perpendicular to and lapped in the direction of placement. Do not penetrate vapor barrier.

C. Protect from damage until concrete is placed. Punctures and tears in vapor barrier shall be repaired using patches of the material which overlaps puncture or tear a minimum of 12 inches; seal with tape or adhesive.

- END OF SECTION -

# SECTION 07210

# BUILDING INSULATION

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Furnish labor, materials, equipment and appliances required for complete execution of Work as shown on Drawings and specified herein.

### 1.02 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of these specifications Work shall conform to applicable requirements of the following documents:

1. HH-I-1972/1 — Insulation Board, Thermal, Polyurethane or Polyisocyanurate, Faced with Aluminum Foil On one side.

2. TT-S-001657 — Sealing Compound Single Component, Butyl Rubber Based, Solvent Release Type (For Buildings and other Types of Construction).

### 1.03 SUBMITTALS

A. In accordance with the procedures and requirements set forth in Section 01300 - Submittals, submit the following:

1. Manufacturer's literature, specifications, installation instructions, technical data, and general recommendations.

2. Samples of each type of insulation specified.

### 1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in unopened, undamaged original packaging with bearing the manufacturer's name.

B. Store materials in clean, dry, protected areas. Do not leave materials exposed to the weather or sunlight, except to the extent necessary to perform the work.

C. Protect against ignition.

## PART 2 -- PRODUCTS

### 2.01 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the requirements, provide products as manufactured by the following manufacturers or equal:

1. Manufacturers of Extruded Polystyrene Board Insulation

   a. Amoco Foam Products Company

   b. Dow Chemical U.S.A.

   c. UC Industries

2.02 MATERIALS

A. Roof Insulation: Provide a minimum of 3" extruded polystyrene insulation. Provide a minimum of two staggered layers, unless otherwise indicated. The tapered insulation installed shall be approved by the roofing manufacturer without limiting the applicability of the roofing warranty. Roof insulation shall meet the requirements of a UL Class A and FM Class 1 roof. Insulation shall have an aged R-value of 5 per inch. Secure insulation as required by the roofing manufacturer to achieve an FM 90 installation. Install ½" perlite or glass faced gypsum board where insulation is installed over metal deck.

B. Adhesive and Fasteners: Type compatible with insulation, masonry, concrete, or other substrate and as recommended or produced by the insulation manufacturer.

C. Sealer and Tape: Type recommended by insulation manufacturer and having perm rating and fire resistance characteristics similar to that of the insulation.

PART 3 -- EXECUTION

3.01 GENERAL

A. Insulation shall be provided in walls, slabs and ceilings and where shown on Drawings.

3.02 INSTALLATION OF INSULATION

A. Install in accordance with the manufacturer's printed installation instructions to provide maximum sound and thermal benefits for material specified. Install to fill or cover voids. Cut neatly to snugly fit angles, corners and irregular areas and carefully wrapped around pipes, conduits, outlets, switches, beams, etc., to maintain continuity of insulation. Avoid gaps or bridges.

B. Cavity Wall Insulation

   1. On vertical surfaces of masonry adhere to inner wythe of block.

   2. Joints between insulation board units shall coincide with masonry joint reinforcing.

D. Roofing Insulation: Install roofing insulation in accordance with insulation and roofing manufacturer printed instructions and recommendations.

3.03 ADJUSTMENT AND CLEANING

A. Adequately protect Work from damage resulting from subsequent construction operations. Replace damaged or soiled Work.

- END OF SECTION -

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# SECTION 07530

# SINGLE PLY MEMBRANE ROOFING (EPDM)

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Furnish labor, materials, equipment and appliances required for a complete mechanically adhered, single-ply membrane roof as shown on Drawings and specified herein.

B. Principal items of work include:

1. Preparation of roof deck to receive new roofing materials.

2. Application of insulation, and accessories.

3. Fifteen year “Total Roofing System Warranty”.

4. Ballast.

5. Removal and cleanup of excess materials and debris.

### 1.02 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. ASTM Designations; Stipulated under PART 2 - PRODUCTS.

### 1.03 SUBMITTALS

A. In accordance with the procedures and requirements set forth in Section 01300, submit the following:

1. Manufacturer’s Data.

2. Manufacturer’s Installation Instructions.

3. Total System Warranty.

### 1.04 QUALITY ASSURANCE

A. The installer must be skilled and experienced and approved by roofing membrane manufacturer for type of roofing and associated work required, and equipped to perform workmanship in accordance with recognized standards.

B. Provide periodic inspections by an official manufacturer’s technical representative on all roofing and flashing. Inspections to be made at the beginning of the job and a minimum of one more while the roofing and/or flashing work is in progress to insure workmanship is in accordance with the manufacturer’s specifications.

1.05 GUARANTEE

A. Furnish to the Owner a fifteen (15) year written Manufacturer's Warranty covering materials and workmanship for the entire "Roofing System", including repair and replacement of roofing components which are deemed faulty or in disrepair during the guarantee period. Such items in disrepair shall be repaired at no cost to the Owner. Cover both labor and materials necessary to effect watertightness, including that required to repair roof leaks caused by standing water, defective material or workmanship, without limit as to amount required to effect watertightness.

B. Guarantee Label:

1. Furnish a guarantee label to be mounted by the Contractor at the building or other prominent location as directed by the Owner.

2. This label (8-1/2 inch x 11 inch minimum size) shall be laminated in transparent closure for permanent protection. Chart shall be framed in suitable aluminum frame with clear glass front and secured where directed.

3. Label shall contain the following information:

a. Type of system.

b. Name and address of manufacturer.

c. Name, address and phone number of manufacturer's local representative.

d. Name, address and phone number of contractor.

e. Statement of the warranty and its effective date.

f. Cautions and warnings against specific actions or types of misuse which will effect the guarantee.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's unopened containers identified with name, type, grade, class and all other qualifying information, including UL and other specified insurance agency's labels.

B. Store materials in a dry location, in such manner as to prevent damage or intrusion of foreign matter. Conspicuously mark "Rejected" on materials which have once been wet or damaged and remove from the job site.

PART 2 -- PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS, OR EQUAL

A. Carlisle Syn Technical Systems Corporation or equal.

B. Firestone Building Products Company.

2.02 MATERIALS

A. Membrane shall be 0.060-inch thick EPDM. The membrane conforms to the minimum physical properties which meet ASTM D3253.

EPDM MEMBRANE

| PROPERTY | TEST METHOD | SPECIFICATION |
|---|---|---|
| Tolerance on Nominal Thickness percent | ASTM D412 | ±10 |
| Elongation, Ultimate Min., percent | ASTM D412 | 300% Min. |
| Tear resistance, lbf/in | ASTM D412 | 175 Min. |
| Brittleness point, max., degrees Fahrenheit (degrees F) | ASTM D746 | -49°F |
| Resistance to heat aging<br>Properties after 4 weeks at 240 degrees Fahrenheit | ASTM D1204 | |
| Breaking Strength Min., lbF (N) | | 1,200 psi |
| Elongation, Ultimate Min., percent | | 200 |
| Linear Dimensional Change Max., percent | | ±2 |
| Ozone Resistance*<br>Condition after exposure to 100 phm | ASTM D1149 | No cracks |
| Ozone in air for 168 h at 104 degrees Fahrenheit | | No cracks |

B. Fasteners:

1. General:

a. The pullout values listed below are considered minimum and have been established to reflect the structural soundness of the deck to provide proper membrane and/or insulation attachment. They are not intended to address additional design loads for the roofing system.

b. Fasteners shall be properly coated to resist corrosion and deterioration from the effect of the item being fastened, the substrate or adjacent materials including but not limited to moisture and treatment products.

c. Manufacturers Factory Mutual approved concrete fasteners shall be used. Fasteners shall penetrate the deck a minimum of 2 inches to a maximum of 2 1/2 inches. A pilot hole shall be predrilled to a sufficient depth to prevent contract between the fastener point and any accumulated dust in the predrilled hole.

d. A minimum pullout value of 800 pounds must be provided.

C. Flashing: EPDM flashing, furnished by the membrane manufacturer for this system.

D. Bonding Adhesive: Bonding adhesive, furnished by the membrane manufacturer for this system.

E. Splicing Cement: Splicing cement, furnished by the membrane manufacturer for this system.

F. Splice Cleaner and Splice Wipes: Furnished by the membrane manufacturer for this system.

G. Lap Sealant: Shall be trowel or gun consistency. Furnished by the membrane manufacturer for this system.

H. In Seam Sealant: Special sealant applied in the splice. Furnished by the membrane manufacturer for this system.

I. Water Cut-Off Mastic: Furnished by the membrane manufacturer for this system.

J. Molded pipe Flashing: Furnished by the membrane manufacturer for this system.

K. Nite Seal and Lay Flat Tubing: Furnished by the membrane manufacturer for this system.

L. Pourable Sealer: Furnished by the membrane manufacturer for this system.

M. Rubber Fastening Strip: Furnished by the membrane manufacturer for this system.

N. Seam Fastening Plates: Two inch diameter metal fastening plates, furnished by the membrane manufacturer for this system.

O. Edging: Metal or hard rubber material, furnished by the membrane manufacturer for this system.

P. Walkway system shall be trowel smooth concrete pavers, providing four-way drainage. Pavers shall weigh minimum 15 lbs per square feet and a minimum size of 24 x 24 inches. Install paver ballast over manufacturer's protection materials. Install walkways around all roof mounted equipment.

## PART 3 -- EXECUTION

### 3.01 SURFACE PREPARATION

A. Contractor shall be responsible for providing proper substrate to receive the roofing system. Installer shall notify Contractor, in writing, of defects in the substrate, and work shall not proceed until defects have been corrected. The starting of work implies the acceptance of such surfaces.

B. Construction work on the roof shall be complete before the roofing operations commence. The roof surfaces shall be clean, smooth, dry, and free from loose and foreign materials, dirt, oil, grease, and holes.

C. Surface joints (including walls and substrate) shall be 1/4-inch or less in width. Repair all joints wider than 1/4-inch with approved joint filler before proceeding with installation.

D. Vents and all other projections through the roof shall be secured in position before roofing is commenced.

3.02 INSTALLATION

A. Roofing shall be furnished and installed in compliance with U.L. Class “A” requirements. Manufacturer’s instructions for the installation of such roofing system shall be strictly adhered to. All accessories necessary to complete the installation shall be provided.

B. The roofing shall be applied and finished in one area in a continuous operation. Care shall be taken to insure that water does not flow beneath any completed sections of roof. Loose edges of membrane shall be temporarily sealed with an approved night seal when the weather is threatening. When work is resumed, the sheet shall be pulled free before continuing installation.

C. Roofing and flashing installation at the junction of all parapet walls, curbs, and other roof openings shall be in accordance with the roof membrane manufacturer’s standard details unless shown otherwise on the Drawings. Typical details of all actual roof conditions shall be submitted for approval prior to membrane installation.

D. Where required by the Drawings or approved Drawings, wooden nailers shall be installed at the perimeter of the roof and around all vents, skylights, hatches and similar penetrations.

E. The EPDM roofing membrane shall be placed over the approved substrate without stretching. The membrane shall be allowed to relax approximately one half hour prior to splicing and flashing. Adjoining sheets shall be positioned in the same manner, lapping edges a minimum of 3-inches.

F. The roofing membrane shall be mechanically fastened at the roof perimeter and around the penetrations according to the manufacturer’s directions. All splices shall be made with a minimum lap of 3-inches, using splicing cement, gum tape and lap sealant as directed by the manufacturer.

G. Perimeter flashing and flashing around vents, skylights, etc., shall be done with manufacturer’s standard flashing using the longest pieces practicable. The splice between the flashing and the main roof sheet should be completed before bonding the flashing to the vertical surface. This splice must be sealed at least 3-inches beyond the fasteners which attach the horizontal membrane to the nailer.

H. Flash all projections (pipes, conduits, etc.) passing through the membrane. Prefabricated pipe seals shall be used to flash all pipes. All flashings and terminations shall be done in accordance with the manufacturer’s approved details.

3.03 QUALITY CONTROL

A. Prior to the placement of the ballast, an inspection shall be made by a representative of the manufacturer in order to ascertain that the roofing system has been installed properly.

- END OF SECTION -

# SECTION 07600

# FLASHING AND ROOFING ACCESSORIES

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. The CONTRACTOR shall furnish and install roofing sheet metal work and related items necessary for a complete installation, as indicated on the Drawings and specified herein, including, but not limited to the following: base flashings; pitch pans, scuppers, and other sheet metal work in conjunction with roof drainage; pipe and stack flashings, and similar items where furnished by equipment suppliers; flashings for ducts, exhaust piping, equipment piping, conduit, etc., penetrating roofing that may be required.

### 1.02 SUBMITTALS

A. Submit shop drawings and samples for review in accordance with Section 01300, Submittals. Provide sizes, shapes, thicknesses and types of materials, finishes fabrication details, anchors, connections and expansion joints in relation to adjacent work.

B. Submit a 12-inch square sample of wall flashing, angle clamping bar and other metal work specified. Deliver samples to a field location as directed by the ENGINEER.

### 1.03 APPLICABLE STANDARDS

A. Except as otherwise shown or specified, comply with applicable manual by (SMACNA) Sheet Metal and A/C Contractors National Association.

B. Except as otherwise shown or specified, comply with the recommendations and instructions of the manufacturer of the sheet metal being installed.

C. All materials and installation shall conform or exceed the requirement of all local codes.

### 1.04 GUARANTEE

A. The roofing guarantee specified in Section 07510, Built-Up Bituminous Roofing shall cover flashings specified in this section. The flashing and edge details shall be as required by the roofing manufacturer to satisfy conditions of the guarantee and shall be supplied by the manufacturer. The details shown on the Drawings are intended to provide minimum standards required for the guarantee.

## PART 2 -- PRODUCTS

### 2.01 FLASHING (Parapet Roofs)

A. Flashing shall be .040-inch aluminum, minimum. The system shall be Presto Lock Facia System by Johns Manville, or equal.

B. Coping system shall be Presto Lock Coping System by Johns Manville, or equal.

2.02 CANT STRIPS

A. Cant Strips shall be Fes-Cant Plus Cant Strip or by Johns Manville or equal. The strips shall be a high density, laminated board made of high strength fibers and expanded peslites.

2.04 PLASTIC CEMENT

A. Plastic cement shall conform to ASTM D 2822 and shall be supplied by the roofing manufacturer.

2.05 FASTENERS

A. Nails, bolts, and nuts, screws, washers, etc., shall be stainless steel and shall be manufactured by the roofing manufacturer.

2.06 ANCHORS

A. Anchors for fastening items to concrete shall be stainless steel machine screws or bolts supplied by the roofing manufacturer.

2.07 BITUMINOUS PLASTIC CEMENT

A. Bituminous plastic cement shall conform to FS SS-C-153.

2.08 ASPHALTIC MATERIAL

A. Asphalt primers shall conform to FS S-A-701. Coating asphalt shall have brushing consistency conforming to FS SS-R-451.

2.09 SCUPPERS AND DOWNSPOUTS

A. Scuppers and Downspouts shall be 0.04-inch aluminum with baked enamel finish. Color will be selected by the ENGINEER.

PART 3 -- EXECUTION

3.01 SHIPPING, HANDLING AND STORAGE

A. Store materials off the ground to avoid damage. Protect from bitumen spillage and repair or replace damage at no additional cost to the COUNTY.

3.02 JOB CONDITIONS

A. Coordination: Coordinate with the roofing system, sheet metal, plumbing, electrical, HVAC and mechanical subcontractors to insure that all items are in place prior to commencement of work.

B. Climatic Conditions: Proceed with the roofing and associated work only when existing and forecasted weather conditions will permit the work to be performed as scheduled.

3.03 SHEET METAL INSTALLATION

A. General: Coordinate metal flashing and trim work with the installation of roofing, waterproofing, piping, existing building, and other adjoining and substrate work. Surfaces to be coated shall be smooth and clean. The installer must examine the substrate and the conditions under which the metal flashing will be installed, and notify the CONTRACTOR in writing of any unsatisfactory conditions. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer. Flanges or gravel stops, vent and other flashings, shall be bedded in hot asphalt, set on top of the roofing plies and reinforced with felt strips as specified. Work shall be water tight, with lines, arises and angles sharp and true. Surfaces shall be free from waves and buckles.

B. Fabrication: Fabricate and install work described herein in accordance with the applicable standard described and illustrated in the National Association, Inc. publication “Architectural Sheet Metal Manual”.

C. Flashings: Base and all other flashings shall be watertight and of a bondable type.

D. Scuppers: Scuppers and the like, shall be fabricated as indicated on the Drawings, or equal, and properly installed.

E. Accuracy: Fabricate and install work with lines and corners of exposed units true and accurate. Form exposed faces flat and free from buckles, excessive waves and avoidable tool marks, considering the temper and reflectivity of the metal. Provide uniform, neat seams with minimum exposure of solder welds, and sealant. Except as otherwise shown, fold back the sheet metal to form a hem on the concealed side of exposed edges.

F. Fasteners: Conceal fasteners and expansion provisions wherever possible in exposed work, and locate so as to minimize the possibility of leakage. Cover and seal work as required for a tight installation. Fasten sheet metal items as indicated or required to provide rigid, secure installation free of warp. Fastenings shall be made in such a manner as not to impair the watertight integrity of the installation. Exposed face nailing will not be permitted.

G. Laps: For embedment of metal flanges in roofing or composition flashing or stripping, extend flanges for a minimum of 4” embedment. Lap seams of sheet metal in direction of flow. Single lock flat seams, heliarc weld or double-lock and mallet flat. Lap seams occurring in members sloping 45 degrees or greater shall be lapped 4” minimum and be bedded in flashing cement. Provide loose-locked expansion joints a maximum of 20 feet and a minimum of 8 feet from corners. On vertical surfaces, lap 2 piece flashings a minimum of 3”.

H. Protection: Separate dissimilar metals from each other by painting each metal surface in the area of contact with a heavy application of bituminous coating, or by other permanent separation as recommended by the manufacturers of the dissimilar metals. The flashing subcontractor shall advise the CONTRACTOR of required procedures for protection of the completed flashing and trim. Furnish such advice for period of installation of other work, and also for the remainder of the construction period.

3.04 COORDINATION

A. Coordinate flashing work with the work of other trades. Adjacent work shall be kept clean and shall not be injured or defaced in any way.

3.05 PROTECTION AND CLEANING

A. The CONTRACTOR shall protect the work of other trades. Work damaged by an operation under this section shall be repaired or replaced at no expense to the COUNTY. All soiled adjoining surfaces shall be carefully cleaned.

B. All debris and surplus material resulting from work under this section shall be removed from the premises.

- END OF SECTION -

# SECTION 07900

# JOINT FILLERS, SEALANTS AND CAULKING

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Furnish labor, materials, equipment and appliances required for the complete execution of Work shown on the Drawings and specified herein.

### 1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03250 - Concrete Accessories

B. Section 03290 - Joints in Concrete

### 1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. ASTM C-920 Elastomeric Joint Sealants

2. ASTM D-1056 Flexible Cellular Materials - Sponge or Expanded Rubber

3. SWRI Sealant and Caulking Guide Specification

4. Federal Specification TT-S-00227 E

### 1.04 SUBMITTALS

A. In accordance with the procedures and requirements set forth in Section 01300 - Submittals, submit the following:

1. Manufacturers literature and installation instructions.

2. Color samples of each type of sealant.

### 1.05 QUALITY ASSURANCE

A. Applicator shall be a company specializing in the installation of sealants with a minimum of five years experience.

### 1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in unopened labeled packages.

B. Store materials in location protected from freezing or damages.

C. Reject and remove from the site materials within broken or damaged packaging.

## PART 2 -- PRODUCTS

### 2.01 MATERIALS

A. Sealants

1. Type 1: Multi-component, non-sag, low-modulus polyurethane rubber sealant meeting ASTM C-920, Type M, Grade NS, Class 25, use NT, M, A, and O. Capable of withstanding 50% in extension or compression such as Sikaflex-2C NS/SL, Sika Corporation Lyndhurst, NY, or Sonolastic SL-1, Sonneborn, Minneapolis, MN, or DynaTrol II by Pecora Corporation, or equal.

2. Type 2: Single component polyurethane sealant meeting ASTM C-920, Type S, Grade NS, Class 25, Use NT, M, A, and O. Capable of withstanding 25% in extension or compression such as Magnum NS-100, Tamms Industries, or Sikaflex 1A, Sika Corporation, Lyndhurst, NY, DynaTrol 1-XL by Pecora Corporation, or equal.

3. Type 3: Single component, low-modulus moisture curing silicone meeting ASTM C-920, Type S, Grade NS, Class 25, Use NT, M, G, and A. Capable of withstanding 50% extension and compression. Pecora 890 by Pecora Corporation or equal.

4. Type 4: Single component, mildew resistant, moisture-curing silicone meeting ASTM C-920, Type S, Grade NS, Class 25, Use NT, M, G, and A. Pecora 898 by Pecora Corporation or equal.

5. Type 5: Single component, acrylic latex meeting ASTM C-834. AC-20+ Silicone by Pecora Corporation, or equal.

6. Type 6: High grade butyl sealant meeting Federal Specification TT-S-00-1657. BC-158 by Pecora Corporation, or equal.

7. Type 7: Multi-component chemical resistant polysulfide sealant conforming to ASTM C-920, Type M, Grade NS, Class 25 such as Sonolastic Two-part, Sonneborn, Minneapolis, MN, Hornflex-L, Tamms, Beltsville, MD, or Cormax PSC, DuPont, Synthacalk GC2+ by Pecora Corporation, or equal.

8. Type 8: Nonsag, multi component, traffic grate polyurethane sealant meeting ASTM C920, Type 19, Grate NS, Class 25, use T, M, A, and O. DynaTread by Pecora Corporation, or equal.

B. Primer: Non-staining primer recommended by sealant manufacturer for the substrates on this project.

C. Backer Rod: Closed cell foam, nonreactive with caulking materials, non-oily, and approved by the sealant manufacturer. Minimum density shall be 3.24 pounds per cubic foot. Use no asphalt or bitumen-impregnated fiber with sealants.

D. Joint Cleaner: Recommended by sealant or caulking compound manufacturer.

E. Bond breaker: Either polyethylene film or plastic tape as recommended by the sealant manufacturer.

F. Color: Where manufacturer's standard colors do not closely match materials being sealed, provide a custom color.

## PART 3 -- EXECUTION

### 3.01 QUALITY CONTROL

A. Coordinate work with details shown on approved shop drawings prepared by other trades.

B. Verify conditions in the field.

C. Schedule work to follow closely the installation of other trades.

D. Apply sealants and related items in temperatures and dry conditions recommended by the manufacturers.

E. Do not paint sealant, unless recommended by sealant and paint manufacturer.

### 3.02 PREPARATION

A. Protect finished surfaces adjoining by using masking tape or other suitable materials.

B. Clean and prime joints before starting any caulking or sealing work.

C. Thoroughly clean joints and spaces of mortar and other foreign materials. Cleaning agent shall be Xylol or similar non-contaminating solvent to remove any film from metal surfaces. Masonry or concrete surfaces shall be brushed or air jet cleaned.

D. Joint Requirements

1. All joints and spaces to be sealed in exterior work shall be less than 1/2 inch deep and not less than 1/4 inch wide. If joints in masonry are less than that specified herein, the mortar shall be cut out to the required width and depth. All joints and spaces to receive sealant shall be completely prepared and thoroughly dry before installation of sealant.

2. Unless otherwise specified, joints and spaces which are open to a depth of 1/2 inch or greater shall be solidly filled with back-up material to within 1/4 inch of the surface. Back-up material shall be packed tightly and made continuous throughout the length of the joints. Bond breaker shall be applied as required. If joints are less than 1/4 inch deep, the back-up material may be omitted, a bond breaker substituted and the joint completely filled with sealant. The back-up material shall not project beyond the 1/4 inch depth of the open space in any joint. The following width-to-depth ratio table shall be adhered to, unless otherwise recommended by manufacturer.

| Joint Width | Sealant Depth | |
|---|---|---|
| | Minimum | Maximum |
| ¼ inch | 1/4 inch | 1/4 inch |
| Over 1/4 inch to 1/2 inch | 1/4 inch | Equal to width |
| Over 1/2 inch to 1 inch | 1/2 inch | Equal to width |
| Over 1 inch to 2 inch | 1/2 inch | 1/2 of width |

3.03 APPLICATION

A. Exercise care before, during, and after installation so as not to damage any material by tearing or puncturing. All finished work shall be approved before covering with any other material or construction.

B. Apply sealant by an approved type of gun except where the use of a gun is not practicable, suitable hand tools shall be used. Avoid applying the compound to any surface outside of the joints or spaces to be sealed. Mask areas where required to prevent overlapping of sealant.

C. All joints shall be waterproof and weathertight.

D. Point sealed joints to make a slightly concave joint, the edges of which are flush with the surrounding surfaces. Exposed joints in the interior side of the door and other frames shall be neatly pointed flush or to match adjacent jointing work.

E. Adjacent materials which have been soiled shall be cleaned immediately and the work left in neat and clean condition.

F. Comply with sealant manufacturer's written instructions except where more stringent requirements are shown or specified and except where manufacturer's technical representative directs otherwise.

3.04 ADJUSTMENT AND CLEANING

A. Remove misplaced sealant compounds promptly using methods and materials recommended by the manufacturer, as the work progresses.

B. Allow sealants to cure and remove protective edging, of doors, louvers, saddles windows etc. as directed by the Engineer.

3.05 SCHEDULE

**Schedule of Sealants**

| **Application** | **Sealant** | **Color** |
|---|---|---|
| Vertical and horizontal joints bordered on both sides by concrete, precast concrete, natural stone or other porous building material. | Type 2 | To closely match adjacent surfaces or mortar and as selected by the Owner. |

| Application | Sealant | Color |
|---|---|---|
| Vertical and horizontal joints bordered on both sides by painted metals, anodized aluminum, mill finished aluminum, PVC, glass or other non-porous building material. | Type 3 | To closely match adjacent surfaces and as selected by the Owner. |
| Masonry expansion and control joints less than 1¼" wide. | Type 1 | To closely match adjacent surfaces and as selected by the Owner. |
| Masonry expansion and control joints equal or greater than 1 ¼ inches wide. | Type 1 | To closely match adjacent surfaces and as selected by the Owner. |
| Interior – wood trim and finish joints. | Type 5 | Color to be selected by Owner |
| Sanitary areas, joints in ceramic tile, around plumbing fixtures, countertops, and back splashes. See Note 1. | Type 4 | To closely match adjacent surfaces and as selected by the Owner. |
| Perimeter sealing of doors, windows, louvers, piping, ducts, and electrical conduit. | Type 2 or Type 3 | To closely match adjacent surfaces and as selected by the Owner. |
| Below thresholds. | Type 6 | Manufacturer's standard |
| Submerged in liquids. See Note 2. | Type 1 | Manufacturer's standard |
| Submerged in liquids with high concentration of chlorine (> 2 ppm). | Type 7 | Manufacturer's standard |
| Horizontal Joints exposed to vehicular or pedestrian traffic. | Type 8 | To closely match adjacent surfaces. |
| Other joints indicated on the drawings or customarily sealed but not listed. | Type recommended by manufacturer | To closely match adjacent surfaces and as selected by the Owner. |

Note 1. Sealants which will come in contact with potable water shall meet the requirements of NSF 61.

Note 2. Where sealant will be immersed in liquid chemicals verify compatibility prior to installation of sealant.

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# SECTION 08710

# FINISH HARDWARE

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Furnish all labor, materials, equipment and tools required for the complete execution of Work as shown on Drawings and specified herein.

### 1.02 SUBMITTALS

A. In accordance with the procedures and requirements set forth in Section 01300 - Submittals, submit the following:

1. Manufacturers data for each item of hardware. Include installation and maintenance instructions.

2. Furnish templates to fabricators of other work which is to receive hardware.

3. Hardware schedule organized into "hardware sets," indicating complete designation of every item required for each door or opening. Furnish initial draft of schedule at the earliest possible date, in order to facilitate the fabrication of other work (such as hollow metal frames) which may be critical in the project construction schedule. Furnish final draft of schedule after samples, manufacturer's data sheets, coordination with shop drawings for other work, delivery schedules and similar information has been completed and accepted.

4. Prepare a keying schedule in consultation with the Owner.

### 1.03 QUALITY ASSURANCE

A. Provide materials, assemblies, equipment and services from a single source for each category except that locksets, latchsets and cylinders must originate from the same manufacturer.

B. Replace any item of finish hardware which cannot be installed or will not function properly.

C. Furnish templates or information to door and frame manufacturer. Coordinate between the manufacturers where two or more articles of hardware are to be mounted on the same door. Verify all dimensions, new and existing.

D. Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thicknesses, profile, swing, security and similar requirements indicated, as necessary for proper installation and function.

1.04 DELIVERY, STORAGE AND HANDLING

A. Handle, store, distribute, protect and install hardware in accordance with manufacturer's instructions or recommendations. Deliver packaged materials in original containers with seals unbroken and labels intact.

B. Properly mark or label, so each piece of hardware is readily identifiable with the approved hardware schedule. Tag each change key or otherwise identifying the door of which its cylinder is intended. Where double cylinder functions are used or where it is not obvious which is the key side of a door, appropriate instructions shall be included with the lock and hardware schedule.

C. Provide secure storage area for hardware.

PART 2 -- PRODUCTS

2.01 MATERIALS AND FABRICATION

A. Hand of Door

1. Drawings show swing or hand of each door leaf (left, right, reverse bevel, etc.). Furnish hardware for proper installation and operation of door.

B. Manufacturer's Name Plate

1. Do not use manufacturer's products which have name or trade name displayed in a visible location (omit removable nameplates), except in conjunction with required UL labels.

C. Base Metals

1. Produce hardware units of the basic metal and forming method indicated, using manufacturer's non-corrosive metal alloy, composition, temper and hardness but in no case of lesser quality material than specified

D. Fasteners

1. Manufacture hardware to conform to published templates, generally prepared for machine screw installation. Do not provide hardware which has been prepared for self tapping sheet metal screws, except as specifically indicated.

2. Furnish stainless steel fasteners for installation with each hardware item. Exposed finish (under any condition) to match hardware finish or surfaces of adjacent work. Match the finish of adjacent work as closely as possible, including surfaces to receive painted finish.

3. Provide fasteners which are compatible with unit fastened and the substrate, and which will not cause corrosion of deterioration of finish hardware, base material or fastener.

E. Tools for Maintenance

1. Furnish a complete set of specialized tools as needed for Owner's continued adjustment, maintenance, removal and replacement of builders hardware.

F. Hardware Finishes

1. Stainless steel, US32D unless otherwise noted.

2. Closers shall have a USP finish unless otherwise noted.

G. Field Checks

1. Make periodic checks during installation of finish hardware to ascertain the correctness of the installation. After completion of the work, certify in writing, that all items of finish hardware have been installed, adjusted and are functioning in accordance with Specification requirements.

2.02 DESCRIPTION OF PRODUCTS

A. Hinges

1. Stainless steel full mortise concealed oil impregnated ball bearing type, five knuckle with non-rising pins for interior doors, and non-removable and non-rising pins for exterior doors. Tips shall be flat.

2. Sizes and weights of hinges:

a. Doors up to 36 inches - 4-1/2 inches regular weight.

b. Doors 36 inches to 40 inches - 5 inches regular weight.

c. Doors 40 inches to 48 inches - 5 inches heavy weight.

3. Provide three hinges per door leaf up to and including 90 inches and one additional hinge for each 30 inches of additional height.

4. Acceptable Manufacturers: Stanley Hardware, Hager Hardware, or equal.

B. Locksets and Latchsets

1. Stainless steel, heavy-duty mortise type conforming to ANSI A156.13 Series 1000, Grade 1.

2. Wrought steel box strikes.

3. Stainless steel deadbolt with 1" throw. approval.

4. 3/4 inch throw, two-piece anti-friction latchbolt.

5. Non-ferrous critical internal parts.

6. Furnish cylinders with six pin weather resistant cores. Cylinders shall be compatible with all locksets, latchsets, and panic hardware locking devices used for this project. Contactor shall coordinate compatibility of these hardware items before installation of hardware. Cylinders shall be manufactured to conform to electronic key system.

7. Trim Design: Stainless steel “L Full Face” escutcheon by Schlage trim design by listed manufacturer. Provide L (lever) design, unless otherwise indicated.

8. Acceptable Manufacturers: Schlage, Yale, or equal.

C. Keys and Keying

1. Provide an access control electronic lock cylinder and electronic key system as specified herein.

2. Furnish quantity of electronic keys as indicated.

D. Key Cabinet

1. Provide wall mounted key cabinets with heavy duty construction design for indoor and outdoor use and keyless touch point pushbutton lock. Cabinet shall accommodate all keys in the project, plus twenty (20) percent additional.

E. Closers

1. Cast iron case with seamless one-piece forged steel spring tub.

2. Heavy duty forged steel arm.

3. Non-sized fully adjustable from size 1-6.

4. Backcheck intensity and location valves.

5. Delayed action closing.

6. Full metal cover.

7. Mechanical hold open device, except at fire rated doors.

8. ANSI 156.4, Grade 1.

9. Conforms to ADA 5 lbf. maximum door opening force requirement for non-fire rated interior doors.

10. Provide mounting brackets, and fasteners required for proper attachment.

11. Acceptable manufacturers: Corbin/Russwin, LCN, Norton, or equal.

F. Overhead Door Holder

1. Heavy duty bronze, surface mounted with positive grip holder.

2. Track: extruded bronze.

3. Degree of opening: 85 - 110.

4. Finish: Satin Chrome Plated.

5. Acceptable manufacturers: Corbin/Russwin, Glynn-Johnson, Norton, or equal.

G. Door Stops and Bumpers

1. Finish: Satin chrome plated.

2. Floor mounted door stops.

   a. Acceptable manufacturers and products: H.B. Ives 444, Hager Hardware Model 267F, and Glynn-Johnson Model FB36, or equal.

3. Wall bumpers

   a. Acceptable manufacturers and products: H.B. Ives Model 407, Hagar Hardware Model 234W, and Glynn-Johnson Model 60C, or equal.

H. Flush Bolts

1. U.L. listed.

2. Forged brass construction, 1/2" diameter flattened bolt tip, 12" long rod.

3. Fit standard ANSI door preparation.

4. Acceptable manufacturers: Glynn-Johnson, Hager Hardware, and H.B. Ives, or equal.

I. Coordinator

1. U.L. labeled and tested for 100,000 cycles.

2. Stop mounted, provide filler strips to fully cover stop.

3. Adjustable holding power and override feature.

4. Acceptable manufacturers: Gylnn-Johnson, Hager Hardware, and H.B. Ives, or equal.

J. Kickplates

1. Stainless steel, 0.050" thick, beveled 3 sides, 8" high, width 2 inches less than door width.

2. Acceptable manufacturers: H.B. Ives, Hagar Hardware, and Builders Brass Works, or equal.

K. Silencers

1. Rubber silencers: 3 for each single door and 2 for each double doors.

2. Acceptable manufacturers and products: Glynn-Johnson Models 64 or 65, Hager Hardware Models 308D or 307D, H.B. Ives Models 20 or 21, or equal.

L. Thresholds

1. Extruded aluminum saddle type with stainless steel fasteners. Six inches wide or as shown on drawings.

2. Acceptable manufacturers: Pemko, National Guard Products, Incorporated, and Zero International, or equal.

M. Door Bottom Seal

1. Extruded aluminum with neoprene seal.

2. Acceptable manufacturers and products: Pemko Model 57, Zero International Model 328 and National Guard Products, Inc. Model 96, or equal.

N. Weatherstripping

1. Extruded aluminum with neoprene seal.

2. U.L. Labeled.

3. Acceptable manufacturers and products: Pemko Model 294, National Guard Products, Inc. Model 190, and Zero International Model 328, or equal.

O. Panic Hardware

1. Heavy duty push bar exit device, U.L. labeled, with corrosive resistant construction.

2. ANSI A156.3, Grade 1.

3. Exterior trim to closely match locksets.

4. Single/active doors: mortise type.

5. Double doors: concealed vericle rod.

6. ANSI Function 08.

7. Acceptable manufacturer's: Von-Duprin, Adams Rite Manufacturing Company, Corbin/Russwin, or equal.

P. Lock Guard

1. 13ga. Stainless steel non-handed lock guard for use with mortise or cylinder locks.

2. Acceptable manufacturer's: Ives Glynn-Johnson, or equal.

2.03 ELECTRONIC LOCK ACCESS CONTROL SYSTEM

A. General: Electronic access control system is to allow drop-in replacements for existing locks and feature a centralized access management and data logging system.

B. Provide electronic lock cylinders with the following features:

1. No wiring or battery required at the lock.

2. Lock cylinders are to have the same form factor and be interchangeable with lock cylinders manufactured by Yale or Schlage.

3. Lock is to have no keyway, be a sealed design, and non-pickable.

4. Lock cylinder is to maintain a record of at least 1,000 of the most recent access events, including the ID of the access key, date, and time. The lock is also to maintain a record of all unauthorized attempts to open the lock.

C. Provide electronic key system with the following features:

1. Key is to be designed to interface with the electronic lock system and provide power to operate the lock.

2. The key system is to be compatible with, and function with all lock systems made by the manufacturer – one key can open any similar electronic lock provided it is programmed to have access.

3. The key system is to be fully addressable, including defining the locks the key can open, a beginning and ending date, and a schedule of days and times when the key can be used.

4. Each key can be programmed to open to 3,300 different locks.

5. The key is to maintain a record of at least 3,500 of the most recent access events, including the ID of the lock, the date, and the time access. The key is also to maintain a record of all attempts to open unauthorized locks.

6. Electronic access control system is to be furnished with a Windows-based (Windows XP) software program for use on a PC for management of the electronic keys and locks. Software is to be complete and come with all accessories to manage the electronic key system. The software is to have the following features:
   a. Define access privileges for keys and locks.
      1.) Scheduled access times
      2.) Multiple schedules per key
      3.) Automatic key expirations
      4.) Create master and reset keys
      5.) Set time delay or multiple key mode in lock
      6.) Disable lost keys
   b. Provide a record of access events downloaded from keys and locks.
      1.) Log of all access events

2.) Email notification of specific events
3.) Generate reports

c. Capable of managing at least 500 keys and 500 locks in a single database.
d. Set up for a single administrator.

7. Lock and key interface with computer/software:
   a. Provide two Master Programming Keys to allow programming of electronic locks
   b. Provide a Key Station/Computer Interface with serial computer interface to allow programming of keys and master keys.

8. Provide electronic locks for all exterior doors shown on the Drawings

9. Provide fifteen (15) electronically programmable keys

10. Electronic Lock Access Control System is to be CyberLock system as manufactured by Videx, Inc.

2.04 PADLOCKS

A. Body: Solid brass, 50 mm x 24 mm x 56 mm.

B. Shackle: 3/8" diameter, chrome-plated hardened steel

C. Internal Parts: Stainless steel.

D. Lock Cylinder: Weather resistant, 6-pin, sealed design.

E. Manufacturer: Federal, Model 500X with CyberLock cylinder.

F. Quantity: 10 units.

PART 3 -- EXECUTION

3.01 GENERAL

A. Templates

1. After the hardware schedule is approved furnish to the various manufacturers, required blueprint templates for fabrication purposes. Templates shall be made available not more than ten (10) days after receipt of the approved hardware schedule.

B. Packaging and Marking

1. Ship hardware with proper non-corrosive fastenings for secure application. Each package of hardware shall be legibly marked indicating the part of the work for which it is intended. Markings shall correspond with the item numbers shown on the approved hardware schedule. Keys shall be tagged within each package set and plainly marked on the face of the envelope with the key control number, door designation and all identification as necessary.

3.02 INSTALLATION

A. Install hardware in a manner which will eliminate cracks on surfaces.

B. Mount hardware units at heights recommended in "Recommended Locations for Builders Hardware" by BHMA, except as otherwise indicated or required to comply with governing regulations.

C. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Do not install surface-mounted items until finishes have been completed on the substrate.

D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as is necessary for proper installation and operation.

E. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with factory standards.

F. Cut and fit thresholds and floor covers to profile of door frames, with mitered corners and hair-line joints. Join units with concealed welds or concealed mechanical joints. Cut smooth openings for spindles, bolts and similar items, if any.

G. Screw thresholds to substrate with No. 10 or larger screws, of the proper type for permanent anchorage and of bronze or stainless steel which will not corrode in contact with the threshold metal.

H. Set thresholds in a bed of either butyl rubber sealant or polyisobutylene mastic sealant to completely fill concealed voids and exclude moisture. Do not plug drainage holes or block weeps. Remove excess sealant.

3.03 ADJUST AND CLEAN

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function. Lubricate moving parts as recommended by manufacturer. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application.

B. Final Adjustment

1. One week prior to acceptance or occupancy make a final check and adjustment of all hardware items. Clean and relubricate operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices and compensate for final operation of heating and ventilating equipment.

C. Instruct Owner personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.

3.04 HARDWARE SETS

A. The door hardware sets on the Drawings indicates functional and general requirements. Items shall be quality and finish as specified. Hardware set identification refers to set

numbers indicated on the Drawings. Consult Drawings for set number required.

B. Hardware shall be as follows:

**Hardware Sets**

1. Hinges
   Panic Hardware (active leaf)
   Door Closer/Holder (each leaf)
   Coordinator
   Flush Bolts (inactive leaf)
   Kick Plate
   Weatherstripping
   Threshold
   Door Bottom Seal
   Astragal w/Weatherstripping

2. Hinges
   Entrance Lock Set
   Door Closer
   Kickplate
   Lock Guard
   Threshold
   Door Bottom Seal
   Weatherstripping

3. Hinges
   Panic Hardware
   Door Closer
   Kickplate
   Lock Guard
   Threshold
   Door Bottom Seal
   Weatherstripping

4. Hinges
   Passage Latchset
   Door Closer/Holder
   Kickplate
   Silencers
   Door Bumpers

5. Threshold
   Door Bottom Seal
   Weatherstripping

– END OF SECTION –

# SECTION 09900

# PAINTING

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Furnish labor, materials, equipment and appliances required for complete execution of Work shown on Drawings and Specified herein.

B. Section Includes:

1. Paint Materials

2. Shop Painting

3. Field Painting
   a. Surface Preparation
   b. Piping and Equipment Identification
   c. Schedule of Colors
   d. Equipment protection from painting
   e. Work in Confined Spaces
   f. OSHA Safety Colors

### 1.02 RELATED SECTIONS

A. Section 15030 - Piping and Equipment Identification Systems

### 1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of these specifications the Work shall conform to the applicable requirements of the following documents:

1. SSPC - Steel Structures Painting Council
   a. SSPC-Vis 1 Pictorial Surface Preparation Standards for Painting Steel Structures
   b. SSPC-SP2 Hand Tool Cleaning
   c. SSPC-SP3 Power Tool Cleaning
   d. SSPC-SP5 White Metal Blast Cleaning
   e. SSPC-SP6 Commercial Blast Cleaning
   f. SSPC-SP10 Near-White Metal Blast

2. NACE - National Association of Corrosion Engineers

3. ASTM D1737 - Test Method for Elongation of Attached Organic Coatings with Cylindrical Mandrel Apparatus

4. ASTM B117 - Method of Salt Spray (Fog) Testing

5. ASTM D4060 - Test Method for Abrasion Resistance of Organic Coating by the Taber Abraser

6. ASTM D3359 - Method for Measuring Adhesion by Tape Test

1.04 SUBMITTALS

A. In accordance with the procedures and requirements set forth in Section 01300 - Submittals, submit the following:

1. Manufacturer's literature and Material Safety Data Sheets for each product.

2. Painting schedule identifying surface preparation and paint systems proposed. Cross-reference with Tables 9-1 and 9-2. Provide the name of the paint manufacturer, and name, address, and telephone number of manufacturer's representative who will inspect the work. Submit schedule for approval as soon as possible following the Award of Contract, so approved schedule may be used to identify colors and specify shop paint systems for fabricated items.

1.05 SYSTEM DESCRIPTION

A. Work shall include surface preparation, paint application, inspection of painted surfaces and corrective action required, protection of adjacent surfaces, cleanup and appurtenant work required for the proper painting of all surfaces to be painted. Surfaces to be painted are designated within the Painting Schedule and include new and existing piping, miscellaneous metals, equipment, interior building wall surfaces, exposed electrical conduit and appurtenance.

B. Perform Work in strict accordance with manufacturer's published recommendations and instructions, unless the Engineer stipulates that deviations will be for the benefit of the project.

C. Paint surfaces which are customarily painted, whether indicated to be painted or not, with painting system applied to similar surfaces, areas and environments, and as approved by Engineer.

D. Piping and equipment shall receive color coding and identification. Equipment shall be the same color as the piping system.

1.06 QUALITY ASSURANCE

A. Painting operations shall be accomplished by skilled craftsman and licensed by the state to perform painting work.

B. Provide a letter indicating that the painting applicator has five years of experience, and 5 references which show previously successful application of the specified or comparable painting systems. Include the name, address, and the telephone number for the Owner of each installation for which the painting applicator provided services.

1.07 STORAGE AND DELIVERY

A. Bring materials to the job site in the original sealed and labeled containers.

B. Container label to include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Store paint materials at minimum ambient temperature of 45°F (7°C) and a maximum of 90°F (32°C), in ventilated area, and as required by manufacturer's instructions.

## PART 2 -- MATERIALS

### 2.01 GENERAL INFORMATION

A. The term "paint" is defined as both paints and coatings including emulsions, enamels, stains, varnishes, sealers, and other coatings whether organic or inorganic and whether used as prime, intermediate, or finish coats.

B. Purchase paint from an approved manufacturer. Manufacturer shall assign a representative to inspect application of their product both in the shop and field. The manufacturer's representative shall submit a report to the Engineer at the completion the Work identifying products used and verifying that surfaces were properly prepared, products were properly applied, and the paint systems were proper for the exposure and service.

C. Provide primers and intermediate coats produced by same manufacturer as finish coat. Use only thinners approved by paint manufacturer, and only within manufacturer's recommended limits.

D. Ensure compatibility of total paint system for each substrate. Test shop primed equipment delivered to the site for compatibility with final paint system. Provide an acceptable barrier coat or totally remove shop applied paint system when incompatible with system specified, and repaint with specified paint system.

E. Use painting materials suitable for the intended use and recommended by paint manufacturer for the intended use.

F. Require that personnel perform work in strict accordance with the latest requirements of OSHA Safety and Health Standards for construction. Meet or exceed requirements of regulatory agencies having jurisdiction and the manufacturer's published instructions and recommendations. Maintain a copy of all Material Safety Data Sheets at the job site of each product being used prior to commencement of work. Provide and require that personnel use protective and safety equipment in or about the project site. Provide respiratory devices, eye and face protection, ventilation, ear protection, illumination and other safety devices required to provide a safe work environment.

### 2.02 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Specifications, provide products from one of the following manufacturers, or equal:

1. Tnemec Company Inc.

2. Ameron

3. CARBOLINE

4. Sherwin-Williams

PART 3 -- EXECUTION

3.01 SHOP PAINTING

A. Shop prime fabricated steel and equipment with at least one shop coat of prime paint compatible with finish paint system specified. Prepare surface to be shop painted in strict accordance with paint manufacturer's recommendations and as specified. Finish coats may be shop applied, if approved by the Engineer. Package, store and protect shop painted items until they are incorporated into Work. Repair painted surfaces damaged during handling, transporting, storage, or installation to provide a painting system equal to the original painting received at the shop.

B. Identify surface preparation and shop paints on Shop Drawings. Verify compatibility with field applied paints. Shop Drawings indicating shop painting will not be approved until project paint system has been submitted to and approved by the Engineer.

3.02 SURFACE PREPARATION

A. General

1. Surfaces to be painted shall be clean and dry, and free of dust, rust, scale, and foreign matter. No solvent cleaning, power or hand tool cleaning shall be permitted unless approved by the Engineer.

2. During painting operations, cover and enclose within tenting, MCC sections, electrical panels, pumps and similar equipment items not intended to be painted. Prior to cleaning and painting, protect and/or remove, hardware, accessories, machined surfaces, nameplates, and lighting fixtures. Reposition items removed upon completion of painting operations.

3. Examine surfaces to be coated to determine that surfaces are suitable for specified surface preparation and painting. Report to Engineer surfaces found to be unsuitable in writing. Do not start surface preparation until unsuitable surfaces have been corrected. Starting surface preparation precludes subsequent claim that such surfaces were unsuitable for the specified surface preparation or painting.

4. Surface preparation shall be in accordance with specifications and manufacturer's recommendations. Provide additional surface preparation, and fill coats where manufacturer recommends additional surface preparation, in addition to requirements of specification.

5. Touch-up shop or field applied coatings damaged by surface preparation or any other activity, with the same shop or field applied coating; even to the extent of applying an entire coat when required to correct damage prior to application of the next coating. Touch-up coats are in addition to the specified applied systems, and not considered a field coat.

6. Protect motors and other equipment during blasting operation to ensure blasting material is not blown into motors or other equipment. Inspect motors and other equipment after blasting operations and certify that no damage occurred, or where damage occurred, the proper remedial action was taken.

7. Field paint shop painted equipment in compliance with Color Coding and as approved by Engineer.

B. Metal Surface Preparation

1. Conform to current Steel Structures Painting Council (SSPC) Specifications for metal surface preparation. Use SSPC-Vis-1 pictorial standards or NACE visual standards TM-01-70 or TM-01-75 to determine cleanliness of abrasive blast cleaned steel.

2. Only perform blast cleaning operations for metal when following conditions exist:
   a. Moisture is not present on the surface.
   b. Relative humidity is below 80%.
   c. Ambient and surface temperatures are 5°F or greater than the dew point temperature.
   d. Painting or drying of paint is not being performed in the area.
   e. Equipment is in good operating condition.
   f. Proper ventilation, illumination, and other safety procedures and equipment are being provided and followed.

3. Sandblast ferrous metals to be shop primed, or component mechanical equipment in accordance with SSPC-SP5, White Metal Blast.

4. Sandblast field prepared ferrous metals in accordance with SSPC-SP10, Near White Metal Blast, where metal is to be submerged, in a corrosive environment, or in severe service.

5. Sandblast field prepared ferrous metals in accordance with SSPC-SP6 Commercial Blast, where metal is to be used in mild or moderate service, or non-corrosive environment.

6. Clean nonferrous metals, copper, or galvanized metal surfaces in accordance to SSPC-SP1, Solvent Cleaning, or give one coat of metal passivator or metal conditioner compatible with the complete paint system.

7. Prime cleaned metals immediately after cleaning to prevent rusting.

8. Clean rusted metals down to bright metal by sandblasting and immediately field primed.

C. Concrete Surface Preparation

1. Cure concrete a minimum of 30 days before surface preparation, and painting begins.

2. Test concrete for moisture content using test method recommended by the paint manufacturer. Do not begin surface preparation, or painting until moisture content is acceptable to manufacturer.

3. Brush-off blast (Reference ASTM D 4259) concrete to remove contaminants, open bugholes, surface voids, air pockets, and other subsurface irregularities. Do not expose underlying aggregate. Use dry, oil-free air for blasting operations. Surface texture after blasting shall be similar to that of medium grit sandpaper. Remove residual abrasives, dust, and loose particles by vacuuming or blowing with high pressure air.

4. Acid etch (Reference ASTM D 260) concrete floors to receive paint. Following method is a minimum requirement. Remove residual dust and dirt. Wet surface of concrete until surface is damp. Etch surface with 15% to 20% muriatic acid solution to produce a “medium sandpaper” texture. Do not allow acid solution to dry on concrete. Rinse concrete when bubbling action of the acid begins to subside. Continue rinsing process until pH is 7 or higher. Remove excess water and allow concrete to thoroughly dry before coating. Other methods may be used, if approved by Engineer.

5. Surface defects, such as hollow areas, bugholes, honeycombs, and voids shall be filled with polymeric filler compatible with painting system. Complete fill coats may be used in addition to specified painting system and as approved by the Engineer. Fins, form marks, and all protrusions or rough edges shall be removed.

6. Repair existing concrete surfaces which are deteriorated to the point that surface preparation exposes aggregate with fill coats or patching mortar as recommended by paint manufacturer and as directed by the Engineer.

7. Clean concrete of all dust, form oils, curing compounds, oil, tar, laitance, efflorescence, loose mortar, and other foreign materials before paints are applied.

D. Castings

1. Prepare castings for painting by applying a brush or a knife-applied filler. Fillers are not to be used to conceal cracks, gasholes, or excessive porosity.

2. Apply one coat of primer with a minimum thickness of 1.2 mils in addition to coats specified. Allow sufficient drying time before further handling.

E. Masonry

1. Cure for a minimum of 30 days prior to paint application.

2. Clean masonry surfaces free from all dust, dirt, oil, grease, loose mortar, chalky deposits, efflorescence, and other foreign materials.

3. Test masonry for moisture content. Use test method recommended by paint manufacturer. Do not begin painting until moisture content is acceptable to manufacturer.

F. Previously-Painted Surfaces

1. Totally remove existing paint when: surface is to be submerged in a severe environment, paint is less than 75% intact, brittle, eroded or has underfilm rusting.

2. Surfaces which are greater than 75% intact require removal of failed paints and then spot primed. Spot priming is in addition to coats specified.

3. Remove surface contamination such as oil, grease, loose paint, mill scale, dirt, foreign matter, rust, mold, mildew, mortar, efflorescence, and sealers.

4. Clean and dull glossy surfaces prior to painting in accordance with the manufacturer's recommendations.

5. Check existing paints for compatibility with new paint system. If incompatible, totally remove existing paint system or apply a barrier coat recommended by the paint manufacturer. Remove existing paints of undetermined origin. Prepare a test patch of approximately 3 square feet over existing paint. Allow test patch to dry thoroughly and test for adhesion. If proper adhesion is not achieved remove existing paint and repaint.

3.03 APPLICATION OF PAINT

A. Apply paint by experienced painters with brushes or other applicators approved by the Engineer, and paint manufacturer.

B. Apply paint without runs, sags, thin spots, or unacceptable marks.

C. Apply at rate specified by the manufacturer to achieve at least the minimum dry mil thickness specified. Apply additional coats, if necessary, to obtain thickness.

D. Special attention shall be given to nuts, bolts, edges, angles, flanges, etc., where insufficient film thicknesses are likely. Stripe paint prior to applying prime coat. Stripe painting shall be in addition to coats specified.

E. Perform thinning in strict accordance with the manufacturer's instructions, and with the full knowledge and approval of the Engineer and paint manufacturer.

F. Allow paint to dry a minimum of twenty-four hours between application of any two coats of paint on a particular surface, unless shorter time periods are a requirement by the manufacturer. Longer drying times may be required for abnormal conditions as defined by the Engineer and paint manufacturer. Do not exceed manufacturer's recommended drying time between coats.

G. Suspend painting when any of the following conditions exist:

1. Rainy or excessively damp weather.

2. Relative humidity exceeds 85%.

3. General air temperature cannot be maintained at 50°F or above through the drying period, except on approval by the Engineer and paint manufacturer.

4. Relative humidity will exceed 85% or air temperature will drop below 40°F within 18 hours after application of paint.

5. Surface temperature of item is within 5 degrees of dewpoint.

6. Dew or moisture condensation are anticipated.

7. Surface temperature exceeds the manufacturer's recommendations.

3.04 INSPECTION

A. Each field coat of paint will be inspected and approved by the Engineer or his authorized representative before succeeding coat is applied. Tint successive coats so that no two coats for a given surface are exactly the same color. Tick-mark surfaces to receive black paint in white between coats.

B. Use magnetic dry film thickness gauges and wet fiber thickness gauges for quality control. Furnish magnetic dry film thickness gauge for use by the Engineer.

C. Coatings shall pass a holiday detector test.

D. Determination of Film Thickness: Randomly selected areas, each of at least 107.5 contiguous square feet, totaling at least 5% of the entire control area shall be tested. Within this area, at least 5 squares, each of 7.75 square inches, shall be randomly selected. Three readings shall be taken in each square, from which the mean film thickness shall be calculated. No more than 20 percent of the mean film thickness measurements shall be below the specified thickness. No single measurement shall be below 80 percent of the specified film thickness. Total dry film thickness greater than twice the specified film thickness shall not be acceptable. Areas where the measured dry film thickness exceeds twice that specified shall be completely redone unless otherwise approved by the Engineer. When measured dry film thickness is less than that specified additional coats shall be applied as required.

E. Holiday Testing: Holiday test painted ferrous metal surfaces which will be submerged in water or other liquids, or surfaces which are enclosed in a vapor space in such structures. Mark areas which contain holidays. Repair or repaint in accordance with paint manufacturer's printed instructions and retest.

1. Dry Film Thickness Exceeding 20 Mils: For surfaces having a total dry film thickness exceeding 20 mils: Pulse-type holiday detector such as Tinker & Rasor Model AP-W, D.E. Stearns Co. Model 14/20, shall be used. The unit shall be adjusted to operate at the voltage required to cause a spark jump across an air gap equal to twice the specified coating thickness.

2. Dry Film Thickness of 20 Mils or Less: For surfaces having a total dry film thickness of 20 mils or less: Tinker & Rasor Model M1 non-destructive type holiday detector, K-D Bird Dog, shall be used. The unit shall operate at less than 75-volts. For thicknesses between 10 and 20 mils, a non-sudsing type wetting agent, such as Kodak Photo-Flow, shall be added to the water prior to wetting the detector sponge.

F. Paint manufacturer or his representative shall provide their services as required by the Engineer. Services shall include, but not be limited to, inspecting existing paint, determination of best means of surface preparation, inspection of completed work, and final inspection of painted work 11 months after the job is completed.

3.05 PROTECTION OF ADJACENT FINISHED SURFACES AND OPERATING EQUIPMENT

A. Use covers, masking tape, other method when protection is necessary, or requested by Owner or Engineer. Remove unwanted paint carefully without damage to finished paint or surface. If damage does occur, repair the entire surface adjacent to and including the damaged area without visible lap marks and without additional cost to the Owner.

B. Take all necessary precautions to contain dispersion of sandblasting debris and paint to the limits of the work. Take into account the effect of wind and other factors which may cause dispersion of the sandblasting debris and paint. Suspend painting operations when sanding debris or paint cannot be properly confined. Assume all responsibilities and costs associated with damage to adjacent structures, vehicles, or surfaces damaged by the surface preparation and painting operations.

C. During painting operations, cover and enclose within tenting, MCC sections, electrical panels, pumps, and similar equipment in operation and items not intended to be painted. Temperatures within tented areas shall not rise above 90°F during equipment operation and/or painting operations. Ventilate tented areas as required for temperature control.

3.06 PIPING AND EQUIPMENT IDENTIFICATION

A. Piping and equipment identification shall be in accordance with Section 15030, Piping and Equipment Identification Systems.

3.07 SCHEDULE OF COLORS

A. Match colors indicated. Piping and equipment colors are indicated in Section 15030. Colors which are not indicated shall be selected from the manufacturer's full range of colors by the Engineer. No variation shall be made in colors without the Engineer's approval. Color names and numbers shall be identified according to the appropriate color chart issued by the manufacturer of the particular product in question.

3.08 WORK IN CONFINED SPACES

A. Provide and maintain safe working conditions for all employees. Supply fresh air continuously to confined spaces through the combined use of existing openings, forced-draft fans and temporary ducts to the outside, or direct air supply to individual workers. Exhaust paint fumes to the outside from the lowest level in the contained space. Provide explosion-proof electrical fans, if in contact with fumes. No smoking or open fires will be permitted in, or near, confined spaces where painting is being done. Follow OSHA, state and local regulations at all times.

3.09 OSHA SAFETY COLORS

A. Paint wall around wall-mounted breathing or fire apparatus with the appropriate safety red color; area not exceed 2-feet wide by 3-feet high, unless apparatus covers the area. Fire apparatus include fire hoses, extinguisher, and hydrants.

B. Paint hazardous areas and objects in accordance with OSHA regulations.

TABLE 9-1
PAINTING SCHEDULE

| SURFACE | APPLICATION | PAINTING SYSTEM & NO. OF COATS | PRODUCT REFERENCE (TABLE 9.2) | TOTAL MIN. DRY FILM THICKNESS (MILS) |
|---|---|---|---|---|
| Concrete and Masonry | | | | |
| Interior masonry and concrete walls [1] | All new structures and repair as need to existing structures | 1 coat sealer<br>2 coats acrylic epoxy | 101<br>116 | 75-85 sq.ft./gal.<br>4-6/coat |
| Exterior masonry cavity walls on cavity face of inner wythe | All new structures | Dampproofing | See Section 07150 | |
| Exterior below grade if interior is dry | Accessible areas (pump room below grade, etc.) | Waterproofing | See Section 07100 | |
| Containment Liner[1] | Secondary containment floors and walls and repair as need to existing structures | 2 coats high solids epoxy coating | 119 | 6-10/coat |
| Metals | | | | |
| Interior and exterior nonsubmerged (gloss) [1] | All new blowers, pumps, motors and mechanical equipment, piping, etc. | 1 coat epoxy polyamide primer<br>1 coat epoxy polyamide<br>1 coat aliphatic polyurethane | 104<br>102<br>115 | 4-6<br>4-6<br>3-5 |
| Submerged Wastewater | All metal piping, and mechanical equipment, etc. | 2 coats high solids epoxy | 119 | 8-10/coat |
| Steel doors and door frames, bollards, steel lintels, monorails, non-galvanized structural steel, misc. metals (steel) [1] | | 1 coat epoxy polyamide<br>1 coat aliphatic polyurethane | 102<br>115 | 5-8<br>3-4 |
| Aluminum surfaces in contact with concrete | | 2 coats coal tar | 107 | 26 |
| Galvanized Structural Steel | | Galvanized per Section 05035 | | |
| Interior: Tar-dipped piping where color is required[1] | | 2 coats epoxy resin sealer<br>2 coats epoxy polyamide | 112<br>102 | 5-8/coat<br>5-8/coat |
| PVC Piping | | 1 coat epoxy polyamide<br>1 coat aliphatic polyurethane | 102<br>115 | 5-8<br>3-4 |

Notes: 1 Repair any existing paint coatings damaged during construction as required with paint coating compatible with existing paint coatings. Prepare existing surfaces as recommend by paint coating manufacturer before repairing existing paint coatings.

TABLE 9-2

PRODUCT LISTING

| REF. | SYSTEM | PURPOSE | PRODUCT | | | |
|---|---|---|---|---|---|---|
| | | | Tnemec Series | AMERON | CARBOLINE | Sherwin-Williams |
| 101 | Epoxy filler | Primer-sealer | 130-6601 | AMERCOAT 147 | Sanitile 100 | Cement-Plex 875 |
| 102 | Epoxy polyamide | Finish coat semi-gloss or gloss | 66 | AMERCOAT 385 | Carboline 890 | Macropoxy 646 |
| 104 | Epoxy Polyamide – metal | Primer | 66 | AMERCOAT 385 | Carboline 893SG | Macropoxy 646 |
| 107 | Coal tar | Sealer | 46-465 | AMERCOAT 78HB | Bitumastic 300M | Hi-Mil Sher Tar Epoxy |
| 112 | Epoxy polyamide | Sealer | 66-1211 | AMERCOAT 385 | Carboguard 893SG | Macropoxy 920 Pre-Prime |
| 115 | Aliphatic Polyurethane | Finish coat | 1074 or 1075 | AMERCOAT 450 HS | Carbothane 134HB | Acrolon 218HS |
| 116 | Acrylic epoxy | Finish coat | 113 or 114 | AMERCOAT 335 | Sanitile 255 | Water-Based Catalyzed Epoxy |
| 119 | High solids epoxy | Finish coat | 104 | AMERLOCK 400 | Carboline 890 | Tank Clad HS |

- END OF SECTION -

# SECTION 10400

# IDENTIFYING DEVICES

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Furnish all labor, materials, equipment and appliances required for the complete execution of the Work as shown on the Drawings and specified herein.

B. Principal items of work include:

1. Caution signs.

2. Safety signs

### 1.02 SUBMITTALS

A. In accordance with the procedures and requirements set forth in Section 01300, Submittals, submit the following:

1. Color and finish samples for signs.

2. Shop Drawings shall include, but not be limited to:

a. Complete details for all signs giving sizes and styles of lettering and colors.

b. Complete schedules for all signs giving location, message, letter, size, color, and method of attachment.

c. Details of fabrication and attachment of all items.

### 1.03 DELIVERY, STORAGE AND HANDLING

A. Deliver all materials in unopened, unbroken and undamaged original packaging bearing the manufacturer's label and identification for installation.

B. Handle all materials with care to prevent defacement of any nature.

## PART 2 -- PRODUCTS

### 2.01 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Specifications, provide products from one of the following manufacturers, or equal:

1. Andco Industries Corporation

2. Interface Architectural Signage Incorporated

3. Environmental Sign Systems

2.02 MATERIALS

A. Plastic signs shall be self extinguishing plastic with raised letters meeting the requirements of the American with Disabilities Act of 1990; total thickness minimum of 0.125 inch; rounded corners.

B. Character size and style shall be 3/4 inch high upper case Helvetica. Spacing and proportions of letters shall be in strict accordance with the Americans with Disabilities Act of 1990.

C. Colors shall be as selected by the Owner from the manufacturer standard colors.

D. Materials shall be suitable for exterior or interior exposure as applicable.

2.03 ACCESSORIES

A. Mounting Hardware: Stainless steel screws.

B. Tape Adhesive: Double sided tape, permanent adhesive.

2.04 FABRICATION

A. All items specified herein to be factory fabricated to the extent practicable.

B. Provide all attachments and anchors necessary for concealed installments for signs.

PART 3 -- EXECUTION

3.01 INSTALLATION

A. All materials specified herein shall be installed in compliance with the approved manufacturer's printed specifications. Mounting devices, bolts, screws, nuts and the like shall be of high strength aluminum or stainless steel. The final location of each sign shall be as determined by the Engineer.

3.02 ADJUSTMENT AND CLEANING

A. After completion of project, remove all protective devices, touch up as necessary and clean all exposed surfaces with a mild solution of detergent and warm water. Leave all surfaces in a neat and clean condition.

3.03 SCHEDULES

A. CAUTION SIGNS shall have a yellow background with the word CAUTION 2 inches high with white letters and black background centered above wording below in black letters. Each sign shall be provided with pictogram showing figure in compliance with sign (i.e. a figure wearing glasses).

| Wording | Size | Quantity |
|---|---|---|
| CAUTION: AUTOMATIC STARTING EQUIPMENT | 7x17 | 2 |
| NOTICE: NON POTABLE WATER NOT TO BE USED FOR DRINKING | 10 X 14 | 4 |

B. SAFETY SIGNS. Signs shall comply with ANSI Z S35 requirements.

| Wording | Size | Quantity |
|---|---|---|
| CONFINED SPACE – DO NOT ENTER | 7x7 | 5 |
| PERMIT REQUIRED – CONFINED SPACE | 7x7 | 5 |
| SODIUM HYPOCHLORITE – RIGHT TO KNOW | 10 X 14 | 2 |
| SODIUM HYDROXIDE – RIGHT TO KNOW | 10 X 14 | 2 |
| CARBON SYSTEM – RIGHT TO KNOW | 10 X 14 | 2 |

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# SECTION 11000

# EQUIPMENT GENERAL PROVISIONS

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. The Contractor shall furnish, install, test, and place in acceptable operation all mechanical equipment and all necessary accessories as specified herein, as shown on the Drawings, and as required for a complete and operable system.

B. The mechanical equipment shall be provided complete with all accessories, special tools, spare parts, mountings, and other appurtenances as specified, and as may be required for a complete and operating installation.

C. It is the intent of these Specifications that the Contractor shall provide the Owner complete and operational equipment/systems. To this end, it is the responsibility of the Contractor to coordinate all interfaces with related mechanical, structural, electrical, instrumentation and control work and to provide necessary ancillary items such as controls, wiring, etc., to make each piece of equipment operational as intended by the Specifications.

D. The complete installation shall be free from excessive vibration, cavitation, noise, and oil or water leaks.

E. The requirements of this section shall apply to equipment furnished under Divisions 11, 13, 14, and 15.

### 1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. All equipment, materials, and installations shall conform to the requirements of the most recent editions with latest revisions, supplements, and amendments of the specifications, codes, and standards listed in Section 01090, Reference Standards.

### 1.03 PERFORMANCE AFFIDAVITS

A. When required in the individual equipment Specifications, the Contractor shall submit manufacturer's Performance Affidavits for equipment to be furnished.

B. By these affidavits, each manufacturer must certify to the Contractor and the Owner, jointly, that he has examined the Contract Documents and that the equipment, apparatus, or process he offers to furnish will meet in every way the performance requirements set forth or implied in the Contract Documents.

C. The Contractor must transmit to the Engineer three (3) original copies of the affidavit given him by the manufacturer or supplier along with the initial Shop Drawing submittals.

D. The Performance Affidavit must be signed by an officer of the basic corporation, partnership, or company manufacturing the equipment and witnessed by a notary public.

E. The Performance Affidavit shall have the following format:

Addressed to: (Contractor) and FULTON COUNTY DEPARTMENT OF PUBLIC WORKS

Reference: RIVERSIDE ROAD PUMP STATION

Text: (Manufacturer's Name) has examined the Contract Documents and hereby state that the (Product) meets in every way the performance requirements set forth or implied in Section ____ of the Contract Documents.

Signature: Corporate Officers shall be Vice President, or higher. (Unless statement authorizing signature is attached.)

1.04 SHOP DRAWINGS

A. Shop Drawings shall be submitted to the Engineer for all equipment in accordance with Section 01300, Submittals and shall include the following information in addition to the requirements of Section 01300, Submittals:

1. Performance characteristics and descriptive data.

2. Detailed equipment dimensional drawings (both plan and section views) and setting plans.

3. General lifting, erection, installation, and adjustment instructions, and recommendations.

4. Complete information regarding location, type, size, and length of all field welds in accordance with “Standard Welding Symbols” AWS A2.0 of the American Welding Society. Special conditions shall be fully explained by notes and details.

5. The total uncrated weight of the equipment plus the approximate weight of shipped materials. Support locations and loads that will be transmitted to bases and foundations. Exact size, placement, and embedment requirements of all anchor bolts.

6. Details on materials of construction of all components including applicable ASTM designations.

7. Information on bearing types and bearing life.

8. Gear box design and performance criteria and AGMA service factor.

9. Piping schematics

10. Motor data sheet indicating motor horsepower; enclosure type; voltage; insulation class; temperature rise and results of dielectric tests; service-rating; rotative speed; motor speed-torque relationship; efficiency and power factor at ½, ¾, and full load; slip at full load; running, full load, and locked rotor current values; and safe running time-current curves.

11. Equipment and motor protective device details. Connection diagrams for motor and all protective devices.

12. Equipment shop coating systems, interior and exterior.

13. Panel layout drawings, schematic wiring diagrams, and component product data sheets for control panels.

14. A list of spare parts and special tools to be provided.

15. Any additional information required to show conformance with the equipment specifications.

16. Warranty documentation including statement of duration of warranty period and contact phone numbers and addresses for warranty issues.

B. SHOP DRAWINGS ON ITEMS REQUIRING PERFORMANCE AFFIDAVITS WILL NOT BE REVIEWED UNTIL ACCEPTABLE PERFORMANCE AFFIDAVITS ARE RECEIVED.

1.05 OPERATION AND MAINTENANCE INSTRUCTION/MANUALS

A. Operation and Maintenance (O&M) manuals shall be submitted in accordance with Section 01300, Submittals, and Section 01730, Operation and Maintenance Manuals.

1.06 GENERAL INFORMATION AND DESCRIPTION

A. All parts of the equipment furnished shall, be designed and constructed for the maximum stresses occurring during fabrication, transportation, installation, testing, and all conditions of operation. All materials shall be new, and both workmanship and materials shall be entirely suitable for the service to which the units are to be subjected and shall conform to all applicable sections of these Specifications.

B. All parts of duplicate equipment shall be interchangeable without modification. Manufacturer's design shall accommodate all the requirements of these Specifications.

C. Equipment and appurtenances shall be designed in conformity with ASTM, ASME, AIEE, NEMA, and other generally accepted applicable standards.

D. All bearings and moving parts shall be adequately protected by bushings or other approved means against wear, and provision shall be made for accessible lubrication by extending lubrication lines and fittings to approximately 30 inches above finished floor elevation.

E. Details shall be designed for appearance as well as utility. Protruding members, joints, corners, gear covers, etc., shall be finished in appearance. All exposed welds on machinery shall be ground smooth and the corners of structural shapes shall be rounded or chamfered.

F. Machinery parts shall conform within allowable tolerances to the dimensions shown on the working drawings.

G. All machinery and equipment shall be safeguarded in accordance with the safety codes of the USA and the State in which the project is located.

H. All rotating shafts, couplings, or other moving pieces of equipment shall be provided with suitable protective guards of sheet metal or wire mesh, neatly and rigidly supported. Guards shall be removable as required to provide access for repairs.

I. All equipment greater than 100 pounds shall have lifting lugs, eyebolts, etc., for ease of lifting, without damage or undue stress exerted on its components.

J. All manufactured items provided under this Section shall be new, of current manufacture, and shall be the products of reputable manufacturers specializing in the manufacture of such products.

1.07 WARRANTY AND GUARANTEE

A. All equipment shall be guaranteed in accordance with the General Conditions as modified by the Supplementary Conditions.

B. Guarantee requirements may be added to or modified in the individual equipment specifications.

PART 2 -- PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. The materials covered by these Specifications are intended to be equipment of proven reliability, and as manufactured by reputable manufacturers having experience in the production of such equipment. The Contractor shall, upon request of the Engineer, furnish the names of not less than 5 successful installations of the manufacturer's equipment of the same size and model of that offered under this contract. The equipment furnished shall be designed, constructed, and installed in accordance with the industry accepted practices and shall operate satisfactorily when installed as shown on the Drawings and operated per manufacturer's recommendations.

2.02 ANCHORS AND SUPPORTS

A. The Contractor shall furnish, install, and protect all necessary guides, bearing plates, anchor and attachment bolts, and all other appurtenances required for the installation of the devices included in the equipment specified. Working Drawings for installation shall be furnished by the equipment manufacturer, and suitable templates shall be used by the Contractor when required in the detailed equipment Specifications.

B. Anchor bolts and fasteners shall be furnished in accordance with Section 05050, Metal Fastening, and with the individual equipment Specifications. All anchor bolts shall be a minimum of 1/2-inch diameter. All anchor bolts, handrail bolts, washers, clips, clamps, and fasteners of any type shall be constructed of 316 stainless steel, unless otherwise specified the individual equipment Specifications.

C. The Contractor shall provide all concrete pads or pedestals required for equipment furnished. All concrete equipment pads shall be a minimum of 6” high, unless otherwise shown on the Drawings and shall be doweled.

D. Pipe sleeves or other means of adjusting anchor bolts shall be provided where indicated or required. Equipment shall be leveled by first using sitting nuts on the anchor bolts, and then filling the space between the equipment base and concrete pedestal with non-shrink grout, unless alternate methods are recommended by the manufacturer and are acceptable to the Engineer (such as shim leveling pumps, or chemical grout). Non-shrink grout shall be as specified in Section 03600, Grout.

2.03 STRUCTURAL STEEL

A. Structural steel used for fabricating equipment shall conform to the requirements of Section 05120, Structural Steel.

B. All materials shall conform to applicable provisions of the AISC Specifications for the design and fabrication of structural steel, and to pertinent ASTM Standard Specifications.

2.04 DISSIMILAR METALS

A. All dissimilar metals shall be properly isolated to the satisfaction of the Engineer.

2.05 GALVANIZING

A. Where required by the equipment specifications, galvanizing shall be performed in accordance with Section 05035, Galvanizing.

2.06 STANDARDIZATION OF GREASE FITTINGS

A. The grease fittings on all mechanical equipment shall be such that they can be serviced with a single type of grease gun. Fittings shall be “Zerk” type.

2.07 ELECTRICAL REQUIREMENTS

A. All electrical equipment and appurtenances, including but not limited to motors, panels, conduit and wiring, etc., specified in the equipment specifications shall comply with the applicable requirements of the Division 16 specifications and the latest National Electric Code.

B. Motors shall conform to the applicable requirements of Section 15170, Electric Motors. Medium voltage motors shall conform to the applicable requirements of Section 11221, Medium Voltage Electric Motors.

C. In the individual equipment specifications, specified motor horsepower is intended to be the minimum size motor to be provided. If a larger motor is required to meet the specified operating conditions and performance requirements, the Contractor shall furnish the larger sized motor and shall upgrade the electrical service (conduit, wires, starters, etc.) at no additional cost to the Owner.

D. Motor starters and controls shall be furnished and installed under Division 16 and Division 17 unless otherwise specified in the individual pump specifications.

## 2.08 ACCESSORIES, SPARE PARTS, AND SPECIAL TOOLS

A. Spare parts for equipment shall be furnished where indicated in the equipment Specifications or where recommended by the equipment manufacturer.

B. Spare parts shall be identical and interchangeable with original parts.

C. The spare parts shall be packed in containers suitable for long term storage, bearing labels clearly designating the contents and the pieces of equipment for which they are intended.

D. Painting requirements for spare parts shall be identical to those for original, installed parts. Where no painting or protective coating is specified, suitable provisions shall be made to protect against corrosion.

E. Spare parts shall be delivered at the same time as the equipment to which they pertain. Spare parts shall be stored separately in a locked area, maintained by the Contractor, and shall be turned over to the Owner in a group prior to substantial completion. All of these materials shall be properly packed, labeled, and stored where directed by the Owner and Engineer.

F. The Contractor shall furnish all special tools necessary to operate, disassemble, service, repair, and adjust the equipment in accordance with the manufacturers operation and maintenance manual.

G. The Contractor shall furnish a one year supply of all recommended lubricating oils and greases. The manufacturer shall submit a list of at least four manufacturer's standard lubricants which may be used interchangeably for each type of lubricant required. All of these materials shall be properly packed, labeled and stored where directed by the Engineer.

## 2.09 EQUIPMENT IDENTIFICATION

A. All mechanical equipment shall be provided with a substantial stainless steel nameplate, mechanically fastened with stainless steel hardware in a conspicuous place, and clearly inscribed with the manufacturer's name, year of manufacture, serial number, and principal rating data.

B. Each pump and other piece of mechanical equipment shall also be identified as to name and number by a suitable laminated plastic or stainless steel nameplate mechanically fastened with stainless steel hardware; for example, “Booster Pump #1”. Coordinate name and number with same on remotely located controls, control panel, and other related equipment.

C. Nameplates shall not be painted over.

## PART 3 -- EXECUTION

### 3.01 SHOP TESTING

A. All equipment shall be tested in the shop of the manufacturer in a manner which shall conclusively prove that its characteristics comply fully with the requirements of the Contract Documents and that it will operate in the manner specified or implied.

B. No equipment shall be shipped to the project until the Engineer has been furnished a certified copy of test results and has notified the Contractor, in writing, that the results of such tests are acceptable.

C. Seven (7) certified copies of the manufacturer's actual test data and interpreted results thereof shall be forwarded to the Engineer for review.

D. If required by the individual equipment Specifications, arrangements shall be made for the Owner/Engineer to witness performance tests in the manufacturer's shop. The Engineer shall be notified ten (10) working days before shop testing commences. Expenses are to be paid by the Contractor.

E. Shop testing of electric motors shall be in accordance with applicable requirements of Section 15170, Electric Motors, Section 11221, Medium Voltage Electric Motors, and Section 16000, Basic Electrical Requirements.

### 3.02 STORAGE OF EQUIPMENT AND MATERIALS

A. Contractor shall store his equipment and materials at the job site in strict accordance with the manufacturer's recommendations and as directed by the Owner or Engineer, and in conformity to applicable statutes, ordinances, regulations, and rulings of the public authority having jurisdiction. Equipment and materials shall not be delivered to the site prior to 90 days in advance of the scheduled installation. Partial payment requests will not be processed for materials delivered prior to 90 days before installation or for materials that are not properly stored.

B. Material or equipment stored on the job site is stored at the Contractor's risk. Any damage sustained of whatever nature shall be repaired to the Engineer's satisfaction at no expense to the Owner. Stored electrical equipment is to be protected from the elements and shall have space heaters energized.

C. Contractor shall not store unnecessary materials or equipment on the job site and shall take care to prevent any structure from being loaded with a weight which will endanger its security or the safety of persons.

D. Contractor shall observe all regulatory signs for loadings on structures, fire safety, and smoking areas.

E. Contractor shall not store materials or encroach upon private property without the written consent of the owners of such private property.

## 3.03 MANUFACTURER'S FIELD SERVICES

A. The Contractor shall arrange for a qualified Technical Representative from each manufacturer or supplier of equipment who is regularly involved in the inspection, installation, start-up, troubleshooting, testing, maintenance, and operation of the specified equipment. Qualification of the Technical Representative shall be appropriate to the type of equipment furnished and subject to the approval of the Engineer and the Owner. Where equipment furnished has significant process complexity, furnish the services of engineering personnel knowledgeable in the process involved and the function of the equipment. When necessary, the Contractor shall schedule multiple Technical Representatives to be present at the same time for the purpose of coordinating the operation of multiple pieces of related equipment.

B. For each site visit, the Technical Representative shall submit jointly to the Owner, the Engineer, and the Contractor a complete signed report of the results of his inspection, operation, adjustments, and testing. The report shall include detailed descriptions of the points inspected, tests and adjustments made, quantitative results obtained if such are specified.

C. The manufacturer's Technical Representative shall provide the following services.

1. Installation: The Technical Representative shall inspect the installed equipment to verify that installation is in accordance with the manufacturer's requirements. Where required by individual equipment specifications, the Technical Representative shall also supervise the installation of the equipment.

2. Testing: After installation of the equipment has been completed and the equipment is presumably ready for operation, but before it is operated by others, the Technical Representative shall inspect, operate, test, and adjust the equipment as required to prove that the equipment is in proper condition for satisfactory operation under the conditions specified. Unless otherwise noted in the signed site visit report, the report shall constitute a certification that the equipment conforms to the requirements of the Contract and is ready for startup and that nothing in the installation will render the manufacturer's warranty null and void. The report shall include date of final acceptance field test, as well as a listing of all persons present during tests.

3. Startup: The Technical Representative shall start up the equipment for actual service with the help of the Contractor. In the event that equipment or installation problems are experienced, the Contractor and the representative shall provide the necessary services until the equipment is operating satisfactorily and performing according to the specifications at no additional cost to the Owner. Unless otherwise noted in the signed site visit report, the report shall constitute a certification that the equipment conforms to the requirements of the Contract and is ready for permanent operation and that nothing in the installation will render the manufacturer's warranty null and void.

4. Training: The Technical Representative shall instruct the Owner's operating personnel in correct operation and maintenance procedures. The instruction shall demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment. Such instruction shall be scheduled at a time arranged with the Owner at least 2 weeks in advance of the

training and shall be provided while the respective Technical Representative's equipment is fully operational. The Contractor shall have submitted, and the Engineer shall have accepted, the O&M Manuals prior to commencement of training.

5. Services after Startup: Where required by the individual equipment specifications, the Technical Representative shall return to the project site thirty (30) days after the start up date to review the equipment performance, correct any equipment problems, and conduct operation and maintenance classes as required by the Owner. This follow-up trip is required in addition to the specified services of Technical Representative prior to and during equipment startup. At this time, if there are no equipment problems, each manufacturer shall certify to the Owner in writing that his equipment is fully operational and capable of meeting operating requirements. If the equipment is operating incorrectly, the Technical Representative will make no certification to the Owner until the problems are corrected and the equipment demonstrates a successful thirty (30) days operating period.

D. Services of the Technical Representative will require a minimum of three (3) site visits, one for installation and testing, one for startup, and one for training, and will be for the minimum number of days recommended by the manufacturer and approved by the Engineer but will not be less than the number of days specified in individual equipment sections.

E. The Contract amount shall include the cost of furnishing the Technical Representative for the minimum number of days specified, and any additional time required to achieve successful installation and operation. The times specified for services by the Technical Representative in the equipment Specifications are exclusive of travel time to and from the facility and shall not be construed as to relieve the manufacturer of any additional visits to provide sufficient service to place the equipment in satisfactory operation.

F. The Contractor shall notify the Engineer at least 14 days in advance of each equipment test or Owner training session.

G. The Technical Representative shall sign in and out at the office of the Engineer's Resident Project Representative on each day he is at the project.

3.04 INSTALLATION

A. The Contractor shall obtain written installation manuals from the equipment manufacturer prior to installation. Equipment shall be installed strictly in accordance with recommendations of the manufacturer. A copy of all installation instructions shall be furnished the Engineer's field representative one week prior to installation.

B. The Contractor shall have on hand sufficient personnel, proper construction equipment, and machinery of ample capacity to facilitate the work and to handle all emergencies normally encountered in work of this character. To minimize field erection problems, mechanical units shall be factory-assembled insofar as practical.

C. Equipment shall be erected in a neat and workmanlike manner on the foundations at the locations and elevations shown on the Drawings.

D. All equipment sections and loose items shall be match-marked prior to shipping.

E. For equipment such as pumping units, which require field alignment and connections, the Contractor shall provide the services of the manufacturer's qualified mechanic, millwright, or machinist, to align the pump and motor prior to making piping connections or anchoring the pump base. Alignment shall be as specified herein.

F. The Contractor shall furnish oil and grease for initial operation and testing. The manufacturer and grades of oil and grease shall be in accordance with the recommendations of the equipment manufacturer.

3.05 ALIGNMENT

A. Set equipment to dimensions shown on drawings. Dimensions shall be accurate to +/- 1/16 inch unless otherwise noted on the drawings. Wedges shall not be used for leveling, aligning, or supporting equipment.

B. General Equipment Leveling: Non-rotating equipment shall be set level to +/- 1/16 inch per 10 foot length (.005 inch per foot) unless otherwise noted on the drawings. Shims shall be used unless equipment is furnished with leveling feet. Set shims flush with equipment baseplate edges. When grouting is required, equipment shall be shimmed to allow a minimum of one inch grout thickness. Grout shall cover shims at least 3 inches. Final level check shall be held for inspection and approval by Engineer before proceeding.

C. Grouting

1. Fill anchor bolt holes or sleeves with grout, after bolt alignment is proven, and prior to placing grout under equipment bases.

2. Surface Preparation. Roughen surface by chipping, removing laitance, and unsound concrete. Clean area of all foreign material such as oil, grease, and scale. Saturate area with water at least 4 hours prior to grouting, removing excess water ponds.

3. Application. Place grout after the equipment base has been set and its alignment and level have been approved. Form around the base, mix grout, and place in accordance with the grout manufacturers published instructions. Eliminate all air or water pockets beneath the base using a drag chain or rope.

4. Finishing. Point the edges of the grout to form a smooth 45 degree slope.

5. After grout has cured (not before 3 days after placement) paint exposed surfaces of grout with shellac.

6. Level Verification. After grout has cured, and immediately prior to drive alignment, recheck equipment for level and plumb. Re-level and square as necessary. Hold final checks for inspection and approval by Engineer.

D. Inspect for and remove all machining burrs or thread pulls in female holes on mating surfaces of mounting frame and machine feet.

E. Inspect and clean equipment mounting base pads, feet, and frames to remove all grease, rust, paint and dirt.

F. Assembled equipment shafts shall be set level to .0015 inches per foot of shaft length (+/- .0005 inches) up to a maximum of 0.015 inches for any length shaft unless the manufacturers requirements are more stringent or unless otherwise noted in the equipment specifications. Use the machined surfaces on which the equipment sets for the base/mounting frame leveling plane. Use the machined shaft surface for equipment leveling plane.

G. Sprocket and Sheave Alignment. Check shaft mounted components for face runout and eccentricity (outside diameter) runout by magnetically mounting a dial indicator on a stationary base and indicating over 360 degrees on a continuous machined surface at the outside diameter of the component. Maximum allowable total indicated face runout and eccentricity for sprockets and sheaves will be per ANSI Standard B29.1-1975.

H. Belt tensioning. Set drive belt tension to manufacturer's specification for the belt type. Recheck alignment after drive tensioning.

I. Thermal/Mechanical Growth. Thermal/mechanical growth corrections for driver and driven machines will be used in vertical and horizontal alignment where applicable. The equipment manufacturer will determine thermal/mechanical growth applicability for any machine and provide the correction offsets to be used.

J. Rotating Shaft Alignment

1. Fixtures will be set up on the driver and driven machine, machines shaft surfaces. Machined coupling hubs may be used only if there is no clearance to mount fixtures directly on the shafts.

2. Primary alignment method for direct drive machines is when coupled. Uncoupled alignment will be used only when approved by the Engineer.

3. Account for possible coupling flex by always rotating coupled machines in the same direction during alignment.

4. Uncoupled machines must be connected so that both shafts turn together without relative motion during alignment.

5. Indicator bar sag will be measured and included for each reverse indicator alignment setup.

6. Reverse Dial Indicator. The final maximum allowable misalignment: vertical and horizontal from the desired targets of .000 inches (for a non-thermal growth machine) or from the given target readings (for a thermal growth machine) must meet BOTH of the following conditions simultaneously: 1/2 the final total indicator reading at each indicator will be no more than shown in the table below AND the final remaining correction at each machine foot be no more than .001 inches of required movement.

| Machine Speed (RPM) | Total Misalignment* (inches) |
|---|---|
| Up to 1800 | .002 |
| 1800 and greater | .001 |

* 1/2 indicator reading

## 3.06 FIELD TESTING

A. All equipment shall be set, aligned and assembled in conformance with the manufacturer's drawings and instructions. Provide all necessary calibrated instruments to execute performance tests. Submit report certified by the pump manufacturer's representative.

B. Preliminary Field Tests, Yellow Tag

1. As soon as conditions permit, after the equipment has been secured in its permanent position, the Contractor shall:

   a. Verify that the equipment is free from defects.
   b. Check for alignment as specified herein.
   c. Check for direction of rotation.
   d. Check motor for no load current draw.

2. Contractor shall flush all bearings, gear housings, etc., in accordance with the manufacturer's recommendations, to remove any foreign matter accumulated during shipment, storage or erection. Lubricants shall be added as required by the manufacturer's instructions.

3. When the Contractor has demonstrated to the Engineer that the equipment is ready for operation, a yellow tag will be issued. The tag will be signed by the Engineer, or his assigned representative and attached to the equipment. The tag shall not be removed.

4. Preliminary field tests, yellow tag, must be completed before equipment is subjected to final field tests, blue tag.

C. Final Field Tests, Blue Tag

1. Upon completion of the above, and at a time approved by the Engineer, the equipment will be tested by operating it as a unit with all related piping, ducting, electrical and controls, and other ancillary facilities.

2. The equipment will be placed in continuous operation as prescribed or required and witnessed by the Engineer or his assigned representative and the Owner or his assigned representative.

3. The tests shall prove that the equipment and appurtenances are properly installed, meet their operating cycles and are free from defects such as overheating, overloading, and undue vibration and noise. Operating field tests shall consist of the following:

   a. Check equipment for excessive vibration and noise as specified herein.

   b. Check motor current draw under load conditions. The rated motor nameplate current shall not be exceeded.

   c. Recheck alignment with dial indicators where applicable, after unit has run under load for a minimum of 24 hours.

D. In addition to the above described field tests, any other tests specifically required by Section 11100, Pumps – General, the individual equipment Specifications, or by the manufacturer shall be performed.

E. Until final field tests are acceptable to the Engineer, the Contractor shall make all necessary changes, readjustments and replacements at no additional cost to the Owner.

F. Upon acceptance of the field tests, a blue tag will be issued. The tag will be signed by the Engineer and attached to the unit. The tag shall not be removed and no further construction work will be performed on the unit, except as required during start-up operations and directed by the Engineer.

G. Defects which cannot be corrected by installation adjustments will be sufficient grounds for rejection of any equipment.

H. All costs in connection with field testing of equipment such as lubricants, temporary instruments, labor, equipment, etc., shall be borne by the Contractor. Power, fuel, chemicals, water, etc. normally consumed by specific equipment shall be supplied by the Owner unless otherwise specified in the individual equipment specifications.

I. The Contractor shall be fully responsible for the proper operation of equipment during tests and instruction periods and shall neither have nor make any claim for damage which may occur to equipment prior to the time when the Owner formally takes over the operation thereof.

J. Field testing of electric motors shall be in accordance with Section 15170, Electric Motors, Section 11221, Medium Voltage Electric Motors, and Section 16000, Basic Electrical Requirements.

3.07 VIBRATION TESTING

A. Unless specified otherwise in the detailed equipment specifications, each pump, blower, compressor, motor or similar item of stationary rotating equipment having a rated power in excess of 40HP shall be tested after installation for acceptable vibration levels.

B. Vibration testing shall be performed by an experienced factory-trained and authorized third-party analysis expert (not a sales representative) retained by the Contractor and approved by the Engineer. Each unit or pump system shall be tested separately without duplicate equipment running. All field testing shall be done in the presence of the Engineer. The Engineer shall be furnished with four (4) certified copies of vibration test data for each test performed.

C. For systems with variable speed drives, tests shall be conducted at various speeds between maximum and minimum. For systems with two-speed drives, tests shall be conducted at both speeds. For systems with constant-speed drive, tests shall be conducted under various loading conditions as determined by the Engineer.

D. All field vibration tests shall be performed with the equipment operating on the product for which it is intended, or a substitute acceptable to the Engineer.

E. The term displacement, as used herein, shall mean total peak-to-peak movement of vibrating equipment, in mils; velocity shall be measured in inches per second, RMS. Displacement and velocity shall be measured by suitable equipment equal to IRD Mechanalysis, Bentley, Nevada.

E. Frequency of vibration, in cycles per minute (cpm), shall be determined when vibration exceeds specified levels or as otherwise necessary. Vibration shall be measured on the bearing housing, unless other locations are deemed necessary by the vibration analysis expert and Engineer.

F. For all equipment tested, vibration shall be checked in the radial and axial directions. Unless otherwise specified elsewhere, axial vibration shall not exceed 0.1 in/sec; and radial vibration shall not exceed 0.2 in/sec. For pumps radial vibration shall not exceed that permitted by the Hydraulic Institute Standards except that, at vibration frequencies in excess of 8,000 cpm, the velocity shall not exceed 0.2 in/sec.

G. Copies of test results shall be submitted to the Engineer for review. Should the vibration field test results exceed shop test results, the manufacturer's recommendations, or the limits specified herein, the Contractor shall correct the deficiencies within thirty (30) days. After corrections have been completed, the vibration testing shall be re-run and the results re-submitted to the Engineer for review.

H. Noise or vibration in any rotating equipment which the Engineer judges to be excessive or damaging, shall be cause for rejection.

3.08 FAILURE OF EQUIPMENT TO PERFORM

A. Any defects in the equipment, or failure to meet the guarantees or performance requirements of the Specifications shall be promptly corrected by the Contractor by replacements or otherwise.

B. If the Contractor fails to make these corrections, or if the improved equipment shall fail again to meet the guarantees or specified requirements, the Owner, notwithstanding his having made partial payment for work and materials which have entered into the manufacture of said equipment, may reject said equipment and order the Contractor to remove it from the premises at the Contractor's expense.

C. The Contractor shall then obtain specified equipment to meet the contract requirements or upon mutual agreement with the Owner, adjust the contract price to reflect not supplying the specific equipment item.

D. In case the Owner rejects said equipment, then the Contractor hereby agrees to repay to the Owner all sums of money paid to him for said rejected equipment on progress certificates or otherwise on account of the lump sum prices herein specified.

E. Upon receipt of said sums of money, the Owner will execute and deliver to the Contractor a bill of sale of all his rights, title, and interest in and to said rejected equipment; provided, however, that said equipment shall not be removed from the premises until the Owner obtains from other sources other equipment to take the place of that rejected.

F. Said bill of sale shall not abrogate Owner's right to recover damages for delays, losses, or other conditions arising out of the basic contract.

## 3.09 PAINTING

A. All surface preparation, shop painting, field repairs, finish painting, and other pertinent detailed painting specifications shall conform to applicable sections of Section 09900, Painting.

B. All shop coatings shall be compatible with proposed field coatings.

C. All inaccessible surfaces of the equipment, which normally require painting, shall be finished painted by the manufacturer. The equipment and motor shall be painted with a high quality epoxy polyamide semi-gloss coating specifically resistant to chemical, solvent, moisture, and acid environmental conditions, unless otherwise specified.

D. Gears, bearing surfaces, and other unpainted surfaces shall be protected prior to shipment by a heavy covering of rust-preventive compound sprayed or hand applied which shall be maintained until the equipment is placed in operation. This coating shall be easily removable by a solvent.

## 3.10 WELDING

A. The Equipment Manufacturer's shop welding procedures, welders, and welding operators shall be qualified and certified in accordance with the requirement of AWS D1.1 “Structural Welding Code - Steel” or AWS D1.2 “Structural Welding Code - Aluminum” of the American Welding Society, as applicable.

B. The Contractor's welding procedures, welders, and welding operators shall be qualified and certified in accordance with the requirements of AWS D1.1 “Structural Welding Code - Steel” or AWS D1.2 “Structural Welding Code - Aluminum” of the American Welding Society, as applicable.

C. The Contractor shall perform all field welding in conformance with the information shown on the Equipment Manufacturer's drawings regarding location, type, size, and length of all welds in accordance with “Standard Welding Symbols” AWS A2.0 of the American Welding Society, and special conditions, as shown by notes and details.

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# SECTION 11100

# PUMPS - GENERAL

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. The Contractor shall furnish, install, test, and make fully operational all pumping equipment, complete with all necessary accessories, in compliance with the Contract Documents.

B. All pumping equipment shall be provided in accordance with the requirements of Section 11000, Equipment General Provisions.

C. The provisions of this section shall apply to all pumps and pumping equipment specified except where specifically noted otherwise in the Contract Documents.

D. The pumps shall be provided complete with all accessories, shims, sheaves, couplings, and other appurtenances as specified, and as may be required for a complete and operating installation.

### 1.02 SHOP DRAWINGS

A. Shop Drawings shall include the following information in addition to the requirements of Section 01300, Submittals, and Section 11000, Equipment General Provisions.

1. Details of shaft sealing system.

2. Pump performance curves at rated speed and reduced speed (if reduced speeds are specified). Curves shall indicate flow, head, efficiency, brake horsepower, NPSH required, and minimum submergence. Curves shall include limits (minimum and maximum flows) for stable operation without cavitation, overheating, recirculation, or excessive vibration. Pump manufacturer shall also create a system curve for each pumping application from information provided to them by the Engineer and shall submit the system curve along with the Shop Drawings.

3. General cutaway sections, materials, dimension of shaft projections, shaft and keyway dimensions, shaft diameter, dimension between bearings, general dimensions of pump, suction head bolt orientation, and anchor bolt locations and forces.

4. Foundry certificates and results of Brinnell hardness testing showing compliance to ASTM A 532 (where required in the individual pump specifications).

5. Submersible pump submittals shall also include:
   a. Product data sheets for power and control cables and length of cables.
   b. Details on pump guide rail system and mounting requirements.

PART 2 -- PRODUCTS

2.01 MATERIALS

A. All materials employed in the pumping equipment shall be suitable for the intended application. Material not specifically called for shall be high-grade, standard commercial quality, free from all defects and imperfection that might affect the serviceability of the product for the purpose for which it is intended, and shall conform to the following requirements unless otherwise specified in individual pumping equipment Specifications:

1. Cast iron pump casings and bowls shall be of close-grained gray cast iron, conforming to ASTM A 48, or equal.

2. Bronze pump impellers shall conform to ASTM B 584, “G” bronze.

3. Stainless steel pump shafts shall be of Type 400, Series. Miscellaneous stainless steel parts shall be of Type 316.

B. Suction and discharge flanges shall conform to ANSI standard B16.1 or B16.5 dimensions.

C. Handholes on pump casings shall be shaped to follow the contours of the casing to avoid any obstructions in the water passage.

2.02 APPURTENANCES

A. Pressure Gauges

1. The Contractor shall furnish and install pressure gauges on the suction and discharge of each pump, except wet-pit submersible pumps and vertical turbine pumps.

2. The Contractor shall furnish and install pressure gauges on the discharge piping of each wet-pit submersible pump and vertical turbine pump in the locations shown on the Drawings or as directed by the Engineer.

3. Suction gauges shall be of the single scale compound type to indicate both pressure and vacuum. Each suction gauge shall be graduated in feet of water over the span of 34 feet below and above zero.

4. Discharge gauges shall be graduated in feet from zero to a minimum of five (5) feet of water above the respective pump shutoff head or to a minimum of 30% above the maximum operation pressure, whichever is greater. Graduation shall be in feet of water.

5. All gauges shall be supplied by one manufacturer and shall be as specified in Section 17650, Pressure Gauges.

6. All gauges shall be provided with diaphragm seals or isolating ring seals as specified in Section 17698, Instrumentation and Control Accessories.

B. Flexible couplings for direct driven pumps shall be as manufactured by Falk, Dodge, Woods Corp., or equal and shall be furnished with guards in accordance with OSHA Rules and

Regulations. Spacer couplings shall be provided where necessary to allow removal of the pump rotating element without disturbing the driver.

2.02 ELECTRICAL REQUIREMENTS

A. All pumps shall be furnished with motors such that the motor shall not be overloaded throughout the full range of the pump operation, unless otherwise specifically approved by the Engineer.

B. Motor starters and controls shall be furnished and installed under Division 16 and Division 17 unless otherwise specified in the individual pump specifications.

2.03 EQUIPMENT IDENTIFICATION

A. In addition to the requirements of Section 11000, Equipment General Provisions, nameplate data for each pump shall include the rating in gallons per minute, rated head, speed, and efficiency at the primary design point.

PART 3 -- EXECUTION

3.01 INSTALLATION

A. Drains: All gland seals, air valves, and drains shall be piped to the nearest floor drain or trench drain with galvanized steel pipe or copper tube, properly supported with brackets.

B. Solenoid Valves: Where required, the pump manufacturer shall furnish and install solenoid valves on the water or oil lubrication lines. Solenoid valve electrical rating shall be compatible with the motor control voltage and shall be furnished complete with all necessary conduit and wiring installation from control panel to solenoid.

3.02 SHOP TESTING

A. Shop tests shall be performed in accordance with Section 11000, Equipment General Provisions, and except where stated otherwise herein, shall be conducted in accordance with applicable methods and standards of the American National Standard for Centrifugal Pump Tests by the Hydraulic Institute.

B. Pump testing shall be witnessed by the Owner/Engineer where specified in the individual pump specifications. The testing procedure shall be submitted to the Engineer for review before scheduling the testing. The Engineer shall be given at least 2 weeks advanced notice of the scheduled testing date.

C. Certified test curves for shall be provided for all centrifugal pumps unless otherwise specified in the individual pump specifications.

D. Pumps shall be within the tolerances specified by the Hydraulic Institute Standards with the following exceptions:

1. At design heads, +10% of design capacities or at design capacities, +5% of design heads.

2. No minus tolerances shall be allowed with respect to capacity, head, or efficiency at the design points.

E. For wet pit submersible pumps and vertical turbine pumps, all tests shall be run at minimum pump submergence specified in the individual pump specifications.

F. Where required in the individual pump specifications, each individual casting shall be Brinnell tested in a minimum of two places, in an area of representative casting thickness to ASTM Method E-10. Results shall be certified by a registered Professional Engineer. Test results shall verify the satisfaction of the required Brinnell hardness of the finished product as specified in respective subsections.

3.03 FIELD TESTING

A. Field tests shall be performed in accordance with in Section 11000, Equipment General Provisions, and additionally as specified below and in the individual pump specifications.

B. Final acceptance tests shall demonstrate the following:

1. The pumps have been properly installed and are in proper alignment.

2. The pumps operate without overheating or overloading of any parts and without objectionable vibration. Vibration shall be within the Hydraulic Institute limits, or manufacturer's limits if more stringent.

3. The pumps can meet the specified operating conditions. All pumps shall be checked at maximum speed for a minimum of four points on the pump curve for capacity, head, and amperage. The rated motor nameplate current shall not be exceeded at any point. Pumps with drive motors rated at less than five horsepower shall only be tested for overcurrent when overheating or other malfunction becomes evident in general testing.

- END OF SECTION -

SECTION 11133

SUBMERSIBLE SUMP PUMP

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Furnish and install submersible non-clog sump pumps at the locations shown on the Drawings and as specified herein. All pumps shall be supplied by the same manufacturer.

B. Equipment shall be provided in accordance with the requirements of Section 11000, Equipment General Provisions and Section 11100, Pumps - General.

### 1.02 OPERATING CONDITIONS AND PERFORMANCE REQUIREMENTS

A. Sump Pump Schedule:

| | **SD-P-1A&B** | **SD-P-2A&B** |
|---|---|---|
| Arrangement | Duplex | Duplex |
| Design Capacity (gpm)* | 120 | 120 |
| Total Dynamic Head (ft.) | 43 | 43 |
| Max. Motor Horsepower | 5 | 5 |
| Max. Pump Speed (rpm) | 3600 | 3600 |
| Min. Size of Solids (in.) | 1.3 | 1.3 |
| Discharge Diameter (in.) | 2 or 3 | 2 or 3 |
| Area Classification | Unclassified | Unclassified |
| Control Panel Rating | NEMA 4X | NEMA 4X |

* Capacity per pump for Duplex units.

## PART 2 -- PRODUCTS

### 2.01 ACCEPTABLE MANUFACTURERS

A. The pumps shall be submersible sewage pumps as manufactured by Myers, Zoeller, Flygt, or equal.

### 2.02 MATERIALS

A. Pump Construction - The lifting cover, stator housing, and volute casing shall be close grained cast iron conforming to ASTM A48-Class 25 through 35. All exposed nuts, bolts, washers, and other fastening devices shall be Type 304 stainless steel.

B. Casing shall be completely open from suction to discharge with no wearing rings or impeller faceplates required. All internal case clearances shall be equal to the inlet diameter so that all materials which will pass through the inlet can pass through the pump.

C. Impeller shall be of either the flow through or recessed design. The impeller shall be secured to the motor shaft per manufacturers recommendations.

D. Shafting shall be constructed of high grade carbon steel, Grade 1045 (minimum), for the pump and motor, and sufficiently large in diameter to transmit safely the maximum torque developed by the drive unit and of such a design as to provide a rigid support for the impeller and to prevent excessive vibration. The shaft shall be suitably heat-treated, turned, ground, and polished over its entire length. The shaft shall be protected from wear through the seal box by a removable hardened 416 stainless steel shaft sleeve with seal to prevent leakage under the sleeve.

E. Shaft Seal for the pump and motor shaft shall utilize a mechanical seal. The mechanical seal shall consist of carbon and ceramic seal faces running in an oil-filled chamber to provide constant lubrication, BUNA N or ethylene propylene flexible members, brass or stainless steel metal parts and 18-8 stainless steel spring.

F. Bearings shall be of the anti-friction ball or roller type. Bearings shall be heavy-duty, permanently oil lubricated which will carry all radial and axial thrust loads. Bearings shall have a minimum ABMA $L_{10}$ life of 30,000 hours under worst possible operating conditions.

2.03 ELECTRICAL AND CONTROL REQUIREMENTS

A. All electrical appurtenances shall be rated for installation in classified areas as indicated in the Sump Pump Schedule.

B. Motors shall conform to all applicable parts of Section 15170. The pump motor shall be designed for 460 volt, 60 Hertz, three-phase operation. See sump pump schedule for motor horsepower. Motors shall be mounted on each pump and shall conform to the latest applicable NEMA, IEEE, and ANSI standards for submersible service. The motors shall be rated for continuous duty with a minimum service factor of 1.15.

1. The pump motor shall be squirrel-cage induction type, housed in a watertight chamber.

2. The stator winding and stator leads shall be moisture resistant.

3. Insulation shall be manufacturer's premium grade Class F insulation rated 155° C, 40° C ambient plus 115° C rise. The stator shall be dipped and baked three times in Class F varnish and shall be heat-shrink fitted into the stator housing.

4. The use of bolts, pins, or other fastening devices requiring penetration of the stator housing shall not be allowed.

5. The motor shall be guaranteed for continuous unsubmerged duty, capable of sustaining a minimum of ten (10) starts per hour without overheating.

6. The motor shall be provided with pre-lubricated radial and thrust bearings which are designed to carry the entire load which may be imposed upon it under all operating conditions.

7. All motors shall be of nationally known manufacture and shall be housed in enclosures specifically designed for submersible pump application.

C. The cable entry water seal design shall insure a watertight and submersible seal.

1. The junction chamber, containing the terminal board, shall be sealed from the motor by elastomer compression O-ring seal.

2. Connection between the cable conductors and stator leads shall be made with threaded compressed type binding post permanently affixed to a terminal board and thus perfectly leak proof.

D. Power and control cables between the pumps and the control panel shall be provided by the pump manufacturer who shall be responsible for reviewing the electrical drawings as necessary to determine the required cable length. All pumps for the same application shall be provided with the same length of cable. No splices shall be allowed unless specifically called for in the electrical drawings. Cable shall be hypalon jacketed SPC cable suitable for submersible pump applications and shall be sized according to NEC and ICEA standards. Stainless steel strain relief connectors shall be furnished for all cables.

E. Float switches shall be provided with the pump controls. Float switches shall comply with requirements specified under Division 17, Control and Information System. Float switches shall be set and shall operate according to the sump pump schematic and installation details shown on the Drawings and as specified herein. Float switches to be installed in classified areas shall be intrinsically safe and suitable for use in the classified area as specified in the Sump Pump Schedule.

2.04 CONTROL PANELS

A. Motor starters and controls for the 480 VAC, 3-phase sump pump installations shall be provided in a NEMA 4X 316 stainless steel control panel. Control panels shall conform to all requirements of Sections 17500 – Enclosures, General and 17510 – Cabinets and panels. The control panels shall be assembled using NEMA rated components. Components designed and built to International Electrotechnical Commission (IEC) standards are not recognized. Equipment designed, manufactured and labeled in compliance with IEC standards is not acceptable.

B. The control panel shall include, but not be limited to, the following:

1. A single circuit breaker type lockable disconnect switch operable from outside the control panel.

2. A motor circuit protector and full voltage nonreversing magnetic starter for each pump. The motor starter shall be NEMA Size 1 (minimum) for each pump.

3. Each pump shall be provided with a Hand-Off-Auto (H-O-A) control switch on the front of the control panel with control in the automatic mode by float switches in the

sump. Automatic controls for duplex installations shall also include automatic alternation of duty and standby pumps after each shutdown.

4. Control power shall be 120 VAC from an integral, fused control power transformer.

5. Each control panel for duplex installations shall include alarm/indication lights and legend plates on the front of the control panel for “high water level,” “control power on”, “lead pump on” and “lag pump on”. A high level float switch shall activate a remote “sump high water alarm” through un-powered auxiliary alarm contact.

6. Provide un-powered contacts for remote monitoring for the following:
   a. Pump Running
   b. Common trouble alarm
   c. Sump High Water Level

C. Provide four (4) suspended float type switches for mounting in the sump and controlling the pumps. Float switches are to meet the requirements of Section 17670.

D. Control Function: Standard pump down control sequence with 4 floats – “ALL PUMPS OFF”, “START LEAD”, “START LAG/ALARM”, “HIGH SUMP LEVEL ALARM”. Include pump protective devices (high temperature, moisture) in the control sequence to stop the pump and alarm.

2.05 SPARE PARTS

A. Spare parts shall be provided in accordance with Section 11000, Equipment General Provisions and shall include the following for each size pump:

Two (2) - sets of seals, “O” rings
One (1) – spare pump

PART 3 -- EXECUTION

3.01 MANUFACTURER’S FIELD SERVICES

A. The services of a qualified manufacturer’s technical representative shall be provided in accordance with Section 11000, Equipment General Provisions.

| **Service** | **Number of Trips** | **Number of Days/Trip** |
|---|---|---|
| Installation and Testing | 1 | 1 |
| Startup and Training | 1 | 1 |

- END OF SECTION -

SECTION 11141

CHOPPER-TYPE SUBMERSIBLE PUMPS

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Furnish, install, and test centrifugal chopper-type submersible pumps at the locations shown on the Drawings and as specified herein.

B. Provide equipment in accordance with the requirements of Section 11000, Equipment General Provisions and Section 11100, Pumps - General.

### 1.02 RELATED REQUIREMENTS

A. The Drawings show general arrangement, location, and basic dimensions.

B. Related work as called for on Drawings or specified in this or other Technical Specification Sections.

### 1.03 OPERATING CONDITIONS AND PERFORMANCE REQUIREMENTS

A. The chopper pump(s) are to be specifically designed to pump waste solids at heavy consistencies without plugging or dewatering of the solids. Materials shall be chopped/macerated and conditioned by the pump as an integral part of the pumping action. The pump must have demonstrated the ability to chop through and pump high concentrations of solids such as plastics, heavy rags, grease and hair balls, wood and paper products, and stringy materials without plugging, both in tests and field applications.

**Wet Well Recirculation/Dewatering Pumps**

| | | |
|---|---|---|
| Number of Units: | 2 | |
| Tag Numbers: | SW-P-1 | SW-P-2 |
| | Design Point | Secondary Operating Point |
| Design Capacity (gpm): | 1,200 | 600 |
| Minimum Total Dynamic Head (feet): | 14 | 35 |
| Minimum Efficiency: | 48% | |
| Maximum Brake Horsepower: | 15 | |
| Maximum Pump Speed (rpm): | 1,800 | |
| Temperature of Liquid Pumped: | Ambient | |
| Suction Condition: | Flooded | |
| Minimum Suction Diameter (In.): | 8 | |
| Minimum Discharge Diameter (In.): | 6 | |

### 1.04 SUBMITTALS

A. Furnish in accordance with Section 01300 - Submittals and Section 01730 - Operation and Maintenance Manuals.

1. Shop Drawings. In addition to the items specified in Section 01300, “Submittals”, furnish the following:

   a. Certified pump curves indicating total head, capacity, brake horsepower, and efficiency of complete pumping unit.

   b. Dimensioned installation drawings, and construction material designations by ASTM Standards.

2. Operation and Maintenance Manuals.

3. Furnish certified report prepared by manufacturer’s technical representative certifying satisfactory installation, operation and in-service placement of units.

1.05 QUALITY ASSURANCE

A. Standardization: All like equipment to be obtained from single manufacturer.

B. System Coordination: CONTRACTOR is responsible for all details necessary to properly install, adjust, and place in operation a working system.

C. Pump vendor to design and provide pump guide rail system.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, unload and store products on site in manner that prevents damage. Use special care to prevent damage from temperature and condensation.

B. Flanges to be protected by wooden blank flange protectors, strongly built and securely bolted thereto, or otherwise attached.

C. Power and control cables are to be shipped with securely attached caps on cable ends to prevent moisture wicking into cable while stored.

PART 2 -- PRODUCTS

2.01 MANUFACTURER(S)

A. Subject to compliance with the requirements of this Section, the following manufacturers have the capability of performing the work in this Section:

   1. Vaughan Co. Inc.

   2. Hayward Gordon

   3. Or Pre-Approved Equal.

B. The naming of a manufacturer in this Section is not an indication that the manufacturer’s standard equipment is acceptable in lieu of the specified component features. Naming is only an indication that the manufacturer may have the capability of engineering and supplying a system as specified.

## 2.02 MATERIALS AND/OR EQUIPMENT

A. Pumping Unit Construction and Materials:

1. Casing:
   a. Flanged ductile iron per ASTM A536 or cast iron per ASTM A48 Class 30.
   b. Back pull-out design with external adjustment of impeller-to-cutter clearance.
   c. Casing to be designed to be supported from discharge elbow, and have smooth rounded passages to minimize clogging.

2. Impeller:
   a. Material: Cast steel per ASTM A148.
   b. Hardened to 550 Brinell or Rockwell C 60 Hardness.
   c. Design: Two blade, semi-open type, with back pump-out vanes, carefully contoured to minimize clogging. Alternatively, the area behind the impeller to be protected from fouling by the cutting and expulsion action of serrated and sharpened teeth in the rear of the impeller shroud sweeping across spiral grooves in the casing backplate.
   d. Dynamically balanced.

3. Cutter System:
   a. Cutter Bar: Cast steel per ASTM A148, hardened to 550 Brinell or Rockwell C 60 Hardness, recessed into pump bowl and extend the full diameter across pump suction opening.
   b. Upper Cutter: Cast steel per ASTM A148, hardened to 550 Brinell or Rockwell C 60 Hardness, mounted between impeller and seal area and designed to cut against the pump-out vanes and impeller hub. Alternatively, the area behind the impeller to be protected from fouling by the cutting and expulsion action of serrated and sharpened teeth in the rear of the impeller shroud sweeping across spiral grooves in the casing backplate.

4. The following items to be provided if applicable to the furnished pump.
   a. Pump Shaft: AISI 4140 heat-treated steel.
   b. Shaft Sleeve: Type 316 stainless steel.

B. Submersible Motor:

1. U/L Listed and suitable for operation in Class I, Division I, Group D atmosphere.

2. Sized to be non-overloading at any point on the pump performance curve.

3. Service Factor: 1.15

4. Design: Squirrel cage induction, NEMA Design B for continuous operation.

5. Construction: Frame, end brackets, flange, and cap assembly to be cast iron ASTM A48, Class 25 or better.

6. Motor Shaft: Type 416 stainless steel.

7. Insulation: Moisture-resistant Class B with Class F materials.

8. Motor to have sufficient cooling and insulation to withstand ten (10) starts per hour, and be able to operate up to 15 minutes unsubmerged without tripping thermal protection devices.

9. Bearings:
   a. Upper Bearings: Single row, ball.
   b. Lower Bearings: Single row, ball.
   c. Bearings to have a $L_{10}$ "rating life" of 17,500 hours per ABMA 9.

8. Seals: Tandem mechanical seal system to run in oil-filled chamber. Lower seal to have stationary tungsten carbide ring and rotating carbon or tungsten carbide ring inside an Alloy 20 welded bellows. Upper seal to have carbon rotating face and ceramic stationary face. Each seal to have separate springs and positively driven rotating members. Alternatively, both upper and lower mechanical seals to have Silicon Carbide seal faces.

9. Thermal Protection: Equip motor with normally closed, thermal switches embedded in the coils of the stator windings. Switches to open on rise in temperature.

10. Moisture Protection: Furnish seal chamber moisture sensor.

11. Motor Cable: Special submersible service cable in one continuous length from pumping unit to the junction box. Size per NEC.

12. Cable Sealing: Epoxy encapsulated leads.

13. Fastenings and Fittings: Nuts, bolts and fastenings exposed to liquid pumped to be Type 300 Series stainless steel.

C. Accessories:

1. Discharge Elbow: Construct of ASTM A48 cast iron with ANSI Class 125 flanged outlet. For pumps without legs, design to support entire weight of pumping unit.

2. Guide Rails and Brackets: Provide sliding guide bracket of rubber-coated cast iron or steel. Guide rails to be minimum 1-1/2-inch diameter, Schedule 40, Type 316 stainless steel pipe. Upper guide bar support to be fabricated from Type 316 stainless steel. Lower guide bar support to be integrally cast boss on discharge elbow, arranged so that guide bar is held in position by sliding over boss. Provide intermediate guide bar supports, fabricated from Type 316 stainless steel when guide bars exceed 10-feet in length. Bolts to be Type 316 stainless steel.

3. Lift Cable: Furnish for each unit, a type 316 stainless steel wire rope lifting cable sized by pump manufacturer. Furnish one end of the wire rope with a quick disconnect anchor for attachment to lifting hoist and secure the other end to the pump with type 316 stainless steel fittings. Furnish sufficient length of wire rope to attach the pump to the lifting hoist mounted on top of station when the pump is mounted on the discharge elbow.

4. Pump manufacturer to provide lifting hoist as shown on Drawings to ensure compatibility between hoist and pump.

5. Stainless Steel Nameplates: Attached to the pump and drive motor giving the manufacturer's model and serial number, rated capacity, head, speed, and all pertinent data.

D. Spare Parts: Furnish spare parts in accordance with Section 11000 - Equipment General Provisions and include the following:

1. One (1) cutter bar.

2. One (1) impeller.

3. If applicable to the furnished pump:
   a. Shaft sleeve.
   b. One (1) complete set of bearings (motor and pump).
   c. One (1) complete mechanical seal assembly.

4. Two (2) pump gasket and o-ring sets.

2.03 CONTROLS

A. General:

1. Provide a Local Control Panel for local and automatic pump control as specified in this section.

2. Design: Pump manufacturer's control and alarm system to be designed to function with pumping units, factory wired, and tested. Controls are to automatically start and stop pumping units and permit manual operation at the panel as specified herein.

3. Install at the location shown on the Drawings.

4. All electrical components used in the construction of the Local Control Panel shall conform to the requirements outlined in the specifications of Division 16.

5. Power Requirements: Each Local Control Panel (LCP) to operate from a single 480-volt, 3-phase power source.

6. Panel components are to conform to Division 16 requirements.

B. Control Panel Enclosure: Provide the Local Control Panel in accordance with Section 16160, Cabinets and Enclosures, and as specified herein.

1. Rating: NEMA 4X 316 stainless steel.

2. Construction: Dead front with padlock provisions.

3. Fully hinged outer door with stainless steel hinge and stainless steel 3-point twist type latches.

4. Hinged, stainless steel or copper-free aluminum swing out inner panel for mounting hand switches, panel lights and other panel mounted devices.

5. Stainless steel or copper-free aluminum back panel with provisions to mount control devices and terminal strip for field connections.

C. Control System Features: The Local Control Panel shall include, but not be limited to the following:

1. Main power disconnect switch or circuit breaker device, mechanically interlocked with swing out panel door so that the main power must be “OFF” before door can be opened.

2. Motor starters for the pump.

3. HAND-OFF-AUTO (HOA) control switch.

4. Furnish a repeat cycle timer for wet well mixing operation (ATC series 342 or equal).

5. START/STOP pushbuttons.

6. Elapsed Time Meter: Include six-digit non-resettable electromechanical counter with units in hours.

7. Provide un-powered dry type contacts for the following conditions.
   a. Pump Running.
   b. H-O-A Switch in AUTO position.
   c. Common pump failure contact that is representative of all pump alarms (i.e. moisture, high stator temperature, motor overload, etc.).

8. Include individual alarm/indicating pilot lights at the Local Control Panel for Pump Running, High Moisture, High Stator temperature, Motor Overload, and Power On. Provide a common reset pushbutton to clear all alarms. Pilot devices shall meet all requirements as outlined in 16902, Electric Control and Relays.

D. Control Operation:

1. When the local HAND-OFF-AUTO switch is in OFF, the pump is not run regardless of other run commands.

2. When the local switch is in the AUTO position, control is transferred to the Local Control Panel. In the AUTO mode the Local Control Panel controls the pump based on the repeat cycle timer. The repeat cycle timer is to have individually adjustable time settings for pump run time and pump off time. The control system will automatically start and stop the pump for the durations set on the repeat cycle timer and repeat those settings as long as the Local Control Panel switch is set in the AUTO position.

3. When the local switch is in HAND position, the associated pump is controlled manually by the local Start/Stop pushbuttons.

4. When a pump failure or alarm condition occurs, the local control panel illuminates the control panel pilot light and issues a common trouble alarm to the monitoring

system.

PART 3 -- EXECUTION

3.01 ERECTION/INSTALLATION/APPLICATION AND/OR CONSTRUCTION

A. Install equipment and accessories per manufacturer's printed instructions and recommendations, and approved shop drawings. Lubricate and make units ready for operation.

B. Guide Rails: Install guide rails plumb and parallel.

C. Adjust free length of power cable to minimize movement with pump in place.

3.02 MANUFACTURER'S FIELD SERVICES

A. The services of a qualified manufacturer's technical representative shall be provided in accordance with Section 11000, Equipment General Provisions. For each series of pumps, field services shall include the following site visits:

1. At least one trip of one (1) day to check and supervise the equipment installation and field tests.

2. One trip of one (1) day to supervise testing.

3. One trip of one (1) day after acceptance of the equipment to instruct the Owner's personnel in proper operation and maintenance of the equipment to meet the requirements of Section 11000, Equipment General Provisions.

B. Any additional time required to achieve successful installation and operation shall be at the expense of the Contractor.

3.03 FIELD QUALITY CONTROL

A. Placing in Service

1. Before Start-Up:
   a. Check impeller and make sure all rotating elements are free and clear.
   b. Check direction of motor rotation with pump disconnected to ensure the direction of pump and motor are compatible.
   c. Check seal chamber oil level and lubrication of seals;
   d. Megger each unit for insulation breaks or moisture;
   e. Measure motor no-load current;
   f. Manually trip level sensors and check complete cycle of control operation.
   g. Have manufacturer's representative inspect the completed installation for conformance with manufacturer's recommended installation requirements and approve the installation.

2. Complete unit, when assembled and operating, to be free from excessive vibration, cavitation, and noise.

B. Field Tests

1. Run each unit submerged for not less than 30 minutes. Remove each unit and megger each unit for insulation breaks or moisture. Raise and lower each unit three times in presence of Owner and Engineer to ensure alignment of guide rail system.

- END OF SECTION -

SECTION 11151

VERTICAL NON-CLOG PUMPS

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Furnish, install, and make fully operational, all vertical non-clog pumping equipment complete with all necessary accessories at the locations shown on the Drawings and as specified herein. All pumps are to be supplied by the same manufacturer.

B. The manufacturer of the Vertical Non-Clog Pumps as specified herein is responsible for coordination and procurement of equipment specified in this Section, Section 11221, Medium Voltage Electric Motors, and Section 11395, Medium Voltage Variable Frequency Drives.

C. Equipment is to be provided in accordance with the requirements of Section 11000, Equipment General Provisions and Section 11100, Pumps - General.

D. The completed installation is to be free from excessive vibration, cavitation, noise, and oil or water leaks.

### 1.02 OPERATING CONDITIONS AND PERFORMANCE REQUIREMENTS

| Designation | INF-P-1A, INF-P-1B, INF-P-1C, INF-P-2A, INF-P-2B, & INF-P-2C | | |
|---|---|---|---|
| Design Condition | #1 | #2 | #3 |
| Pump Capacity (gpm) | 0 | 13,200 | 18,500 |
| Total Dynamic Head (feet) | 260’ ± 10’ | 196 | 140’ ± 10% |
| Minimum Efficiency (%): | - | 85 | 80 |
| Maximum NPSHr (ft): | - | 22 | 35 |
| Minimum Stable Continuous Flow (gpm): | ≤ 6,000 | | |
| Maximum Motor Horsepower (Hp) [1]: | 1,000 | | |
| Maximum Driven Pump Speed (rpm)[2]: | 885 | | |
| Drive: | Variable speed - VFD | | |
| Liquid Pumped | Raw Sewage | | |
| Temperature of Liquid: | Ambient, maximum 80°F | | |
| Minimum Size of Solids (spherical diameter, in) | 6 | | |
| Minimum Suction Size (in): | 16 | | |
| Minimum Discharge Size (in): | 16 | | |
| Suction Condition: | Flooded | | |
| Minimum Casing Test Pressure (psig) | 195 | | |

| Basis of Design[3]: | Morris 7100 NC Model 1616332V |
|---|---|

Notes:

1. Minimum motor horsepower is 900, however, the required pump brake horsepower on any point of the pump characteristic curve at the specified operating speed is not to exceed the rated motor horsepower. Motor service factors shall not be used to meet any operating condition along the full length of the pump characteristic curve.
2. This is the maximum pump speed to meet the specified operating conditions and the speed that the pump shall be tested at in the factory to demonstrate compliance with these specifications.
3. The general arrangement shown on the drawings is based on this pump make and model. Make any and all modifications to the piping to accommodate the actual pump furnished at no additional cost to the Owner.

## 1.03 SUBMITTALS

A. The following items are to be submitted with the Shop Drawings in accordance with, or in addition to the submittal requirements specified in Section 01300, Submittals, and Section 11000, Equipment General Provisions:

1. Shop Drawings and Product Data for Pumps, motors, and variable frequency drives. Data for all equipment (pumps, motors, and drives) is to be submitted concurrently.

2. Operation and Maintenance Manuals in accordance with 01730, Operation and Maintenance Manuals.

3. Manufacturer's report of satisfactory installation and field operational tests.

4. Certificate of Conformance as required under Quality Assurance.

5. Vibration Testing Baseline Data

6. Field vibration testing report per Section 11000, Equipment General Provisions.

## 1.04 QUALITY ASSURANCE

A. Manufacturer's Qualifications: The manufacturer is to have at least five installations where pumping equipment of same model, capacity, and size specified has been in successful operation for at least two years.

B. System Coordination: Contractor is responsible for all details necessary to properly install, adjust, and place in operation a working system.

C. Coordination Responsibility:

1. To ensure equipment compatibility, the pump manufacturer of the Vertical Non-Clog Pumps as specified herein is responsible for coordination and procurement of equipment specified in this Section, Section 11221, Medium Voltage Electric Motors, and Section 11395, Medium Voltage Variable Frequency Drives.

2. The Contractor retains overall responsibility for equipment coordination, installation, testing, and operation.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the requirements of this Section, the following manufacturers have the capability of performing the work in this Section:

1. Morris Pumps Series 7100 NC

2. Flowserve Model 16MN33A

3. Or Pre-Approved Equal.

B. The naming of a manufacturer in this Section is not an indication that the manufacturer's standard equipment is acceptable in lieu of the specified component features. Naming is only an indication that the manufacturer may have the capability of engineering and supplying a system as specified.

2.02 MATERIALS

A. General:

1. Pumps are to be bottom suction, side discharge, vertical, heavy-duty, non-clog, solids-handling type, designed to pump raw wastewater and equipped with flanged suction and discharge assemblies.

2. Pumps are to be driven by variable speed motors and variable frequency drives in a direct-coupled arrangement.

3. Entire rotating element is to be removable without disconnecting suction and discharge piping. The unit is to be designed such that the motor may be removed from the pump for independent servicing.

4. Provide lifting rings or lugs on pump/baseplate for use in handling.

B. Volute/Casing:

1. Design of casing is to allow removal of the rotating element without disconnecting suction or discharge piping (back pullout design).

2. Material is to be cast iron with 3% nickel per ASTM A48, Class 35/3% Ni.

3. Volute is to have smooth, unobstructed fluid passages large enough to pass solids of the specified size and devoid of blowholes and other irregularities.

4. Provide a casing cleanout with cover on the impeller centerline located at the cutwater point on the volute.

5. Volute to be tangential discharge style, capable of rotation in 45° increments, and reversible for clockwise or counterclockwise rotation. Discharge arrangement to be as shown on the Drawings.

6. For matching parts, provide machined tongue-and-groove or rabbeted surfaces for accurate and permanent alignment.

7. Wear Ring: Axial type, replaceable, hardened (425 - 475 Brinell), 400 series stainless steel (ASTM A743, CA15), minimum of 3/8-inch thick, ¼-inch wear allowance, secured by recessed head stainless steel set screws.

8. Suction and discharge connections are to be flat-faced Class 125 flanges per ANSI B16.1. Drill and tap suction and discharge connections for pressure gauge connections.

9. Provide casing drain and vent connections.

C. Impeller:

1. One-piece, single suction, enclosed, two to four vane, non-clogging type of the radial flow design. Impeller to be keyed and secured to shaft with a contoured locking plate and not less than 3, high-strength, socket-head, cap screws.

2. Clockwise or counter-clockwise rotation to match discharge arrangement shown on the Drawings.

3. Clearance between the impeller outside diameter and cutwater to be capable of passing the solid size listed in the Schedule of Performance and Operating Conditions.

4. Fabricated from cast iron with 3% nickel per ASTM A48, Class 35/3% Ni.

5. Statically and dynamically balanced to ISO Standard 1940, Grade G6.3.

6. Wear Ring: Axial type, replaceable, hardened 400 series stainless steel (ASTM A743, CA-40), minimum 450 Brinell Hardness, 1/8-inch wear allowance, secured by recessed head stainless steel screws.

D. Bearing Frame:

1. Back pull-out design, rigid cast iron construction per ASTM A48, Class 25.

2. Bearing housing to be dust-proof with lip-type grease seals.

3. Provide with jack bolts for external impeller adjustment.

E. Backhead/Stuffing Box:

1. Fabricated from cast iron in per ASTM A48, Class 35.

2. Drill and tap gland for a minimum ¼-inch clean water seal flushing connection.

3. Provide a minimum ½-inch drain tap below the stuffing box gland to drain leakage away.

F. Shaft:

1. One piece, high strength steel, ground and polished. Shaft to be of sufficient diameter to rigidly support the impeller and prevent excessive vibration at all speeds.

2. The shaft is to be heat-treated, turned, ground, and polished over it's entire length.

3. Shaft is to be fabricated from 316 stainless steel.

4. The shaft is to be protected throughout the packing/seal area by a renewable, hardened (≥450 Brinell), 400 series stainless steel sleeve with a minimum thickness of ¼" and fabricated from one of the following materials:

   a. ASTM A743, CA-40; or
   b. ASTM A276, 410.

5. Shaft sleeve is to be internally ground and positively secured to the shaft to prevent independent rotation. Provide a shaft sleeve seal to prevent water leakage between the shaft and the sleeve.

G. Bearings:

1. Radial Bearings: Grease lubricated, roller or spherical bearings.

2. Thrust Bearings: Grease lubricated, angular contact ball or spherical roller bearings.

3. Bearings to have a $B_{10}$ life of 100,000 hours per ABMA 9.

4. Provide "Alemite" fittings on all grease supply connections.

H. Mechanical Seal:

1. Type: Heavy duty, self-centering, radially split seal.

2. Seal Faces: Resin–impregnated carbon versus sintered silicon carbide.

3. Adaptive Hardware: 316 Stainless steel.

4. Spring: Alloy C-276

5. Gaskets and O-rings: Viton

6. Mating Ring Elastomer: PTFE encapsulated fluorocarbon

7. Sleeve Elastomer: Fluorocarbon O-ring.

8. Chesterton Type 442, AES SEAL Type RDS, or John Crane Type 37FS.

I. Base - The motor support is to be independent of the pump bearing frame. The vertical support members holding the motor weight are to be supported by the pump support

feet/sole plate and in no case is the driver weight to be transmitted through any portion of the pump bearing housing.

1. The pump is to be supported by rigid reinforced concrete piers. The piers are designed to support the pump on three sides. The piers are of adequate size to provide suitable clearance between pump suction elbow and the mounting floor and of sufficient strength to accept all forces imposed by the pump. Pump manufacturer is to provide dead load, live load, and natural frequency data for the concrete pier designer. The support piers will be designed to withstand all loads and in accordance with local building code requirements.

2. Provide a steel mounting plate to span the opening at the concrete piers as shown on the Drawings. The plate is to have provisions for bolting and grouting to the concrete piers. Design the mounting plate to carry all the pump loads to the concrete piers through the casing mounting feet.

J. Accessories:

1. Coupling: Motor is to be directly connected through flexible couplings as manufactured by Falk, Dodge, or equal.

2. Coupling Guard: All metal construction (stainless steel) bolted to pump and arranged to facilitate removal. The guard is to be OSHA approved.

4. Provide bronze pipe plugs on outlets.

5. Stainless Steel Nameplates: Attached to the pump and drive motor giving the manufacturer's model and serial number, rated capacity, head, speed, and all pertinent data.

6. Anchor bolts, flange bolts, studs, nuts, and other pump hardware to be Type 316 stainless steel in conformity with ASTM A276.

7. Furnish and install suction and discharge gauges under Section 11100, Pumps - General.

## 2.03 ELECTRIC MOTOR

A. General:

1. Motor is to be non-overloading over entire operating range of pump from shut-off to run-out.

2. Construction Features: Per Section 11221, Medium Voltage Electric Motors. Motors do not need to be witness tested.

3. Provide motor with extended lubrication lines down to 3 feet above operating platform level.

B. Motor Requirements & Features:

| | |
|---|---|
| Voltage: | 4160V, 3 Ph, 60 Hz |
| Horsepower, Maximum | 1,000 |
| Speed, rpm: | 900 |
| Enclosure: | WPII |
| Mounting: | Vertical |
| Shaft: | Solid |
| Thrust: | Normal |
| Insulation: | Class H |
| Inverter Duty: | Yes |
| Service Factor: | 1.15 (sine wave power) |
| Non-Reverse Ratchets | No |
| Space Heater: | Yes |
| Motor Winding Temperature Switches: | No |
| Stator RTDs: | Yes, 2 per phase |
| Bearing RTDs | Yes |
| Vibration Switch | Yes |
| Vibration Sensors | Yes – X, Y, & Z |
| Separate Cooling Fan: | No |
| Motor Differential Current Transformers / Six-Lead External Wye Connection: | No |

2.04 SPARE PARTS

A. Provide spare parts in accordance with Section 11000, Equipment General Provisions.

B. Spare parts are to be identical and interchangeable with the original parts and furnished in clearly identifiable and labeled containers.

1. One (1) - complete mechanical shaft seal assembly.

2. One (1) - set of wearing rings.

3. One (1) shaft sleeve.

4. One (1) set of pump bearings.

5. Two (2) - sets of gaskets and O-ring seals.

6. One (1) coupling with complete shim set.

7. In addition to the items specified above, Manufacturer is to furnish any additional parts or lubricants required to operate the system for one (1) year.

2.05 SHOP TESTING

A. Shop tests shall be performed in accordance with the following Specifications, Section 11100, Pumps – General, and, except where stated otherwise herein, the Hydraulic Institute Standards. Shop testing for one (1) pump is to be witnessed by the Owner and Engineer. Perform preliminary tests and forward test results, along with certified hydrostatic test

results, in good time to the Engineer prior to the witnessed testing. Hydrostatic tests need not be witnessed. The preliminary test results are to indicate that the pumps meet or exceed the specified performance conditions. Tolerances are to be within the Hydraulic Institute Standards except that the allowable head tolerance is to be within the range specified in the Conditions of Service. If preliminary testing indicates that modifications are required to equipment or test facilities, all such modifications are to be carried out prior to the witnessed shop tests and revised performance testing. Provide the Engineer with a minimum of 30 days' advance notice of the witnessed test schedule. The Contractor is to provide transportation and lodging for four (4) persons from Owner's or Engineer's staff to attend. Upon satisfactory completion of these witnessed tests, prepare certified test curves as indicated below and forward to the Engineer for his final approval.

B. Each pump is to be shop-tested, when driven by its actual motor driver, for flow versus head and brake horsepower over the full range of its characteristic curve. Test data is to be measured and recorded in accordance with the Hydraulic Institute test procedures. Results are to be corrected as required to the specified operating conditions and plotted in the standard format. Pumps need not be shop-tested with the actual Variable Frequency Drive to be used in the Pump Station.

C. Test one pump for net positive suction head required (NPSHr) from the best efficiency point to runout. NPSHr test is not to be witnessed. Data for a similar pump (same size/model) may be submitted for the NPSHr test, provided the test was performed within 1 year of the date of the shop testing.

D. Perform a factory vibration test to establish a vibration baseline data base for each unit. Vibration testing is to be in accordance with the procedures established for field vibration testing specified in Section 11000, General Equipment Provisions.

## PART 3 -- EXECUTION

### 3.01 MANUFACTURER'S FIELD SERVICES

A. Provide the services of a qualified manufacturer's technical representative in accordance with Section 11000, Equipment General Provisions. Field services shall include the following site visits:

| Service | Number of Trips | Number of Days/Trip |
|---|---|---|
| Installation and Testing | 1 | 2 |
| Startup and Training | 1 | 2 |
| Services after Startup | 1 | 1 |

### 3.02 ERECTION/INSTALLATION/APPLICATION AND/OR CONSTRUCTION

A. Pumps and motors are to be installed as indicated on the Drawings and as required by the pump manufacturer's printed instructions and approved practices for installation of pumping equipment.

B. All hold-down nuts on foundation bolts are to have full thread make-up.

C. Align and level pumping unit to suction piping. Use precision levels and gauges. Final alignment to utilize a laser-type shaft alignment system performed in presence of Owner's representative.

D. Use wedges or shims to level, providing for grout of thickness required.

E. Align pump and driver following manufacturer's instructions.

F. Grout in accordance with the applicable concrete items and grout manufacturers' recommendations. Let grout set seven days before removing wedges or shims. Remove all wedges or shims. Grout gaps left by wedges or shims.

G. After grout is set, check alignment and realign as necessary. Connect piping, making sure no stresses are transferred to the pump. Make any necessary changes to piping.

H. Pipe seal water drain/drip rim drain to floor drain/hub drain.

I. After completion of all procedures specified above, clean and touch up any damaged coating system as required.

J. Lubricate and make unit ready for operation.

3.03 PAINTING

A. Shop and field coats of paint shall comply with all requirements in Section 09900 - Painting.

3.04 FIELD TESTING

A. Each pump is to be given a field operation test in accordance with the requirements of Section 11100, Pumps - General.

B. Perform field vibration testing in accordance with the procedures established in Section 11000, General Equipment Provisions and submit test report.

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# SECTION 11195

# PACKAGED SEAL WATER SYSTEM

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Furnish, deliver, install, test, and place in satisfactory operation two (2) packaged seal water systems, complete with all necessary accessories at the location shown on the Drawings and as specified herein.

B. Each Packaged Seal Water System is to consist of a tank, two water pumps, control panel, and interconnecting piping and valves, assembled and mounted on a single structural steel base.

C. The components of the Packaged Seal Water System form an integrated system and are to be furnished by a single Manufacturer, who is to provide all of the equipment and appurtenances regardless of manufacture and is responsible for the satisfactory operation of the entire system.

### 1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Shall be as specified in Section 01090, Reference Standards.

### 1.03 CONTRACTOR'S RESPONSIBILITY

A. The services of a qualified manufacturer's technical representative shall be provided for a period of not less than two (2) days as follows:

1. At least one trip of one (1) day check and supervise the equipment installation and field tests.

2. One trip of one (1) day to supervise initial start-up and operation and to instruct the Owner's personnel in proper operation and maintenance of the equipment.

## PART 2 -- PRODUCTS

### 2.01 MANUFACTURER

A. Subject to compliance with this specification, the following manufacturers have the capability of manufacturing the specified equipment:

1. Metropolitan Pump Company, Model Iso-Pac

2. IPECO/IMCO

3. MECO

4. Or Equal.

## 2.02 MATERIALS AND/OR EQUIPMENT

A. General:

1. Supply and install two (2) packaged seal water systems. Each packaged seal water system shall be independently capable of meeting the Service Conditions specified below.

2. The Packaged Seal Water System is to be factory prefabricated on a common structural steel skid with all components mounted and all interconnecting wiring and piping completed and factory tested prior to shipment. The only field connections are to be the connection of the system to the potable water supply, connection of the discharge piping, and three phase power connection.

3. The Packaged Seal Water System is to be a variable flow, constant pressure water system.

4. The suction and discharge manifolds, as well as the pressure sensing lines with shut-off cocks for gauges and pressure switches are to be furnished assembled.

5. Any connections to process piping are to be made with stainless steel tubing with compression fittings. Plastic tubing is not acceptable.

6. All electrical wiring is to be complete between the components and the control panel except the main power feed to the panel.

B. Service Conditions:

1. Number of Pumps: 2

2. Flow Rate: 0 – 6 gpm

3. Operating Pressure at 6 gpm: 100 psi

4. Pump Cycle Time: 10 minutes (a maximum of 6 start/stop/start per hour per pump under actual load conditions).

5. Maximum skid dimensions: 6 feet wide by 6 feet long.

C. Pumps:

1. Type: Vertical, non-self-priming, multistage, in-line, centrifugal

2. Impeller: 304 Stainless Steel

3. Case: Cast iron, ASTM A48 Class 30, with bronze wear rings, renewable.

4. Shaft Seal: Balanced cartridge seal with O-ring, silicon carbide.

5. Pump/Motor Shaft: 18-8 stainless steel shaft or S.A.E. 1045 carbon steel with S.S. shaft sleeve.

6. Fittings: All wetted parts to be bronze or 304 stainless steel.

7. Locate discharge connections to allow removal of the rotating element without disturbing the system piping connections.

D. Motors:

1. Horsepower: 3 (maximum);

2. RPM: As required by driven equipment;

3. Voltage: 460V, 3 phase, 60 hertz;

4. Enclosure: TEFC;

5. Service Factor: 1.15

E. Break Tank:

1. Type: Vertical, cylindrical, with removable cover and reinforcing rims.

2. Material: 14-gage 316 SS or spun fiberglass.

3. Minimum Working Volume: 50 gallons

4. Inlets/Outlets: NPT half couplings welded to the tank shell.

F. Piping and Valves:

1. Piping:

a. Material: Copper.

b. End Connections: Socket Weld.

c. Furnish unions or Dresser style connections to facilitate removal of equipment.

d. Flexible Connectors: Each pump is to be equipped with a vibration isolation spool rated for 200 psi minimum.

e. Provide an air gap bronze fitting, Zurn No. Z-1025 or equivalent by Josam.

f. All piping, fittings, valves and gaskets in the packaged seal water system shall be rated for 200 psi minimum.

2. Valves:

a. Float Control Valve: Provide a modulating float control valve to feed and regulate the water level in the tank. The float valve is to be tank mounted to maintain a minimum 6-inch air gap. The float valve is to have the following features:

1) Body: Angle or globe, cast iron with SS trim.

2) Stainless steel rod and float

3) Slow open and slow close feature

b. Isolation Valves: Furnish isolation valves on the suction and discharge of each pump. Valves are to be ¼-turn, bronze ball valves.

c. Check Valves: Bronze body, silent check valves.

d. Control Valve/Relief Valve: The system pressure is to be maintained by a pilot-operated, diaphragm type, pressure regulating valve to relieve excess flow/pressure back to the tank. The valve is to have the following features:

1) Body: Angle or globe, cast iron with bronze trim.

2) Pilot Controls: Bronze with stainless steel trim.

3) Control piloting tubing: non-corrosive with self-cleaning strainers.

4) CLA-VAL or equal.

G. Control Panel:

1. The enclosure for each seal water system shall be NEMA 4X, Type 316 stainless steel construction with stainless steel hinge, stainless steel 3-point twist type latches, gasketed, door handle, and lock. Control panel shall comply with the requirements specified in Section 16902, Electric Controls and Relays. Main power disconnect or circuit breaker to be mechanically interlocked with door so that main power must be off before door can be opened. Include terminal strip for field connections with suitable identification. Provide legend plates as follows:

a. Pilot Devices - Aluminum with black background and white letters, mechanically attached with pilot device.

b. Controlled Device – 1” wide black plastic with 3/8” white engraved lettering, attached with stainless steel screws or epoxy.

c. Control Panel – 1” wide black plastic with 3/8” engraved white lettering, attached to exterior door with stainless steel screws or epoxy.

2. Design: Pump supplier’s control and alarm system designed to function with the pumping units, factory wired, and tested for proper operating sequence under all conditions before shipment to the jobsite. Controls to automatically start and stop pumping units and permit manual start and stop operation at the panel.

a. Sequence of Operation: The Packaged Seal Water System is to consist of one lead pump and one lag pump. When the wastewater pumps are all off, all of the seal water pumps are to be off. During normal operation, the lead pump will sequence on when one or more of the wastewater pumps is operating.

1) If the demand is less than the capacity of the lead pump, water will be diverted back into the break tank via the control/relief valve. Water will continue to re-circulate as long as any of the wastewater pumps are operating. When all of the wastewater pumps are stopped, the seal water pumps will stop also and the pump alternator is to advance and change which pump is the lead pump in the lead/lag sequence.

2) If the demand is greater than the capacity of the lead pump, the seal water system pressure will drop and the control system will sequence on the lag pump when the pressure switch reaches the set point. The control system will activate the “Low System Pressure” alarm.

3) If the water level in the tank drops below a minimum set point, as sensed by the level switch, the control system will activate a “Low Tank Level” alarm. The level switch acts as a permissive signal to allow the seal water pumps to run. If the water level in the tank rises sufficiently to close the level switch, then the seal water pumps can resume the normal control sequence.

b. Control/Alarm Features:

1) H-O-A switches and red running lights, green stopped lights for each unit, plus white pilot light to indicate system in automatic mode, and amber pilot lights for each specified trouble alarm condition.

2) Provide time-delay relays to prevent motors from starting simultaneously after power failure.

3) Low Discharge Pressure: System pressure below the adjustable set point is to annunciate a red “LOW SYSTEM PRESSURE” indicator pilot light on the control panel door.

4) Low Tank Level: Tank level below the adjustable set point is to shut down the system and annunciate a red “LOW TANK LEVEL” indicator pilot light on the control panel door.

5) Alarm pilot lights are to latch closed until reset at the seal water control panel.

6) Remote Monitoring Contacts: Provide un-powered dry type contacts for remote monitoring of the following conditions:

i. System Fail (to include low discharge pressure, low tank level, and pump fail)
ii. Pump in AUTO
iii. Pump RUN

7) Accept a dry remote start/stop contact signal from local PLC to indicate when a wastewater pump is operating and seal water system is to turn on/off.

3. Components:

   a. Relays to be rated minimum 10 amps resistive, continuous, industry-standard plug-in type with tube type connectors. Provide internal light to indicate relay energization.

   b. Pilot devices to be 30.5 mm heavy-duty nonmetallic NEMA 4X, Square D, Class 9001, Type SK or equal.

   c. Push buttons to be extended guard type.

   d. Pilot lights to be LED type.

   e. Control power transformers 500 VA and smaller to be internally mounted machine tool type specifically designed for high inrush currents of starter and relay coils. Secondary windings to be fused and grounded. Fused switches to be provided for 480-volt primary windings. Transformers larger than 500 VA to be externally mounted outdoor rated dry type.

   f. Identification:

      1) Tag all components with plastic nameplates.

      2) Tag all instruments mounted behind panel with embossed plastic tape labels.

   g. Motor Starters: Full voltage, non-reversing combination motor circuit protector (MCP) starters with three minimum NEMA Class 20 ambient compensated overload relays with one thermal element per motor phase and manually resettable without opening inner panel door. Starters to be horsepower rated per NEMA Standards Size 1 or larger with 120-volt coils.

   h. Solid state U.L. listed alternator to alternate sequence of all pumps after each pumping cycle. Alternator to include push-to-advance switch to manually select pump starting sequence. Provide LED indicators to show lead pump position. Alternator contact rating to be a minimum of 10 amps resistive at 120 volts.

4. Wiring:

   a. Control wiring stranded copper, minimum #14 AWG.

   b. Power wiring stranded copper, minimum #12 AWG.

   c. Insulation dual-rated for type THHN and THWN applications.

   d. Power terminals lug-type, 600 V minimum rated, with separate bare copper ground lugs for incoming and pump ground wires.

   e. Control terminals screw type, 300 V minimum rated, with minimum 4 spare terminals.

f. External control wiring terminations to be vinyl-insulated crimp connectors with spade lugs.

g. Internal control wiring to be labeled with tube type or heat shrink type preprinted wire marker, or color-coded.

H. Pressure Gauges:

1. General: Furnish and install pressure gauges on the discharge manifold.

2. Type: General service industrial grade pressure gauge for measuring process operating conditions.

3. Construction:

a. Size: 2½" nominal dial size;

b. Movement: Bourdon tube, 316 S.S., with overload and underload stops;

c. Case & Ring: Polished 316 SS stainless steel;

d. Window: Glass;

e. Connection: 3/8" NPT, 316 S.S.;

f. Pointer: Black, adjustable needle;

g. Filling: Liquid filled.

4. Accuracy: ASME grade 1A (1% of full scale)

5. Scale Range:

a. General: Normal operating pressure lies between 50 and 80 percent of scale range.

b. Pump Suction Service: Compound, 0 - 30" Hg/0 - 15 psi.

6. Manufacturer: Dresser-Ashcroft Type 1009, or equal.

7. Accessories: Unless otherwise shown on PLANS, furnish each pressure gauge with a diaphragm seal and isolation valve.

b. Isolation Valve: 1/4 turn, solid body, 316 S.S. ball valve, Apollo Valve or equal.

I. Pressure Switches:

1. Required Features:

a. All pressure switches to be furnished with a stainless steel or brass bourdon tube and a case conforming to NEMA 4X requirements. All switches to be snap-action, provided with SPDT contacts rated at not less than 5 amps at

120 volts.

b. All pressure switches to be adjustable over the full range and to have visible indicating set point scales. Accuracy to be +/- 2 percent of set point. Deadband to be 2 percent maximum.

c. Pipe mounted electronic sensors shall be isolated by valve and union.

2. Manufacturer: Mercoid, Honeywell or equal.

J. Level Switch:

1. Type: Level detection with externally mounted, horizontal, float probes to actuate relay switching upon level detection.

2. Performance and Features:

a. Material: Type 304 stainless steel.

b. Float: Nylon or polypropylene

c. Switch: Hermetically sealed, magnetically actuated, make-and-break type reed switch, SPST, 50 VA contact rating.

3. Manufacturer: Warrick Co. model LS-7 Series, Type 8, B/W Controls, or equal.

K. Pressure vessel:

1. Install bladder style pressure vessel on the discharge of each package seal water system to enable the seal water pumps to shut down.

2. Pressure rating, minimum: 150 psi

3. Capacity, minimum: 10 gal

4. Pressure vessel shall be designed, constructed and stamped per ASME Section VIII.

L. Spare Parts: Furnish the following spare parts:

1. One complete, uninstalled spare pump and motor.

2. One pressure gage.

3. One pressure switch.

4. One level switch.

5. One complete mechanical seal.

6. One complete set of gaskets required to assemble the pump.

7. Six spare fuses for each type used.

8. In addition to the items specified above, Manufacturer shall furnish any additional parts or lubricants required to operate the system for one (1) year.

## PART 3 -- EXECUTION

### 3.01 INSTALLATION

A. Install Packaged Seal Water Systems in accordance with Plans, approved shop drawings, and manufacturer's installation manual. The underside of the skids shall be coated with coal tar epoxy, at least 10 mils thick.

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# SECTION 11221

# MEDIUM VOLTAGE ELECTRIC MOTORS

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. The Contractor shall furnish all labor, materials, tools and equipment necessary for furnishing, installing, connecting, testing and placing into satisfactory operation all medium voltage electric motors as shown on the Drawings and specified herein. All medium voltage motors required for this Contract shall comply with this Section unless otherwise noted.

B. Reference Section 09900, Painting and the applicable Sections of Divisions 11, 15 and 16.

C. Medium voltage motors are defined as motors rated 2.3 thru 15kV.

### 1.02 SUBMITTALS

A. In accordance with the procedures and requirements set forth in the General Conditions and Division 1, the Contractor shall obtain from the equipment manufacturer and submit the following:

1. Shop Drawings.

2. Preliminary Operation and Maintenance Manuals.

3. Final Operation and Maintenance Manuals.

4. Spare Parts List.

5. Reports of Certified Shop Tests.

B. Each submittal shall be identified by the applicable Equipment Identification Number and Specification Section.

C. Shop Drawings

1. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipments compliance with the Contract Documents.

2. Partial, incomplete or illegible submissions will be returned to the Contractor without review for resubmittal.

3. Shop drawings shall include, but not be limited to:

a. Equipment specifications and data sheets identifying all materials used and methods of fabrication.

b. Motor data shall also include the following:

i. Full load power rating (HP) and service factor
ii. Full load speed (rpm)
iii. Rated voltage and rated frequency
iv. Enclosure
v. Mounting position
vi. Type of bearings, lubrication and design thrust
vii. Temperature rise of stator windings (°C) at continuous 1.0 service factor
viii. Maximum ambient temperature (°C) if >40°C
ix. Altitude above sea level (ft) if >3300 ft
x. Design inertia of the load (at motor speed)
xi. Direction of rotation CW or CCW as viewed from NDE of the motor
xii. Design torque at locked rotor, minimum and BDT in % of the motor full load torque
xiii. Locked rotor and full load amps
xiv. Guaranteed efficiency at full, 3/4 and 1/2 load
xv. Power factor at full, 3/4 and 1/2 load
xvi. Motor sound power levels
xvii. Vibration in velocity measured at bearing housings
xviii. Rotor inertia
xix. X/R, T"d, Ta
xx. Speed range and load profile when driven by a variable frequency drive
xxi. Number of allowed starts
xxii. Number of days of startup included
xxiii. Number of days of training
xxiv. Comments and exceptions to specifications (if any)

c. Example equipment nameplate data sheet.

d. Connection wiring diagrams.

e. List of recommended lubricants.

f. Motor Test Data Sheets shall be submitted

g. An outline drawing or an outline data sheet showing complete motor dimensions. Drawings or sheets shall bear complete identifying data including frame size, speed, horsepower ratings and application for each particular unit.

h. Description of proposed shop testing methods, procedures and apparatus with calibration dates shall be submitted. Testing methods and procedures shall be submitted at least 45 days in advance prior to conformation of witness testing dates and actual testing.

i. Qualifications of proposed testing firm to perform acceptance testing shall be submitted. Submit records of firms experience at least 45 days in advance to actual testing, five recent references with phone numbers shall be submitted.

j Data for all motor accessories, heaters, detectors, etc., shall be submitted.

D. Operations and Maintenance Manuals

1. Submit operation and maintenance manuals in accordance with the procedures and requirements set forth in the General Conditions and Division 1 of the General Requirements.

2. Two copies of a preliminary O&M manual shall be included in the shop drawing submittal. Without inclusion of these manuals, the submittal will be considered incomplete and will be returned without review.

E. Lubricants

1. The manufacturer shall submit a list with a minimum of four manufacturer's standard lubricants which may be used interchangeably for each type of lubricant required.

2. The Contractor shall utilize this list in preparing his comprehensive lubrication survey as specified in Division 1 of the General Requirements.

F. Certificates of Compliance

1. Certified copies of motor characteristic curves and all other data necessary for establishing control and protective equipment settings shall be submitted.

2. Results of unwitnessed shop tests shall be certified. Routine tests in conjunction with complete initial tests, shall be submitted accompanied by a certificate of authenticity sworn to before a notary public by an officer of the manufacturing company. Results shall be included for each test.

   Upon receipt of the certified test reports, witness shop tests shall be scheduled and the Engineer shall be notified of the witness test date.

3. Results of the witness tests shall be submitted with copies of certified initial tests, accompanied by a certificate of authenticity sworn to before a notary public by an officer of the manufacturing company.

   Upon approval of the witness shop tests, release for shipment to site shall proceed and the Engineer shall be notified of the arrival date.

G. Reports

1. Certified shop tests, and witnessed shop tests reports shall be submitted.

1.03 REFERENCES

A. Equipment shall comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

1. National Electrical Code (NEC)

| | | | |
|---|---|---|---|
| 2. | NEMA MG1 | - | Motors and Generators |
| 3. | UL 547 | - | Thermal Protectors for Electric Motors |
| 4. | UL 674 | - | Electric Motors and Generators for Use in Hazardous Locations |
| 5. | UL 1004 | - | Electric Motors |
| 6. | ABMA 9 | - | Load Ratings and Fatigue Life for Ball Bearings |
| 7. | ABMA 11 | - | Load Ratings and Fatigue Life for Roller Bearings |
| 8. | IEEE 85 | - | Sound Tests |
| 9. | IEEE 112 | - | Test Procedure for Polyphase Induction Motors and Generators |
| 10. | NETA. ATS | - | International Electrical Testing Association Acceptance Testing Specifications |

B. Where conflict arises between the local codes and the requirements of the National Electrical Code, the National Fire Code, ASTM, etc., the more stringent requirements shall prevail.

1.04 DESIGN REQUIREMENTS

A. Motors shall be designed, built, and tested in accordance with the latest applicable editions of ANSI/IEEE, NEMA, NFPA, and UL. The classifications, ratings, performance and testing of all motors shall be in accordance with the latest edition of NEMA Publication No. MG 1.

B. Motors shall be of sufficient capacity to operate the driven equipment under all conditions of operation imposed by the driven equipment without loading the motors beyond their rated nameplates current and power.

C. The rating of the motors offered shall in no case be less than the horsepower shown on the Contract Drawings or stated herein. Both the rating and the characteristics of the motor shall be suitable for the successful operation of the driven equipment, under load conditions, within nameplates values of service factor and ambient temperatures.

D. All motors shall be continuous time rated suitable for operation in a 40 degrees C ambient temperature.

E. Motors specified shall meet the requirements of an energy efficient motor as defined by NEMA MG1, energy efficiency requirements. Motors with horsepower or RPMs not listed by NEMA shall conform to comparable standards of construction and materials as those for listed NEMA motors.

F. Motors operated from variable frequency drives shall comply with NEMA MG 1 performance standards for inverter duty motors.

## PART 2 -- PRODUCTS

### 2.01 MANUFACTURERS

A. The equipment covered by this Specification is intended to be standard equipment of proven performance as manufactured by reputable concerns. Equipment shall be designed, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Drawings.

B. Electric motors shall be Premium Efficiency motors manufactured by Reliance Electric Company, Siemens, U.S. Motors/Emerson Electric Company; General Electric Company; or Pre-approved equal.

### 2.02 MATERIALS AND CONSTRUCTION

A. General

1. The motor types specified under this Section shall include three phase, 60 Hertz, alternating current, squirrel cage 4160 volt induction motors, vertical shaft, as specified in the Division 11 mechanical equipment specifications.

2. Motors shall be designed to meet the application requirements and to have a minimum locked rotor torque of 60% and a minimum breakdown torque of 200% at full voltage. At the specified starting conditions, the motors shall have a minimum of 10% torque margin throughout the driven equipment load curve.

3. Motor rated horsepower shall be sized with a minimum 5% margin on the maximum brake-horsepower for any normal operating condition.

4. Motors shall be rated for use with variable frequency drives (VFD) and shall be inverter duty rated. Motors shall meet an 80°C temperature rise at 1.0 service factor at maximum rated speed with the VFD waveform. The motor shall be designed to meet the 80°C maximum temperature rise throughout the speed range.

B. Stator Core

1. The stator core shall consist of low loss electrical steel laminations insulated on both sides with separate air vent spacers. The core shall be secured by fingerplates on each end and held in compression by welded cross members or through bolts.

2. The stator core shall be supported by a rigid frame structure. This frame shall transmit to the foundation all static and dynamic forces associated with normal operation and all expected fault conditions.

3. The stator lamination steel shall be 24 gauge with M-19 grade (or better) material which will minimize hysteresis and eddy current losses to yield a maximum core loss of 2.08 watts/lb at 1.5 Telsa. The lamination steel shall also be a C5 core plate capable of burnout temperatures (during rewinding) of 400°C. The core shall be designed to operate with a maximum tooth density of 90,000 lines per square inch at rated voltage.

C. Stator Windings

1. All motors shall be adequately braced to permit across-line full voltage starting. The stator windings and motor leads shall have Class F or H insulation with copper conductors. Class F insulation shall be provided for non-inverter duty motors and Class H insulation shall be provided for inverter duty motors. In either case, temperature rise shall be limited to that for Class B insulation.

2. Motors shall be form wound with mica tape insulation. Slot liners shall be installed prior to coil insertion. The end coil bracing shall be in place prior to the VPI process. The completely wound stator shall be vacuum pressure impregnated to provide a rigid, sealed insulation system capable of passing an immersion test per NEMA MG 1 Part 20.18.

3. Windings shall be epoxy coated. The windings shall be thoroughly treated with approved insulating compound suitable for protection against moisture, salt air and slightly acid or alkaline conditions. The insulation system for enclosed motors shall be upgraded by additional dips and bakes to increase moisture resistance.

4. Motors shall have an inverter grade insulation system designed and built in accordance with NEMA MG1 Part 31.

5. The stator windings and end turn connections shall be fully brazed to withstand full voltage starting regardless of the starting method indicated. The bracing system shall essentially eliminate coil vibration under high current conditions of starting as well as during normal operation. If a tied system is used, it shall be such that no tie depends on the integrity for any other tie within the system.

D. Bearings

1. The motors shall have spherical roller thrust bearings at the non-drive end (top). All anti-friction thrust bearings shall be designed for an L10 life of 100,000 hours (including pump design thrust and rotor weight). For applications with higher thrust loads (which cannot meet the L10 life) plate-type thrust bearings and oil lubricated sleeve guide bearings shall be used. The oil sump shall be designed to maintain a maximum 40°C temperature rise. Motors shall be designed for the necessary upthrust.

2. The motor shall be designed and built so that it is capable of safely running in the reverse direction without damage at a speed twenty (20) percent higher than the reverse runaway speed under the maximum turbining head specified, as calculated by the pump manufacturer. The maximum head shall be predicated on the failure of the pump discharge check valve to operate coupled with simultaneous power failure of the motor.

3. When required by motor speed and bearing size, provision shall be made for forced lubrication. The oil supply shall be supplied with motor. In addition, oil rings and an adequate oil reservoir in the bearing housings shall be provided to permit orderly shutdown of the motor in the event of failure of the forced feed lubrication system.

E. Enclosures

1. Frame and Construction: The motor frame shall be welded from thick steel members to provide adequate strength and rigidity to meet the vibration levels specified herein. The external side panels of the motor enclosure shall be fabricated from plate steel with a minimum thickness of 1/4". Enclosures manufactured with synthetic materials such as plastic or fiberglass are not acceptable. The bearing bracket shall be secured to the frame with a rabbet fit.

2. Motor enclosures shall conform to the NEMA classifications specified in the Division 11 equipment specifications. Motors shall have a steel or cast iron frame, cast iron end brackets and steel conduit box.

   a. Vertical motors of the open type shall be provided with drip hoods of approved shape and construction. When the drip hood is too heavy to be easily removed, provision shall be made for access for testing.

   b. Open motors shall be provided with corrosion resistant screens over the air openings in accordance with NEMA requirements for guarded machines. All enclosures shall be provided with stainless steel corrosion resistant screens over all openings.

3. The internal cooling air of all motors shall circulate from both ends of the motor towards the center of the rotor and stator lamination stacks, then through vents in the rotor and stator laminations (symmetrical cooling) to the exhaust openings or heat exchanger. Under no circumstances shall uni-directional (asymmetrical) cooling airflow be utilized due to the uneven heat distribution caused particularly in the rotor and bearings.

4. All motors shall include corrosion resistant bolts.

5. Drain(s) shall be provided in the lowest location(s), as necessary, to eliminate the accumulation of liquids.

6. There shall be a metal arrow on each end of the motor indicating direction of rotation. The arrows shall be stainless steel and fasten to the motor frame with stainless steel drive pins.

7. There shall be four air gap inspection ports on each end of the motor. Fans and air baffles shall be designed to accommodate air gap measurement.

8. Motors shall be capable of being lifted in one piece and fully assembled when shipped.

9. Motor conduit box shall be split from top to bottom and shall be capable of being rotated to four positions. Motor conduit box shall be in accordance with the following:

   a. The main terminal box shall be made of welded sheet steel, sized for stress cones and have a minimum size of ANSI type II.

   b. A separate cast aluminum motor mounted terminal box or boxes shall be provided for RTDs, space heaters, bearing relays and any other specified

accessories wired to ring tongue/screw type terminal blocks.

d. Conduit box shall be gasketed and shall include rubber-like gaskets between the frame and the conduit box and between the conduit box and its cover.

e. Conduit boxes or openings in motor housings shall be provided with conduit hub type fittings to permit threaded conduit connections.

f. Terminal leads shall be flexible and shall be of sufficient length to extend for a distance of not less than ten inches beyond the face of the terminal box. Terminal leads shall be fitted with solderless lugs suitable for attachment to lugs installed on external wiring. Leads shall be sealed with a non-wicking, non-hygroscopic insulating material or an insulating wrap-cap as manufactured by Ideal Industries.

g. Provisions for terminal box size, length of leads, size of conduit openings and type of terminal lugs shall be complied with irrespective of any other standards or practice.

h. A motor frame grounding stud shall be provided inside the conduit box. A drilled and tapped hole shall be included.

F. Balancing and Vibration

1. Rotors shall be dynamically balanced with a half key to grade G1 per ISO 1940 to insure low vibration levels. The vibration levels shall be measured on the bearing housing in the X, Y & Z direction at rated speed with the fully assembled machine mounted on a rigid foundation per NEMA MG 1 Part 7.6.2. The vibration spectrum shall be recorded and include frequencies up to 5 times operating speed. The maximum allowable no-load vibration (filtered) shall be 0.08 in/sec.

G. Sound Level

1. The average sound pressure level ($L_{pm}$) of motors shall not exceed 85 dBA at 3 feet measured according to IEEE 85 in a free field at no-load. If it is not possible to meet 85 dBA the motor vendor shall state the minimum sound level possible.

2.03 ACCESSORIES

A. Space Heaters

1. Space heaters for condensation prevention shall be rated 120 volt. Wattage shall be suitable for the particular frame size and type in accordance with the manufacturer's recommendation.

2. Space heater wire leads shall be brought out to an auxiliary conduit box on the motor. Box construction shall match main power conduit box.

B. Winding Thermal Protection

1. Winding thermal protection shall be in accordance with the following:

a. Resistance temperature detectors shall be 100 ohm precision type with calibrated resistance-temperature characteristics. Detectors, two per phase, shall be positioned to detect highest winding temperature and located between coil sides in stator slots. Detector leads shall be wired to a separate NEMA 4 rated terminal box.

C. Bearing Temperature

1. Bearing temperature detectors RTD type similar to the winding detectors specified above shall be provided on both bearings.

D. Vibration Switch

1. Provide a 2-wire, solid-state, vibration switch suitable for machine shutdown protection in the event of high vibration.

2. Switch is to be a single setpoint, externally adjustable, with a built in LCD indicator, all mounted in a NEMA 4 rated enclosure suitable for a Class I, Division 2, Group D environment.

3. Vibration switch is to be Metrix Instrument Company (PMC Beta) model 5477, or equal.

E. Vibration Transducers

1. Vibration Transducers shall be IEPE (Integrated Electronics Piezo Electric) type accelerometers suitable for "Condition Monitoring" including vibration probes, mounting brackets, connectors and cabling for industrial machinery environments, with a corrosion resistant (i.e. stainless steel, monel, titanium), NEMA 4 housing.

2. The transducers shall be installed by the motor manufacturer mounted to measure both radial (X – Y) and thrust (Z) vibration acceleration with units in "g" and shall have a sensitivity of 100mV/g.

3. Transducers shall be Rockwell Automation / Allen-Bradley — 9100CSA or 9200CSA or equal.

2.04 SPARE PARTS

A. The Contractor shall furnish and deliver to the Engineer, at that part of the site and at such time as the Engineer may direct, spare parts for the electric motors in accordance with Division 1 - General Requirements.

B. The spare parts shall be listed in an index and packed in containers suitable for long term storage, bearing labels clearly designating the manufacturer's part number with complete information for use and reordering.

C. Spare parts shall be furnished in accordance with the manufacturer's recommendations for the motor size and type. Spare parts shall include at a minimum the following:

1. One complete set of upper and lower bearing liner halves for the drive end (DE) and non-drive end (NDE) bearings for each type and size of motor. Spare bearings shall

be furnished for all motor types. When sleeve bearing motors are provided, spare oil rings shall be furnished for those motors.

2. One set of bearing temperature detectors shall be provided (per each set of three, or less) of each type of motor.

3. One complete set of oil ring(s), front and rear inboard and outboard seals.

4. One set of special tools which may be needed.

5. In addition to the items specified above, Manufacturer shall furnish any additional parts or lubricants required to operate the system for one (1) year.

## PART 3 --- EXECUTION

### 3.01 MANUFACTURER'S FIELD SERVICES

A. A qualified manufacturer's service representative shall assist in the installation of the motors, check the motor installation before it is placed into operation, assist in the performance of field tests, observe and assist initial operations and train the plant operations and maintenance staff in the care, operation and maintenance of the motors.

B. The Contractor shall provide equipment start-up services and training in accordance with the Division 1 - General Requirements.

C. The Contractor shall provide a field report from the manufacturer's representative for each visit to the site. The report shall include complete information on time, schedule, tasks performed, persons contacted, problems corrected, tests results, training, instruction and all other pertinent information.

D. The service representative shall sign in with the Engineer on each day they are at the site.

### 3.02 DELIVERY, STORAGE AND HANDLING

A. Electric motors shall be delivered, stored and handled in accordance with the Division 1 - General Requirements, the motor manufacturer's instructions and the following:

1. Motors shall be inspected for shipping damage when received.

2. All sleeve or oil lubricated bearings motors shall be identified and the bearing reservoirs filled to normal level.

3. Motors shall be handled using motor base lifting lugs. Avoid pounding or bumping of motor which may damage motor. A hoist and spreader bar arrangement shall be used to avoid damage.

4. Motors shall be stored indoors in clean, dry heated areas.

5. Motor space heaters shall be energized to prevent moisture condensation throughout the storage and construction period.

6. Motors shall not be stored in areas subject to continuous vibration. A small quantity of grease shall be injected into each bearing on a monthly basis. Purged grease shall be inspected for water or rust.

3.03 INSTALLATION

A. Motors shall be installed in accordance with manufacturer's instructions and recommendations.

B. Each motor shall be carefully and properly aligned with the driven equipment.

C. Equipment shall be secured to mounting surface with anchor bolts. Anchor bolts shall be provided meeting manufacturer's recommendations and of sufficient size and number to secure equipment.

3.04 PAINTING

A. External Surfaces

1. All severe duty motors shall have all external surfaces pretreated, primed and painted. External surfaces shall be pretreated so the surface is clean and free of contaminants. After pretreatment, the surface shall be primed with an oxide primer and then spray painted with a minimum of .003 inch thick epoxy polyamide and semi-gloss coating that is chemical, solvent, salt water, and acid resistant.

2. All other motors shall have external surfaces pretreated, primed and painted in accordance with the manufacturer's standard treatment.

B. Internal Surfaces

1. All severe duty motors shall have all internal surfaces pretreated, primed and painted. Internal surfaces shall be pretreated so the surface is clean and free of contaminants. After pretreatment, the surface shall be primed with an oxide primer and then painted with an epoxy paint. Machined joints and threaded parts shall be coated with rust inhibiting compound.

2. All other motors shall have internal surfaces pretreated and primed in accordance with the manufacturer's standard treatment.

C. All machined bolts and screws and other hardware shall be of the hex head type and shall be zinc plated. Stainless steel hardware shall be used on severe duty motors.

3.05 SHOP TESTING

A. Shop testing shall be performed on each motor at the manufacturer's plant prior to shipment. Shop test shall be in accordance with the latest revisions of NEMA MG 1 and shall demonstrate that the equipment tested conforms to the requirements specified.

B. The Contractor shall submit certified shop test reports as specified herein.

C. Shop Tests shall be witnessed by the Engineer where required by the Division 11 specifications. At least 10 days notice shall be given the Engineer prior to tests dates.

D. Shop tests shall consist of the following:

1. Visual inspection of the motor
2. Insulation resistance measurement
3. Measurement of winding resistance
4. Direction of rotation with proper phase sequence
5. Check air gap
6. Vibration at no load with recording of bearing vibration signatures
7. No-load readings of current and input power at rated Volts and Hz.
8. High potential test according to MG 1-20.48
9. Functional test all accessories for proper operation
10. Determination of locked rotor torque and current
11. Determination of no load speed, voltage, current and losses at rated frequency.
12. Determination of percent slip
13. Determination of speed vs. torque curve
14. Determination of speed vs. current curve
15. Determination of open and short circuit saturation curves
16. Motor heat run test (recordings until temperatures stabilize to determine full load temperature rise)
17. Determination of full-load current
18. Determination of efficiency at 100%, 75% and 50% of full load
19. Determination of power factor at 100%, 75% and 50% of full load
20. Determination of breakdown torque (calculated)
21. Winding resistance test
22. High potential test
23. Sound pressure level measurement at no load
24. Polarization index test
25. Vibration Test.
26. Bearing Inspection.

3.06 FIELD TESTS

A. After installation, each motor shall be field checked and tested for the following:

1. Field Checks:
   a. Motors shall be checked to determine that they have been properly installed, lubricated and connected.
   b. Electrical and grounding connections have been made and are correct;
   c. Ventilating air passageways shall be inspected for blockage.
   d. Check for overheating.
   e. Check for excessive noise.
   f. Check for correct rotation.
   g. Protective detectors operation shall be checked.
   h. Any excessive vibration shall be checked.
   i. Space heater operation shall be checked.

2. Field Tests:
   a. Insulation resistance tests.
   b. Surge comparison.
   c. Vibration tests shall be performed.
   d. Running current and voltage shall be measured and evaluated relative to

load conditions and nameplate full-load amperes.

e. High-potential tests.

f. Motors shall be operated with driven equipment for a minimum of 48 continuous hours and rechecked for overheating and vibration.

g. Polarization Index shall be tested

B. All test data and values for each motor shall be in accordance with the manufacturer's recommendations and NETA, ATS Acceptance Testing Specification.

C. The Contractor shall submit an acceptance testing report upon completion of inspection and testing. The report shall be in accordance with NETA, ATS Acceptance Testing Specification. Final Acceptance test data shall be recorded on a "Motor Test Record" sheet as referenced in the NETA ATS document and submitted with the report.

- END OF SECTION -

# SECTION 11241

# VENTURI MIXER

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Furnish, install, test, and place in operation, venturi mixers and all necessary accessories as specified herein.

B. The venturi mixers are to be installed in the wet wells and connected to the discharge of a submersible chopper pump, which is specified elsewhere. The venturi mixers are to homogenize the contents of the wet well to help prevent and/or limit the formation of a grease layer on top of the wastewater in the wet wells.

C. The equipment is to be provided complete with all accessories, mountings, anchor bolts and other appurtenances as specified and as may be required for a complete and operating installation.

D. The Contractor is responsible to insure that the equipment and appurtenances furnished and installed are compatible and have the necessary operating clearances with the structural elements.

### 1.02 RELATED REQUIREMENTS

A. Work must be performed within an operating pump station and must be scheduled and performed to have minimal impact on station operations.

### 1.03 GENERAL DESIGN AND PERFORMANCE REQUIREMENTS

A. General: Two venturi mixers are to be installed in each of the two wet wells below the average water surface elevation at the locations shown on the Drawings. The two venturi mixers will be manifold together and receive flow from a single chopper pump. The pump flow will discharge through an orifice in the throat of the venturi, and will induce a bulk flow of approximately 3 to 3.5 times the pumped flow. As flow is pumped through the venturi mixer, air will be entrained into the induced flow through an airline attached to the mixer.

B. Design Requirements:

1. Number of Units: 4

3. Design Pumped Flow per Venturi Mixer: 600 gpm

4. Pumped Flow Orifice Diameter: 4 inches

5. Venturi Throat Diameter: 24 inches

6. Pumped Flow Connection: 6 inch flange

7. Air Line Connection: 1½ inch FNPT

1.04 SUBMITTALS

A. Furnish in accordance with Section 01300 - Submittals and Section 01730 - Operation and Maintenance Manuals.

1. Shop Drawings. In addition to the items specified in Section 01300 – Submittals, furnish the following:

a. Dimensioned installation drawings.

b. Detailed description of construction, including parts list with materials of construction and metallurgy with ASTM designations.

2. Operation and Maintenance Manuals.

3. Furnish certified report prepared by manufacturer's technical representative certifying satisfactory installation, operation, and in-service placement of units.

1.05 QUALITY ASSURANCE

A. Standardization: All units to be product of single manufacturer.

B. System Coordination: The Contract Documents are intended to describe details of a complete equipment installation for the purpose specified. Contractor is responsible for all details and appurtenances necessary to properly install, adjust, and place in operation a complete working unit.

1.06 DELIVERY STORAGE AND HANDLING

A. Delivery:

1. Deliver all components to site in manufacturer's shipping crates or boxes.

2. Deliver to site undamaged.

B. Storage: Store above ground, covered, on platforms, skids, or other supports, and protect from corrosion and mechanical damage.

C. Handling: Handle unit to prevent damage during unloading and installation. Follow manufacturer's instructions on lifting and setting.

PART 2 -- PRODUCTS

2.01 MANUFACTURER(S)

A. Subject to compliance with the requirements of this Section, the following manufacturers have the capability of performing the work in this Section:

1. Waste Tec, Inc. Automatic Pit Evacuator

2. "Or Pre- Approved Equal."

B. The naming of a manufacturer in this Section is not an indication that the manufacturer's standard equipment is acceptable in lieu of the specified component features. Naming is only an indication that the manufacturer may have the capability of engineering and supplying a system as specified.

2.02 MATERIALS AND/OR EQUIPMENT

A. General:

1. The venturi mixer is to be designed to induce a bulk flow in the wet well of 3 to 3.5 times the pumped flow through the venturi mixer. The venturi mixer is also to generate a vacuum and entrain air into the induced flow as it passes through the venturi throat.

2. All components of the venturi mixer are to be constructed of Type 304 stainless steel.

3. The venturi tube shall have a throat diameter of 24 inches and throat length greater than 42 inches. Each end of the venturi throat shall increase to 36 inches at an angle greater than 30 degrees. The venturi tube shall a gusseted flanged connection for the pumped flow, and an FNPT connection for the air line.

4. Each venturi mixer shall be supplied with a thrust restraint assembly that mounts on the inlet bell of the venturi mixer and is anchored to the wet well wall. The thrust restraint assembly shall be constructed of Type 304 stainless steel.

5. Provide structural supports to hold the venturi mixer in the position shown on the Drawings. Design the structural supports for the anticipated dynamic loadings associated with the mixer operation and wet well through flows. The supports are to have a minimum material thickness of ¼-inch.

6. Attachment hardware is to be 316 stainless steel.

PART 3 -- EXECUTION

3.01 GENERAL

A. Venturi mixer is to be installed once the wet well is taken out of service and dewatered.

3.02 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Furnish services of manufacturer's trained, competent, technical representative who has knowledge of the proper installation, operation, and maintenance of the equipment to perform the following:

1. Inspect the completed installation for conformance with manufacturer's recommended installation requirements;

2. Supervise operational test of each unit;

3. Instruct Owner's personnel in operation and maintenance of equipment; and

4. Prepare and certify field inspection report.

C. The services of a qualified manufacturer's technical representative are to be provided for a period of not less than two (2) days as follows:

1. At least one trip of one (1) day to check and supervise the equipment installation and field test.

2. One trip of one (1) day to supervise initial start-up and operation and to instruct the Owner's personnel in proper operation and maintenance of the equipment.

D. Field Tests:

1. General: The equipment is to be field tested in the presence of the Owner and manufacturer's representative, to demonstrate that the equipment can mix the contents of the wet well.

2. All labor, materials, and test apparatus necessary for conducting the field acceptance tests are to be furnished by the Contractor at no additional cost to the Owner.

- END OF SECTION -

# SECTION 11395

# MEDIUM VOLTAGE VARIABLE FREQUENCY DRIVES

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. The Contractor shall furnish, install, connect, test and place in satisfactory operating condition all medium voltage variable frequency drives (VFD's) for the booster pump station as specified herein and indicated on the Drawings. The VFDs shall be supplied by the pump supplier.

B. This specification describes the requirements for the purchase, design, fabrication, inspection, testing, shipment, and commissioning of the VFDs. The VFDs shall be suitable for a 4160VAC, three-phase, 60HZ input. The drive output shall be 4160 VAC, three-phase. The Contractor, pump supplier, and VFD Manufacturer shall note the maximum dimensions of the VFD assembly specified herein and indicated on the Drawings.

C. The VFDs shall be assembled using NEMA rated components. Components designed and built to International Electrotechnical Commission (IEC) standards are not recognized. Equipment designed, manufactured and labeled in compliance with IEC standards is not acceptable.

D. Reference Section 01520, Maintenance of Utility Operations During Construction, Section 17000, Control and Information System Scope and General Requirements, Section 16000, Basic Electrical Requirements, Section 11221, Medium Voltage Electric Motors, and Section 16902, Electric Controls and Relays.

E. The programmable motor protectors specified herein shall all be provided by a single manufacturer.

### 1.02 TESTING

A. All tests for each VFD shall be performed in accordance with the requirements of Section 16000 and Division 1. Manufacturer's standard tests shall be performed. Minimum testing shall include:

1. Witnessed Shop Tests

   a. Power semiconductors shall be thermally cycled prior to final assembly into the VFD.

   b. Printed circuit boards shall be tested prior to assembly into the VFD. The printed circuit boards shall go through the manufacturer's standard burn-in and/or thermal cycle test procedures.

   c. Individual power cells shall undergo a visual inspection, an electrical inspection, and a complete full load test prior to final assembly into the VFD.

d. Mechanical operation tests shall be performed for each VFD to verify satisfactory operation. These tests shall include checking operating mechanisms and interlock devices.

e. Electrical function tests shall be performed to ensure proper operation of all devices and components including operation of the VFD at full load conditions. Instrumentation, software, and monitoring tests shall be included.

f. The final assembly, including transformer, shall be tested at full load and voltage by a power back method that returns drive output power to the power line. An unloaded full voltage motor shall also be used during testing.

g. Shop tests shall be performed to simulate real operating conditions as close as possible. The manufacturer shall imitate real operating conditions as far as practicable, including low voltage control circuits.

h. Authorized representatives of the Owner shall be allowed free access to the shop at all times while work is in progress for the purpose of inspection, witnessing of tests, and obtaining information on the progress of the work. The Owner shall give the Contractor 72 hours prior notice.

i. Acceptance of a shop test does not relieve Contractor from requirements to meet field installation tests under specified operating conditions, nor does the inspection relieve the Contractor of responsibilities.

j. The Contractor shall successfully complete acceptance test procedures on the assembled drive system that demonstrate compliance with the requirements of this Specification. The test plan shall be submitted for acceptance at least 30 days prior to the planned test date.

k. Drive system shall not be shipped from the manufacturing and assembly facility until the acceptance tests are completed and the results approved by the test representative.

l. Tests shall be witnessed by a representative of the Engineer. Variable frequency drive manufacturer shall notify the Engineer 2 weeks in advance and shall provide testing procedures to the Engineer 4 weeks prior to actual testing. Failure of a test shall result in rejection of the equipment until performance is in compliance with these Specifications.

m. Certification on materials and records of shop tests necessary for the inspector to verify that the requirements of the Specifications are met shall be made available to the inspector.

n. Submit signed and dated certification that all of the factory inspection and testing procedures described herein have been successfully performed by the Contractor prior to shipment.

o. The contractor shall provide a minimum of 4 weeks notice prior to commencement of witness shop tests.

2. Certified Shop Tests and Reports

a. Submit description of proposed testing methods, procedures, and apparatus.

b. Submit notarized and certified copies of all test reports for each VFD.

c. Submit factory bench-test data to indicate that the manufacturer's proposed equipment has been tested in the specified arrangement and found to achieve specified accuracy.

3. Field Tests

a. Field tests shall be performed in accordance with the requirements of Division 1.

1.03 SUBMITTALS

A. In accordance with the procedures and requirements set forth in Division 1 the Contractor shall obtain from the equipment manufacturer and submit the following:

1. Shop Drawings

2. Harmonic Study Report

3. Programming Guides/Manuals

4. Service Manuals

5. Spare Parts List

6. Special Tools List

7. Shop Test Plan

8. Reports of Certified Shop and Field Tests

9. Warranty Data

B. Each submittal shall be identified by the applicable specification section.

1.04 SHOP DRAWINGS

A. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.

B. Partial, incomplete, or illegible submittals will be returned to the Contractor without review for resubmittal.

C. Drawings submitted by the manufacturer shall be complete and documented to provide the Owner with operations and maintenance capabilities.

D. The Contractor and VFD Manufacturer shall note any and all exceptions to this specification in the Shop Drawings.

E. Shop drawings for each VFD shall include but not be limited to:

1. Layout drawings of the variable frequency drive system that include all cabinet or enclosure dimensions, access details, and weights.

2. Layout drawings of panels or enclosures showing size, arrangement, color, and nameplates. Drawings shall include the physical arrangement of door mounted devices located on the variable frequency drive enclosure. Sufficient detail shall be provided for locating conduit stub-ups. General "catalog data sheet" layout drawings which are not specific to the systems specified herein are not acceptable.

   The Contractor shall specifically review the shipping splits indicated on the shop drawings. The Contractor shall confirm that the shipping splits are correct and will allow installation of the equipment without disassembly.

3. Schematic and interconnection wiring diagrams of all electrical work, including terminal blocks and identification numbers, wire numbers and wire colors. These drawings shall be circuit specific for each motor-load combination. Indicate all devices, regardless of their physical location, on these diagrams. Specific equipment names consistent with the Drawings shall appear on each respective diagram.

4. Complete single line diagrams indicating all devices comprising the variable frequency drive system including, but not limited to, circuit breakers, motor circuit protectors, contactors, instrument transformers, meters, relays, timers, control devices, and other equipment comprising the complete system. Electrical ratings of all equipment and devices shall be clearly indicated on these single line diagrams.

5. Complete Bills of Material and catalog data sheets for all equipment and devices comprising the variable frequency drive system.

6. Heat loss data for each VFD.

7. Drive system efficiencies at 25%, 50%, 75%, and 100% of full load including the effects of transformers, fans, and other devices.

8. Descriptive bulletins that include ratings, protection, controls, diagnostics, and operation.

9. A complete list of recommended spare parts, including item descriptions, recommended quantities, and unit costs. The recommended list should be based on a maintenance plan where the Owner will remove and replace failed items to the lowest replaceable module/component level.

F. The shop drawing information shall be completed and organized in such a way that the Engineer can determine if the requirements of these Specifications are being met. Copies of technical bulletins, technical data sheets from "Soft Cover" catalogs, and similar

information which is “highlighted” or somehow identifies the specific equipment items the Contractor intends to provide are acceptable and shall be submitted.

If standard data and catalog literature is supplied, all furnished options shall be carefully highlighted and options not being furnished shall be carefully deleted. Unclear information will cause rejection of the entire submittal.

G. Prior to completion and final acceptance of the project, the Contractor shall furnish and install “as-built” wiring diagrams for each VFD. These final drawings shall be plastic laminated and securely placed inside each VFD and included in the service manuals.

H. Product Data shall include, but not be limited to:

1. Functional diagrams that identify major system functional blocks and interfaces.

2. Special requirements or restrictions of the motor-load combination that may result from operation on the variable frequency drive system.

I. Harmonic Study and Data shall include but not be limited to:

1. Report of Harmonic Study to determine the harmonic distortion present in the voltage and current waveforms at the incoming line and motor output terminals of the VFD caused by the variable frequency drive system as specified herein.

2. Voltage and current waveforms supplied by the variable frequency drive at the motor leads.

3. Necessary descriptions regarding calculation method, assumptions, values and notations, basis for input information, manufacturer’s harmonic content data, and calculation results interpretation.

J. Programming Guides and Manuals shall be submitted. If the variable frequency drive systems require computer software or configuration, provide copies of all programming guides/manuals. Flow charts and listings of software developed shall be submitted to the Engineer. Submit final flow charts and program listings no later than 6 weeks prior to factory testing of the system.

1.05 OPERATION AND MAINTENANCE MANUALS

A. The Contractor shall submit operation and maintenance manuals in accordance with Section 01730, Operation and Maintenance Manuals, and the procedures and requirements set forth in the Special Provisions, General Requirements, and Division 1.

1.06 TOOLS, SUPPLIES, AND SPARE PARTS

A. The VFD’s and accessories shall be furnished with all special tools necessary to disassemble, service, repair, and adjust the equipment. All spare parts as recommended by the equipment manufacturer shall be furnished by the Contractor to the Owner. Spare parts shall be furnished in accordance with Division 1.

B. The Contractor shall furnish the following minimum spare parts <u>for each VFD</u>:

1. One (1) set of all power and control fuses for each variable frequency drive.

2. One (1) of each fully functional control board.

3. Four (4) of each power semiconductor.

4. Spare auxiliary equipment as specified.

C. The spare parts shall be packed in containers suitable for long term storage, bearing labels clearly designating the contents and the pieces of equipment for which they are intended.

D. Spare parts shall be delivered at the same time as the equipment to which they pertain. The Contractor shall properly store and safeguard such spare parts until completion of the Work, at which time they shall be delivered to the Owner.

E. Spare parts lists, included with the shop drawing submittal shall indicate specific sizes, quantities, and part numbers of the items to be furnished. Terms such as “1 lot of packing material” are not acceptable.

F. Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. Each part shall be properly identified by a separate number. Those parts which are identical for more than one size, shall have the same parts number.

1.07 SERVICES OF MANUFACTURER’S REPRESENTATIVE

A. The Contractor shall provide the services of a qualified manufacturer’s technical representative who shall adequately supervise the installation and testing of all equipment furnished under this Contract and instruct the Contractor’s personnel and the Owner’s operating personnel in its maintenance and operation as outlined in Division 1. The services of the manufacturer’s representative shall be provided for a period of not less than as follows:

1. One trip of four (4) working days during installation and start-up/configuration of the equipment for each pump.

2. One trip of one (1) working day after acceptance of the equipment.

3. One trip of one (1) working day during the warranty period.

Any additional time required to achieve successful installation and operation shall be at the expense of the Contractor.

A field service engineer shall be available 24 hours per day, 365 days per year.

D. The Contractor shall coordinate the services of the VFD Manufacturer’s technical representative with that of the pump supplier.

E. The VFD Manufacturer shall provide a software tool with operational, maintenance, and diagnostic features. Using a laptop computer, this software shall permit the programming of parameters, display block diagrams, report adjustment data, display trends, provide troubleshooting using first fault data/trace back data/trouble record, and contain links to

system documentation and to system help. The software tool shall also have the following features:

1. Ethernet interface with the VFD.

2. Animated function block diagrams with real time variables.

3. Commissioning wizards.

4. Integrated trending window.

5. Multilevel privilege feature for configuration parameter settings.

1.08 IDENTIFICATION

A. Each VFD shall be identified by the circuit number and equipment name as indicated on the Drawings. A nameplate shall be securely affixed in a conspicuous place on each VFD. Nameplates shall be as specified in Section 16195, Electrical – Identification.

1.09 TRAINING

A. Training shall be conducted in accordance with Section 01830, Training and Demonstration.

1.10 WARRANTY

A. Contractor shall warrant that the material and workmanship of all components and the operation of the variable frequency drive system and auxiliary equipment is in accordance with the latest design practices and meets the requirements of this Specification.

B. Warranty work shall include, but not be limited to, the following:

1. Replace components found to be faulty and make changes in equipment arrangement or adjustments necessary to meet the equipment or functional requirements or this Specification.

2. Warranty shall include system rewiring and substitution and rebuilt or additional equipment required during trial operation or subsequent operation of the unit during the period of this warranty.

3. The VFD Manufacturer's warranty shall be in effect for a period of two (2) years from the date of shipment. The VFD Manufacturer shall clearly state the details of the warranty in the Submittals.

1.11 CONSTRUCTION SEQUENCING

A. The Contractor shall reference Section 01520, Maintenance of Utility Operations During Construction, of these Specifications.

1.12 REFERENCES

A. Applicable requirements in the latest edition (or the edition indicated) of the following industry standards and industry practices shall be considered an integral part of this

Specification. Short titles will be used herein when appropriate.

1. IEEE 519 Guide for Harmonic Control and Reactive Compensation of Static Power Converters

2. IEEE 1100 – Powering and Grounding Sensitive Electronic Equipment (Emerald Book)

3. NEMA ICS 6 – Industrial Control and Systems Enclosures

4. NEMA ICS 7 – Industrial Control Systems Adjustable Speed Drives

5. NPFA 70 – National Electrical Code (NEC)

6. UL 347A – Medium Voltage Power Conversion Equipment

B. Any conflicts between this specification and the VFD Manufacturer's documents shall be identified in writing in the Shop Drawings for resolution.

1.13 MANUFACTURERS

A. The equipment covered by this Specification is intended to be standard equipment of proven performance. Equipment shall be designed, constructed, and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Drawings.

B. The Contractor shall obtain the VFD's from one manufacturer. The manufacturer shall have a minimum of 15 years experience in the manufacture of similar units and shall have a general distribution to the electrical trade. Subcontracting of wiring will not be acceptable.

The VFDs shall be the PowerFlex 7000 AFE Series as manufactured by Rockwell Automation/Allen Bradley, Perfect Harmony Series as manufactured by Siemens Robicon, T300MVi as manufactured by Toshiba, or Pre-approved equal.

C. Motor control circuits shall be wired in accordance with the requirements specified herein or indicated on the Drawings.

D. The pump manufacturer shall be responsible for the successful application and operation of the entire drive and control system serving the motor and driven equipment. This includes the responsibility for obtaining all load, torque, speed and performance requirements from the respective sources and integrating these into a variable frequency drive system that fulfills the requirements of this Specification.

E. The Contractor and variable frequency drive system manufacturer are cautioned regarding the review and compliance with the total Contract Documents. Typical examples are circuit breakers, motor circuit protectors, magnetic starters, relays, timers, control and instrumentation products, pilot devices including pushbuttons, selector switches and pilot lights, enclosures, conduit, disconnect switches, terminal boxes, and other equipment.

PART 2 -- PRODUCTS

2.01 SYSTEM DESCRIPTION

A. The VFD shall consist of the following components:

1. Incoming Main Disconnect Device

2. Multi-secondary Isolation Transformer with Rectifier if required

3. Frequency Converter/Inverter

4. Electronic Motor Protection with Selection of Class 10/20/30 Protection

5. Output filter or reactor (when required to limit reflected voltage)

6. Diagnostics and Control Circuits

B. The VFD inverter/chopper shall be of the pulse width modulated (PWM) type. The output devices shall be Insulated Gate Bipolar Transistors (IGBTs) or Symmetrical Gate Commutated Thyristors (SGCTs).

C. The VFD assembly shall be designed and constructed to Underwriters Laboratory (UL and/or cUL) standards.

D. This specification covers a VFD controlling a single motor.

E. All components and material shall be new and of the latest field-proven design and in current production. Obsolete components or components scheduled for immediate discontinuation shall not be used.

F. The equipment shall be completely factory-built, assembled, wired, and tested. When it is necessary to disassemble the units for ease of transportation, adequate materials and instructions shall be provided for easy field reassembling.

2.02 SYSTEM FEATURES AND CHARACTERISTICS

A. Efficiency

1. The efficiency of the VFD including the input transformer and cooling fans shall be greater than 96.5% at 60 hertz output frequency.

B. Power Factor

1. The real and displacement power factor of the VFD including the input transformer shall be greater than 95% at loads greater than 50%.

2. Real power factor shall be calculated as follows:

$$pf = \frac{kW}{kVA}$$

3. Displacement power factor shall be the cosine of the angle measured between the current and voltage transformers as measured on an oscilloscope.

4. Power factor measurement shall be performed at the factory and in the field.

C. Speed Control

1. Sensor-less vector control shall be supplied when required speed regulation is less than 0.5%.

2. Vector control with a tachometer or encoder shall be supplied when required speed regulation is less than 0.01%.

3. The response of the speed regulator shall be at least 20 rad/sec.

4. The VFD output frequency shall be adjustable, 0-75HZ.

D. Torque Control

1. The VFD shall have less than 1% torque ripple over a 20 to 1 speed range on the motor.

2. The accuracy of the torque regulator shall be ± 3% FS with a motor temperature sensor or ± 30% without a motor temperature sensor.

3. The response of the torque regulator shall be as required for variable torque pump duty application.

2.03 DESIGN REQUIREMENTS

A. Mechanical

1. Enclosure Construction

a. The VFD enclosure shall be NEMA 12, suitable for installation in an indoor, unclassified area. The VFD enclosure shall be force ventilated, dead-front, with front accessibility. The enclosures shall be designed for both bottom and top entry of cables. The VFD assembly shall also be designed so that rear cabinet access is not required for operations, maintenance, and repair tasks. The doors shall have heavy duty hinges. Brace each door to prevent sag when fully open.

b. All enclosure openings exceeding 0.25 inch (6 mm) width shall be provided with screens to prevent the entrance of birds, snakes, rodents, and other varmints. The maximum screen mesh opening width shall be 0.25 inch (6 mm).

c. A “loss of cooling” fault shall be furnished. In the event of clogged filters or fan failure, the drive shall produce an alarm and then, in a predetermined time, shutdown safely without electronic component failure. Redundant fans, shall be included in the drive design as backup in the event of fan failure.

d. Air filters shall be of a reusable type that can be easily cleaned. All doors or front panels shall be fully gasketed. Air exhaust from cooling fans shall be at the top of the enclosure away from personnel in front of the equipment.

e. Fan motors shall be protected by an input circuit breaker. Metal squirrel cage ball bearing fan motors with 10-year design life shall be used in the drive design. Plastic muffin fans are not acceptable.

f. When operating at full load, the maximum noise level of the VFD assembly shall not exceed 85 dBA as per OSHA standards at a distance of 1 meter from the unit and at a height of 1.5 meters from the floor.

g. The VFD assembly, including incoming disconnect and integral transformer, shall not be greater than the maximum dimensions indicated on the Drawings.

h. The VFD enclosure shall be painted as specified herein.

2. Enclosure Auxiliary Components

a. Thermostatically controlled enclosure space heaters shall be furnished and shall be bar type operated at half voltage for long life. Space heater elements shall be rated 240 VAC and operated at 120 VAC, single-phase.

b. The space heater circuit shall be energized when the VFD is not in operation.

c. A molded case circuit breaker shall be provided for the space heater circuit overload protection and to serve as a disconnecting means. The enclosure space heaters shall be separately powered from a power source integral to the equipment.

d. The space heaters shall be wired and energized to provide temporary heating during storage.

3. Enclosure Nameplates

a. Nameplates shall be provided in accordance with Section 16195-Identification. Nameplates shall be provided for each VFD to identify the load it serves.

b. Meters, relays, switches, and other devices mounted on the exterior and within the VFD shall be permanently identified using the same name as those appearing on the schematic diagrams.

B. Electrical

1. Power Requirements

a. The VFD shall be capable of providing rated output for continuous input voltage deviations of +10%, -5% from the nominal rating with transformer

taps adjusted accordingly for continuous operation matching the average system voltage.

b. The VFD shall be able to ride through voltage dips down to 70% of nominal, such as those experienced during motor starting.

c. The VFD shall be able to return to normal operation following an incoming power disturbance that falls within the range determined by Figure 3-2 in IEEE 1100.

d. The VFD shall be capable of 100% rated current in continuous operation in accordance with the full load ampere requirements of the motor.

e. The VFD one-minute overload current rating shall be 115% of rated current for variable torque applications.

f. The VFD one-minute overload current rating shall be 150% of rated current for constant torque applications.

g. The VFD output voltage shall not cause insulation stress to the motor or exceed the peak voltage insulation level of the motor. Output filters, if required, shall be integral to the VFD assembly.

h. The VFD shall comply with the latest revision of IEEE 519 for total harmonic current and voltage distortion measurement and calculation. Individual current harmonics shall not exceed the requirements of IEEE 519.

i. The Contractor and VFD manufacturer shall review the pump specifications and note that these are slow motor speed applications.

2. Power Disconnect Devices

a. The VFD assembly shall include an integral main disconnect device with an interlocked and padlockable handle mechanism. The disconnecting device shall be a medium voltage vacuum contactor with a bolted pressure disconnect switch whose blades are externally visible from outside the enclosure. The disconnect device and respective fuses shall have a momentary withstand rating of 250 MVA (minimum).

b. When multiple inverter enclosure doors are supplied, all doors shall be electrically interlocked with the disconnect device. The interlocks shall include a provision to manually override for test and repair.

3. Input Power Transformer and Rectifier

a. The VFD shall contain an incoming dry-type isolation transformer if required to mitigate common mode voltage, whose primary voltage shall be as specified herein and indicated on the Drawings.

b. The transformer, if required, shall include three-phase secondary windings that provide the proper phase shifting to supply a minimum of a 18-pulse

rectification or active front end rectifier to reduce harmonic currents and voltages reflected to the primary power system.

c. The transformer shall be copper wound and shall have a 220°C insulation system to operate at 115° C rise at full load conditions.

d. The transformer shall have an electrostatic shield for protection from voltage transients.

e. The rectifiers shall be protected by fuses with blown fuse indication.

f. The transformer and rectifier shall be an integral part of the VFD assembly with primary disconnect switch, input vacuum contactor, and secondary fusing eliminating the need for separate field installation or wiring.

g. If required, soft charge of the DC bus capacitors shall be accomplished by use of an input reactor on the primary of the input transformer. A vacuum contactor rated for drive full load current shall short the reactor after charge is accomplished.

4. Power Bus

a. All power bus bars and bus joints shall be tin-plated copper for corrosion resistance.

b. Bus bars shall be braced to withstand short circuit currents of 50KAIC (minimum).

c. Input and output connections shall be either top or bottom access.

5. Inverter Section

a. The VFD inverter section shall consist of modular power cells.

b. The IGBTs or SGCTs shall be designed in a bridge connection such that when used in combination with the other bridges, a multi-level output motor voltage waveform is constructed.

c. The IGBTs or SGCTs shall be cooled using a sealed cooling system utilizing modern heat plate technology or forced air cooling.

d. Each cell shall communicate to the controller through optical communications. No other isolation method is permitted.

e. A high resistance ground detection circuit at the neutral point or a motor protection relay shall be included for alarm or warning in the event the load develops a ground leakage current or fault.

f. Three (3) Hall Effect current transformers shall be used for current feedback on the VFD output.

g. An output filter consisting of inductors, resistors, and oil-filled capacitors shall be installed inside the VFD enclosure when required to reduce objectionable harmonic voltages and currents at the motor.

h. PWM firing pulses shall result in an output voltage and current waveform that will have less than one percent (1%) torque ripple over a 20:1 speed range on the motor.

i. The output of the inverter shall produce harmonic current of not more than 3% at full load.

6. Wiring and Terminations

a. Bus bar with standard NEMA two- or four-hole pattern (as required) shall be supplied for input and output connection of external power wiring and shall be conveniently located, clearly numbered, and identified.

b. Control wire terminal blocks for external control wiring terminations shall be nut and bolt type, designed to accommodate stripped insulation wire ends with ring lugs. Terminal blocks shall accept a minimum of two No. 14 AWG conductors. Terminal blocks shall be Phoenix Contact Type D-OTTA 2.5 rated 600V, 20A, Buchanan Equivalent, Allen-Bradley equivalent, or equal.

c. Connection points for inputs and outputs of different voltage levels shall be segregated to reduce possibility of electrical noise. This may be accomplished through the use of terminal barriers and covers.

d. Where wiring is run through sheet metal or any barrier, bushings, grommets or other mechanical protection around the sheet or barrier opening shall be provided.

e. All internal wiring shall be terminated with no more than two (2) conductors per terminal point.

f. The VFD shall have an internal mechanical ground connection suitable for terminating a stranded copper ground conductor of the same size or smaller as the phase conductors. Ground connections shall be near the incoming and outgoing power cable termination points and control wiring connections.

g. Enclosures shall be designed to accommodate power and control cable entry from either top or bottom.

h. Minimum wire bending space shall meet or exceed the values shown in NEC Table 430-10(b) for termination of the power cables.

i. All control wiring shall be copper, No. 14AWG (minimum) labeled at each end with sleeve type wire markers with the wiring numbers shown on the accepted shop drawings. All internal power wiring shall be copper, No. 12 AWG (minimum) and marked accordingly.

C. Control

1. Configuration

a. As specified herein, the VFD Manufacturer shall supply a software tool to configure, monitor and troubleshoot the drive. The software shall have a path to a modem for remote diagnostics. The monitor feature shall have a trending feature where the VFD signals can be displayed in real time.

2. Operator Panel, Instruments, Displays, and Indicating Lights

a. A three position mode selector switch marked “Hand/Off/Auto” shall be provided and installed locally at each booster pump.

b. The door of each power unit shall include a backlit LCD keypad, a two position speed reference selector switch marked “Local/Remote”, one potentiometer (three wire control, +10 V, wiper and common) for speed control in local mode, elapsed time meter, a white “POWER ON” light, an amber VFD “FAULT” light, an amber “MOTOR PROTECTION RELAY FAULT”, an amber “CHECK VALVE FAILED” light, an amber “SEAL WATER LOW FLOW” light, a red VFD “RUNNING” light, a green VFD “Stopped: light, and a black fault reset pushbutton.

b. A door-mounted drive backlit LCD keypad shall be provided for operator interface.

c. The operator keypad display shall:

1) Have configurable bar charts and intuitive icons if available.
2) Contain LED’s to indicate “Run”, “Ready” or “Power On”, and “Alarm/Fault”
3) Have drive control functions and allow local operation of the motor from the keypad
4) Have full access to all parameters and variables.

d. The operator keypad shall be used to read and write parameter data, to present operational information, to produce first fault and device indication, to show alarms, and to allow metering of parameters, and provide Ethernet connectivity to the drive software programming tool specified herein.

e. The operator keypad shall include a level of security.

f. The operator keypad shall have a minimum of six (6) analog test points. Two (2) points shall be for Current A and B, and the other four (4) shall be configurable.

g. Additional metering and indication shall be as specified herein and indicated on the Drawings.

h. Meters, displays, and keypads shall be accessible and visible from the front without opening the enclosure.

i. All pilot devices including pushbuttons, selector switches, pilot lights, and other items shall be 30.5mm, heavy-duty, oiltight, NEMA 12 with legend plates. Legend plates shall be plastic, black field with white lettering. Pushbuttons shall have a full guard. Pilot lights shall be LED type.

3. Operational Controls

a. The VFD shall include the following basic operating adjustments:

1) Acceleration Time
2) Deceleration time
3) Current Limit
4) Minimum frequency or speed
5) Maximum frequency or speed
6) Selectable skip frequencies
7) Sensor-less Vector parameter settings
8) Local/Remote selection

b. The door mounted keypad shall have a button, which when activated, shall check each IGBT *or SGCT* and display any errors in this self diagnostic test.

c. The VFD shall include all the necessary components to protect the VFD and motor against motor overload, internal faults in either the motor or VFD, and disturbances in the incoming AC line. The overload protection shall have a multiple motor thermal curve function that allows tailoring the drive overload for different applications. The failure shall be annunciated on the operator panel's LCD display. The VFD to be shut down and the output voltage reduced to zero for the following conditions:

1) Short circuit on the output of the VFD
2) Instantaneous overcurrent-VFD or motor
3) Motor overload
4) Undervoltage or overvoltage on the incoming AC line
5) Single-phasing of the AC incoming line
6) Overtemperature of the VFD electronics from a component or ventilation failure
7) Gate driver power supply or control power supply undervoltage
8) VFD output open circuit during operation
9) Overvoltage or ground fault of the VFD output
10) Cause of individual power cell fault isolated to failed device.

d. The VFD shall have the ability to return the motor to operating speed upon restoration of power following a voltage interruption on the AC incoming line. This feature shall be configurable and capable of being disabled if desired.

e. The VFD shall be able to reaccelerate a rotating motor. This feature shall be configurable and capable of being disabled if desired. If this feature is disabled, the VFD shall not restart the motor until the motor has slowed sufficiently.

f. The VFD shall have the ability to provide electronic braking to slow down the motor.

g. The VFD shall be equipped with an auto tune-up wizard that includes a motor simulation feature. This function shall allow the drive to be tuned-up without the motor being connected.

4. Control Power Transformers (CPT)

a. A control power transformer (CPT) shall be provided within the enclosure. The CPT shall be powered from the VFD's main power supply.

b. The KVA rating of the CPT shall be as determined by the VFD Manufacturer and shall have a minimum of 25% spare capacity.

c. The CPT secondary voltage shall be 120 VAC.

d. The CPT primary shall be fused with current limiting fuses with an interrupting rating no less than 100,000 amperes.

e. The CPT secondary shall be fused and have one terminal grounded.

f. A second CPT powered from the VFD's main power supply shall be provided, if required, to supply other auxiliary equipment.

5. Input and Output Controls

a. Interface to external controls and signals from other equipment shall be furnished by the VFD Manufacturer as specified herein and indicated on the Drawings. All analog and discrete inputs and outputs required shall be furnished and installed by the VFD manufacturer and the Contractor.

b. The VFD shall provide, as a minimum, two isolated analog inputs at ± 10vdc or 4-20 mA.

c. A minimum of three configurable isolated analog output voltage signals shall be supplied. Two outputs shall be isolated and rated 4-20 mA and the other output shall be rated ± 10vdc.

d. The VFD shall include, as a minimum, eight 24vdc – 120vac discrete inputs.

e. The VFD shall include, as a minimum, five relays, each with 2 NO and 2 NC contacts rated 5A at 115 VAC.

f. The VFD shall provide one normally open contact and one normally closed contact to indicate motor run status. Contacts shall be rated 5A at 230 VAC and 24 VDC.

g. The VFD source voltage for external "Start - Stop" control circuit logic shall be 120 VAC, derived from the CPT.

h. One Pot input (three wire control, +10 V, wiper and common) in local mode.

6. Faults and Alarms

a. The last eight (8) faults and alarms shall be logged in trace memory with 64 analog channels. The trace for each alarm shall start 50 ms before the fault and end 100 ms after the fault. This trace data can be uploaded to the toolbox for display/analysis in the trend window.

1) The VFD shall include one common alarm contact that will be closed during normal operation and will open on VFD fault conditions.

D. Programmable Motor Protector

1. Each VFD shall be provided with a microprocessor based, motor protector to protect, monitor, and control the motor.

2. The motor protector shall be capable of monitoring electrical current; receive commands from remote sources either by contact closures or digital data; give commands (e.g. fail, trip, etc.) to the motor controller and other devices under its control; and communicate by alphanumeric display with the operator and by digital signals with other equipment.

3. True rms current shall be constantly monitored, separated into positive and negative sequence components to determine the heating effects caused by both, and processed to provide maximum motor utilization.

The motor protector shall be mounted on the low voltage compartment door. The relay shall be of draw-out construction to facilitate testing, maintenance, and interchange flexibility. Voltage and current transformers shall be provided as indicated on the Drawings and as required.

4. Specific data entry to suit the actual motor application shall be accomplished by means of an operator panel. Entered data shall be stored in “non-volatile” memory so as not to require battery back-up.

5. A digital display of monitoring functions including, but not limited to, the following shall be provided.

a. Line current in each phase in rms amperes

b. Running time (cumulative in hours)

c. Remaining starts

d. Motor starts exceeded

e. Total energy consumption

f. Power factor

g. Power in kilowatts

h. Voltage reading

i. Alarm status

6. The following protection and control functions including, but not limited to, the following shall be provided. Not all protection and control functions listed below may be used initially but all shall be provided.

   a. Motor running time overcurrent: Device 49/51

   b. Zero-sequence ground fault: Device 50G/51G

   c. Adjustable instantaneous overcurrent: Device 50

   d. Underload trip with start and run time delays: Device 37

   e. Current unbalance: Device 46

   f. Incomplete sequence delay: Device 48

   g. Limitation on number of starts per time-period: Device 66

   h. Undervoltage/Overvoltage: Device 27/59

   i. Phase reversal (voltage): Device 47

   j. Phase differential (current): Device 87

   k. Underfrequency/Overfrequency: Device 81

   l. Power factor: Device 55/78

   m. Motor bearing temperature: Device 38

   n. Underspeed: Device 14

   o. Overload lockout: Device 86

   p. Mechanical Jam trip with start and run time delays

   The specific settings for the active protection and control functions shall be above the settings for the variable frequency drive to minimize overlap and/or conflict.

7. The motor protector shall include complete power metering. An event recorder shall store motor and system information with a date and time stamp each time an event occurs up to 40 events. Sixteen cycles of waveform data shall be stored each time a trip occurs. A simulation feature shall be included to test the functionality and relay response to programmed conditions without the need for external inputs.

8. The motor protector shall be suitable to accept four (4) 4-20mA analog inputs and provide four (4) fully isolated 4-20 mA analog outputs.

9. The motor protector shall be furnished with three independent communication ports; one RS 232 to allow local computer access and two RS585 ports for remote communications. All three ports shall support ModBus RTU protocol. All three ports shall be capable of being active simultaneously. The new motor protectors shall be networked into the existing RS485 motor protector network.

10. The unit shall be operational from a 125VDC control power source.

11. Motor protectors shall be the 469E SR Motor Management Relay as manufactured by G.E./Multilin, or equal.

E. Current Transformers

1. Provide window-type current transformers of the quantity and current rating as indicated on the Drawings.

2. Current transformer accuracy shall be suitable for the connected burden.

F. Potential Transformers

1. Provide potential transformers, fused-type, of the quantity and ratings indicated on the Drawings.

2. Thermal ratings shall be the maximum allowable temperature rise at rated voltage.

2.05 OPERATING CONDITIONS

A. The following operating conditions are applicable for all equipment of this Specification.

1. Humidity: 0-95 percent, non-condensing

2. Ambient Temperature: Zero (0) degrees Celsius to plus 40 degrees Celsius. De-rating factors shall be applied at higher ambient temperatures to 50 degrees Celsius.

3. Altitude: up to 3,300 feet

4. Input Power Supply: 4160 volts, 3-phase, 60 Hertz.

5. Available Short Circuit Duty: as shown on the drawings.

2.06 HARMONIC DISTORTION SUPPRESSION

A. A comprehensive pre-equipment-selection harmonic study shall be prepared by the Contractor as specified herein. The results of this pre-equipment selection study shall be submitted to the Engineer as part of the submittals specified herein. Should this study indicate the need for tuned filters, line reactors, isolation transformers, or other harmonic distortion suppression equipment, these shall be supplied at no additional cost to the Owner. Indicate the location of the harmonic suppression equipment in the submittal data. Location is subject to acceptance by the Engineer.

B. The harmonic distortion values resulting from operation of all or any variable frequency drive-driven motor-load combinations operating at full load shall be as defined in IEEE Standard 519.

1. Maximum allowable total harmonic voltage distortion (THD): 5 percent of the fundamental.

2. Maximum allowable individual frequency harmonic voltage distortion: within the limits of IEEE standard 519.

3. Maximum allowable total demand distortion (TDD): within the limits of IEEE Standard 519-1992, Table 10.3.

4. Maximum allowable individual frequency harmonic demand distortion: within the limits of IEEE Standard 519-1992, Table 10.3.

5. The harmonic distortion levels shall be specific to the "Point of Common Coupling" (PCC) as defined in IEEE Standard 519 and indicated on the Drawings.

C. System single line diagrams and field access to the plant site will be provided to the Contractor for the purpose of providing this study. Contractor shall obtain from others other information that may be necessary to perform this study. Input data and other pertinent information used in harmonic study shall be coordinated by the Contractor with the following:

1. Input data/information/results of the short circuit fault analysis specified herein.

2. Electrical system configuration and electrical equipment shop drawing submittal data including, but not being limited to new non-linear loads, new linear loads, and new capacitors.

D. Preparation of this pre-equipment selection study does not relieve the requirement for the Contractor to perform and submit the results of a second, final comprehensive study prepared by a recognized independent authority acceptable to the Owner after equipment installation.

E. In addition, the Contractor shall field measure actual harmonic distortion and verify with tests performed by an independent authority acceptable to the Owner after satisfactory full-load operation.

F. As part of the specified harmonic studies and other work for this project, identify and correct resonance conditions in the electrical distribution system at no additional cost to the Owner. Shop drawings, data, location of the respective equipment and its connection to the electrical distribution system shall be as acceptable to the Engineer.

## PART 3 – EXECUTION

### 3.01 SHIPPING

A. Preparation for shipment shall be in accordance with the VFD Manufacturer's standards.

B. Loose equipment shall be appropriately packaged and secured for shipment inside the enclosure or shipping container. These items shall be properly tagged for easy identification.

3.02 INSTALLATION

A. The VFD's shall be installed as shown on the Drawings and in accordance with the manufacturer's installation instructions.

B. Install VFD's to allow complete door swing required for component removal. Drives dimensions shall be as shown on the drawings to allow for proper clearances as required by code.

C. Include in the bid an allowance for factory-trained service personnel, other than sales representatives, to supervise field installation, inspect, make final adjustments and operational checks, make functional checks of spare parts, and prepare a final report for record purposes. Adjust control and instrument equipment until this equipment has been field tested by the Contractor and the results of these tests have been accepted by the Engineer.

3.03 PAINTING

A. All metal surfaces of the VFD assembly shall be thoroughly cleaned and given one prime coat of zinc chromate primer. Finish exterior of the enclosures in ANSI-61 or ANSI-49 gray enamel to match the complete line-up of equipment as indicated on the Drawings and accepted by the Engineer. The interior of the VFD enclosure shall be painted white.

B. Prior to final completion of the work, all metal surfaces of the equipment shall be cleaned thoroughly, and all scratches and abrasions shall be retouched with the same coating as used for factory finishing coats.

3.04 RUBBER MATS

A. A three foot wide rubber mat shall be furnished and installed on the floor and in front of each VFD assembly. The mat shall be long enough to cover the full length of each VFD system. The mat shall be 1/4 inch thick with beveled edges, canvas back, solid type with corrugations running the entire length of the mat. The mat shall be guaranteed extra quality, free from cracks, blow holes or other defects detrimental to their mechanical or electrical strength. The mat shall meet OSHA requirements and the requirements of ANSI/ASTM D-178 J6-7 for Type 2, Class 2 insulating matting.

- END OF SECTION -

# SECTION 11431

# OPEN CHANNEL SEWAGE GRINDERS

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Furnish, install, test, and place in operation, open channel sewage grinder(s) and all necessary accessories as specified herein.

B. The open channel sewage grinder(s) are to be mounted vertically across the full width of the channel and perpendicular to the direction of flow and grind the solids in the raw wastewater stream. The solids are to be ground to a uniform fineness, allow particles to be retained in the influent stream, while maintaining minimum headloss.

C. The grinders are to be of modular construction with a frame mounted to the channel, designed to receive the screen and grinder assembly separately.

D. The equipment is to be provided complete with all accessories, special tools, spare parts, mountings, anchor bolts and other appurtenances as specified and as may be required for a complete and operating installation.

E. The Contractor is responsible to insure that the equipment and appurtenances furnished and installed are compatible and have the necessary operating clearances with the structural elements.

### 1.02 RELATED REQUIREMENTS

A. Work must be performed within an operating pump station and must be scheduled and performed to have minimal impact on station operations.

B. Existing equipment must be demolished in sequence to allow installation of the equipment specified herein.

### 1.03 GENERAL DESIGN AND PERFORMANCE REQUIREMENTS

A. General: This equipment is to be installed as a replacement for bar screens that screen the raw sewage before entering the Riverside Road Pump Station. Raw wastewater is conveyed into the screening area of the pump station by a 72-inch pipe that is approximately 36’ below grade. Upon entering the screening area the flow splits into three parallel channels. Each channel is currently equipped with a bar screen – two inoperable mechanical bar screens and a manually cleaned bar rack. Inlet and outlet isolation gates allow any single channel to be removed from service without impacting the flow through the other two channels. The Open Channel Sewage Grinders are to be installed between the isolation gates in the area currently occupied by the bar screens after the bar screens are removed.

B. The grinders will be installed in channels with NEC, Class I, Division 1, Group D ratings (below top of channel) and in a room with NEC, Class I, Division 2, Group D ratings.

C. Design Requirements:

1. Number of Units: 3

2. Equipment Numbers: GR-101, GR-102, GR-103

3. Average Design Flow per Grinder: 19 MGD

4. Peak Flow per Grinder: 47.5 MGD

5. Channel Width: 4'-6" (Field verify)

6. Channel Depth: 14'-3" (Field verify)

7. Slab Elevation at Grade: 871.0' (Field verify)

8. Top of Channel Wall Elevation: 849.0' (Field verify)

9. Bottom of Channel Elevation: 834.75' (Field verify)

10. Wet Well Water Levels:

    a. Min: 829.0'

    b. Avg: 834.0'

    c. Max: 844.0'

D. Grinder is to pass peak flow with wet well at maximum water level without overtopping. Units with bypass bar racks are not acceptable.

E. Grinder is to fit into existing channels with only minor modifications to channel (i.e. chipping less thank ½" of concrete from either wall).

1.04 SUBMITTALS

A. Furnish in accordance with Section 01300 - Submittals and Section 01730 - Operation and Maintenance Manuals.

1. Shop Drawings. In addition to the items specified in Section 01300 – Submittals, furnish the following:

    a. Dimensioned installation drawings.

    b. Detailed description of construction, including parts list with materials of construction and metallurgy with ASTM designations.

    c. Functional description of internal and external instrumentation and controls including list of parameters monitored, controlled, or alarmed.

    d. Control panel elevation drawings showing fabrication and placement of operator interface devices and associated elements.

2. Operation and Maintenance Manuals.

3. Furnish certified report prepared by manufacturer's technical representative certifying satisfactory installation, operation, and in-service placement of units.

1.05 QUALITY ASSURANCE

A. Standardization: All units to be product of single manufacturer.

B. System Coordination: The Contract Documents are intended to describe details of a complete equipment installation for the purpose specified. Contractor is responsible for all details and appurtenances necessary to properly install, adjust, and place in operation a complete working unit.

1.06 DELIVERY STORAGE AND HANDLING

A. Delivery:

1. Deliver all components to site in manufacturer's shipping crates or boxes.

2. Bearings to be lubricated.

3. Deliver to site undamaged.

B. Storage:

1. Store above ground, covered, on platforms, skids, or other supports, and protect from corrosion and mechanical damage.

2. Protect electrical components from condensation.

3. Power and control cables to be shipped with securely attached caps on cable ends to prevent moisture wicking into cable while stored

4. Store with lubricant on the bearings.

C. Handling: Handle unit to prevent damage during unloading and installation. Follow manufacturer's instructions on lifting and setting.

PART 2 -- PRODUCTS

2.01 MANUFACTURER(S)

A. Subject to compliance with the requirements of this Section, the following manufacturers have the capability of performing the work in this Section:

1. JWC Environmental, Inc. Model CDD 9020-XDM

2. "Or Pre-approved Equal."

B. The naming of a manufacturer in this Section is not an indication that the manufacturer's standard equipment is acceptable in lieu of the specified component features. Naming is only an indication that the manufacturer may have the capability of engineering and supplying a system as specified.

2.02 MATERIALS AND/OR EQUIPMENT

A. General:

1. The channel grinder is to be designed to reduce solids normally found in raw sewage flows to a uniform size by the use of a rotating screen drum that captures solids and transports them to the vertical central cutter stack for complete solids reduction. The rotating drum screen is continuously cleaned of solids by the rotation of the drum and the intermeshing of the grinder stack along the screen with minimal clearance between them.

2. The sewage grinder is to consist of dual counter-rotating shaft grinder incorporating double-sided cutters, Conrad-type bearings, and mechanical seals.

3. The Open Channel Sewage Grinder is to be of the two-shaft design with two parallel shafts alternately stacked with intermeshing cutters and spacers positioned on the shaft to form a helical pattern. The two shafts counter-rotate with the driven shaft operating at approximately (2/3) the speed of the drive shaft. The grinder assembly is to be capable of continuous operation, processing wet or dry.

4. Grinder is to be constructed of corrosion resistant materials compatible so as to resist pitting due to cavitation or corrosion due to galvanic action.

5. All structural steel is to have a minimum thickness of 1/4" and coated as specified herein.

6. All anchor bolts, washers, clips, clamps and fasteners of any type are to be constructed of 316 stainless steel. All anchor bolts are to be a minimum of 1/2-inch diameter.

B. Frame:

1. Channel Frame: Provide a frame designed for simple bolt-in installation fabricated of Type 316 series stainless steel. The grinder is to be designed for drop-in installation on the channel frame. The grinder is not to be bolted to the frame.

2. Grinder End Housings: Cast ASTM A536 ductile iron with a cast-in-place flow deflector, designed to protect the bushings while guiding particles directly into the cutting area.

3. Side Rails,

a. Cast from ASTM A536 ductile iron.

b. The inside profile of the side rail shall be concave, with an adjustable UHMW plastic extension strip to minimize clearance at the front of the drums. This clearance shall not exceed 1/16 inch (1.6 mm) from the major diameter of the screen drums.

4. Top and Bottom Frames:

a. Top Frame: Fabricated from ASTM A536 ductile iron.

b. Bottom Frame: Fabricated from ASTM A36 hot rolled steel plates.

C. Screening Drums:

1. Type: Coil drum for high flow rates and low head loss.

2. Orientation: Vertical

3. Clear Opening: ½ inch

4. Material: Fabricated from ½-inch diameter 304 stainless steel rods.

5. The drum support skeleton shall be constructed of 304 stainless steel. The support skeleton shall include hubs for mounting of drum stub shafts. Vertical members shall provide support for the coil. Center support ring(s) shall provide additional support to the center of the drums.

6. Drum stub shafts shall be made of 304 stainless steel with a tensile strength of not less than 95,000 psi. The shaft diameter shall be a minimum of 1-7/8 inch (47.6 mm).

D. Grinder Assembly:

1. The grinder is to be mounted between two heavy-duty rotary tables which are centrally supported on oversized bearings. The rotary tables are to be supported by ball bearings with severe-duty mechanical seals.

2. Shafts: Hexagonal AISI 4140 heat-treated alloy steel with a tensile strength rating of not less than 149,000 psi. Each shaft diameter is to be a minimum of 2.5-inches.

3. The high-speed shaft of the grinder and motor are to be directly coupled with each other using two piece coupling.

4. Shaft Gears: The two counter rotating shafts are to be driven by two heavy-duty spur gears hardened to a Rockwell “C” hardness of 28 – 32

5. The inside configuration of the cutters and spacers is to be hexagonal so as to fit the shafts with a total clearance not to exceed 0.015 inch across the flats to assure positive drive and increasing and compression strength of the spacers.

6. Cutter Design: 11-tooth design with bi-directional leading cutting edges on each tooth so as to cut equally well in either direction without removing the cutter from

the grinder. The height of the tooth is not to exceed 1/2 inch above the root diameter, and is to exert a minimum force of 450 lbs per HP continuously and 1,095 lbs per HP at momentary load peaks at the tooth tip. Cutter root diameter overlap is not to be less than 1/16 inch or greater than 1/4 inch to maintain the best possible cutting efficiency while incurring the least amount of frictional losses.

7. Cutters and spacers are to be AR500 abrasion resistant alloy steel, surface ground for uniformity and through-hardened to a Rockwell "C" hardness of 50 – 52.

8. Provide a cutter stack compression adjustment screw accessed through the top frame of the unit.

9. The radial and axial loads of the grinder shafts are to be borne by oversized ball bearings of the deep groove, double seal, Conrad type. The bearings are to have a minimum $B_{10}$ bearing life in excess of 150,000 hours per ABMA 9.

10. The bearings are to be protected by a combination of a labyrinth path seal device and end face mechanical seals. Seal face materials are to be a minimum of tungsten carbide to tungsten carbide, and not require an external flush or any type of lubrication. The mechanical seals are to be rated at 90 psi continuous duty by the seal manufacturer. The bearings and seals are to be housed in replaceable wear sleeves that support and align the bearings and seals.

11. Each seal element shall be positively locked to its corresponding rotating or static cartridge element.

12. O-rings: Buna-N-elastomers.

E. Intermediate Shaft Support

1. An intermediate shaft support shall be provided in the center of the cutter stack for all grinders. Grinders with 40 inch cutter stacks shall have two (2) intermediate shaft supports. Grinders with 50 inch cutter stacks shall have two (2) intermediate shaft supports. Grinder with 60 inch cutter stacks shall have three (3) intermediate shaft supports.

2. The intermediate shaft support shall provide additional support for heavier than normal influent grinder demand loads and protection for the seal assemblies.

3. The intermediate shaft support shall be made of a cast 303 stainless steel collar and two (2) bushings. The bushings shall act as bearings to allow the free rotation of the shafts.

F. Speed Reducer:

1. The speed reducer shall be a grease-filled planetary-type of reducer with a 500% shock load capacity. The reduction ratios shall be 29:1 for the grinder drive and 377:1 for each drum screen drive.

2. The input shaft of the reducer shall be directly coupled to the motors using a three (3)-piece coupling, and the output shaft of the reducers shall be directly coupled with the grinder shaft or the drum screen shafts using a two (2)-piece coupling.

3. Duty: Continuous.

4. Load Classification: “Heavy Shock”

5. Gears: AGMA Class I with a minimum Rockwell “C” hardness of 60.

6. Construction:

   a. Case: Cast iron

   b. Anti-friction bearings used throughout.

   c. Seals: Shafts sealed with shielded spring-loaded lip type seals.

   d. Motor mount: Cast iron, rabbeted, doweled or sleeved so that automatic alignment is maintained when bolted to the gearbox.

7. Lubrication: Splash type with oil maintained in the housing.

G. Drive Motors:

1. Minimum Horsepower:

   a. Grinder Motor: 10 HP

   b. Screening Drum Drive Motors: (2) – 1 HP

2. Enclosure: Submersible, explosion proof. Designed for use in a Class I, Division 1, Group D location. Motor, and intermediate castings to be ASTM A48 Class 25 minimum cast iron. Mating surfaces machined and fitted with O-rings.

3. Voltage: 460 volts, 3-phase, 60 Hz.

4. Speed: 1,800 rpm (maximum).

5. Insulation: Moisture-resistant Class F 155°C/311°F.

6. Design: Squirrel cage induction, NEMA Design B for continuous operation.

7. Cooling: Motor to have sufficient cooling and insulation to withstand ten (10) starts per hour when unsubmerged.

8. Seals: Tandem mechanical seal system to run in oil-filled chamber. Lower seal to have stationary and rotating lapped seal faces of tungsten carbide; upper to have stationary tungsten carbide ring and rotating carbon or tungsten carbide ring. Each seal to have separate springs and positively-driven rotating members.

9. Bearings:

   a. Upper bearings: permanently lubricated, single row, ball bearings.

   b. Lower Bearings: Permanently lubricated, double row, angular contact ball bearings.

   c. Bearings to have an $L_{10}$ “rating life” of 40,000 hours per ABMA 9.

10. Equip with three (3), normally closed, thermal switches (one per phase) embed in the coils of the stator windings. Switches to open on rise in temperature.

11. Motor Protection Devices: Furnish seal chamber moisture sensors as required to validate motor warranty.

12. Motor Cable: Special submersible service cable with Hypalon jacket in one continuous length from pumping unit to the Local Control Panel. Size per NEC.

H. Miscellaneous Appurtenances:

1. Access Hatch

   a. Furnish and install low zinc, copper free, aluminum access hatches of the sizes and locations required for the installation and removal of the grinders furnished.

   b. Design to be single or multiple leaves as required. Door leaves to be minimum ¼-inch thick aluminum checkered (diamond) pattern plate. Access hatches and frames to be designed to support a minimum live load of 150 pounds per square foot.

   c. Frame to have integral drain.

   d. All hardware to be 300 series stainless steel.

   e. Equip with padlock hasp and hold-open arm.

2. Cable Grips: Furnish S.S. cable grips for the submersible power cables for the grinder and drum motors. Kellems or equal.

I. Painting and Protective Coatings: Steel and cast iron surfaces are to be cleaned, primed and painted in accordance with Section 09900 – Painting for submerged wastewater service.

2.03 CONTROL PANEL, ELECTRICAL COMPONENTS & ACCESSORIES

A. Local Control Panel Enclosure:

1. General: Provide one Local Control Panel (LCP) enclosure for each grinder.

2. Rating: NEMA 4X, Type 316 stainless steel construction.

3. Minimum Metal Thickness: 14 gauge.

4. Rubber-gasketed, hinged door with continuous stainless steel hinge and stainless steel 3-point twist type latches.

5. Stainless steel or copper-free aluminum back panel with provisions to mount control devices and terminal strip for field connections.

B. Grinder Control Station:

1. Provide a NEMA 4X stainless steel control station and terminal box for remote mounting as shown on the Drawings.

2. Control station construction is to be similar to main panel construction.

3. Control station is to serve as a terminal box for submersible cables coming from the grinders.

C. Control Panel Features:

1. Main power disconnect switch or circuit breaker device, mechanically interlocked with door so that the main power must be “OFF” before door can be opened.

2. Motor Starters: Full voltage, combination type, reversing starter with overload relays, control power transformers, reset push-buttons, circuit breaker through-the-panel operators for each motor. Motor starters to be NEMA size 1 (minimum). The magnetic starter to be of the heaterless design and provide phase loss protection, short circuit self-protection and provide thermal memory. The solid-state overload to be self-powered.

3. Control power transformer is to be sized for anticipated loads from devices/controls.

4. Heater and thermostat for condensation protection.

5. Elapsed Time Meters: Include six-digit, non-resettable electromechanical counter for each grinder with units in hours.

6. Furnish each panel with a three-phase power monitor to detect phase failure, phase voltage unbalance, and phase reversal. Monitor to be rated for three-phase power. Manufacturer and type to be square D Type DASV or equal by Cutler Hammer/ Westinghouse or General Electric.

D. Electrical Components:

1. Provide all necessary electrical components and wiring for a complete, functional system.

2. Control Devices:

a. Push-Button Switch and Selector Switch: Heavy-duty, oil-tight construction rated for 600 volts AC, 10 amps continuous; Square D, Class 9001, Type K, or equal.

b. Pilot Light: Push-to-test LED type. Square D, Class 9001, Type K, or equal.

c. E-Stop: Maintained contact push–pull mushroom head button station mounted in a NEMA 7 enclosure adjacent to each grinder.

d. Provide float switches complying with requirements specified under Division 17, Control and Information System. Float switches to be installed in classified areas shall be intrinsically safe and suitable for use in Class I Division 2 area.

3. Wiring (Inside Panels):

a. AC Circuits:

1) Type: 600-volt, Type MTW stranded copper.
2) Size: For current to be carried, but not less than No. 14 AWG.

b. Analog Signal Circuits:

1) Type: 600-volt, Class B, seven-strand concentric soft bare annealed copper twisted shielded pairs meeting requirements of ASTM B8.
2) Size: No. 18 AWG, minimum.

c. Other DC Circuits:

1) Type: 600-volt, Type MTW stranded copper.
2) Size: No. 18 AWG, minimum.

d. Separate analog and other DC circuits at least 6 inches from any AC power and control wiring.

e. Enclose wiring in sheet metal raceways or plastic wiring ducts.

f. Wire Identification:

1) Numbered and tagged at each termination.
2) Wire Tags: Snap-on or slip-on PVC wire markers with legible machine printed markings and numbers. Do not use adhesive or taped-on tags.

g. Wiring Interface Entering or Leaving Enclosures:

1) For analog and discrete signal, terminate at numbered terminal blocks.
2) For special signals, terminate power (240 volts or greater) with manufacturer's standard connectors.

E. Grinder Control System:

1. Provide complete PLC-based control system for each grinder. PLC to be Allen Bradley CompactLogix Model L32E (Owner standard – no “or equal” on this component.)

2. Power Requirements: Each Local Control Panel (LCP) to operate from a single 480-volt, 3-phase power source.

3. Operator Controls and Indications:

   a. At each LCP provide the following operator controls and indications:

      1) Hand Switches:
         a) CONTROL POWER ON/OFF
         b) GRINDER HAND/OFF/AUTO
         c) SCREEN DRUM HAND/OFF/AUTO
         d) RESET

      2) Alarm Indicating Lights:
         a) GRINDER JAMMED (amber)
         b) Grinder Motor HIGH TEMPERATURE (amber)
         c) Grinder Motor MOISTURE (amber)
         d) Drum Motor HIGH TEMPERATURE (amber)
         e) Drum Motor MOISTURE (amber)

      3) Status Indicating Lights:
         a) Power “ON” (white)
         b) Grinder drive “RUNNING” (red)
         c) Drum drive “RUNNING” (red)

      4) Other:
         a) Elapsed Time Meter

4. External Interfaces:

   a. The LCP PLC is to provide the following data to the pump station SCADA system:

      1) Grinder “ON”
      2) Drum “ON”
      3) Operating mode (timed or level)
      4) A common failure alarm contact.

   b. Discrete Inputs to Local Control Panel:

      1) Emergency stop pushbutton.
      2) High channel level.

3) Submersible motor high temperature
   a) (1) for Grinder motor.
   b) (2) for Drum motors.

4) Submersible motor seal failure
   a) (1) for Grinder motor.
   b) (2) for Drum motors.

E. Functional Requirements:

1. General: The grinder is to be operable from the locally mounted control station. The starters are to be located in the local control panel.

2. Operation of each grinder is to be controlled by a Grinder HAND/OFF-RESET/AUTO switch and a Screen Drum HAND/OFF-RESET/AUTO switch at the local control station and the E-Stop located by the machine.

3. When the hand switches are in the HAND position, the Grinder and Screen Drum will run continuously unless stopped by the E-stop or the machine protective devices. All machine protection devices (equipment jammed, high temperature, etc.) are maintained in the HAND position for both the Grinder and the Screen Drum.

4. E-stop: Breaking this contact removes the control voltage from the motor starter coils and all equipment stops and cannot be restarted (automatically or manually) until the E-stop switch is reset.

5. When the Grinder hand switch is in the AUTO position, the grinder is started when one of the following events occurs:

   a. High level is detected upstream of the grinders by the float switch mounted upstream of each grinder. When the high level contact is closed, the grinder is to run continuously until the high water contact is dropped. The grinder control then reverts back to a time based automatic operation. High-level overrides the timed cleaning cycle. Provide an adjustable time delay to prevent excessive toggling between modes.

   b. The time period from the last cleaning cycle has expired. The timed cleaning function is to consist of two adjustable time settings. One setting is to be the duration of a cleaning cycle – how long the grinder runs when the frequency timer is actuated. The second time setting is the duration between cleaning cycles. Time settings are to be adjustable by way of the pump station SCADA system.

6. When the Screen Drum hand switch is in the AUTO position, the Screen Drum is started and stop as controlled by the Grinder operation.

7. Jam Sensing:

   a. The control system monitors the current in one phase of each motor to detect for a high current condition indicating a motor is jammed. If the

phase current reaches an adjustable set point (factory set at approximately 80% of locked rotor) the motor will stop.

b. Grinder Motor: If an over-current condition in the actuator motor occurs, the control system stops the motor momentarily and then restarts it in the opposite direction of rotation. If the motor reverses direction more than 3 times in a 10 second period, the grinder motor stops and goes into an alarm condition. When the drum motor is in a jammed condition, the grinder motor continues to operate. When the grinder motor is in a jam cycle, the drum motor is stopped until the grinder jam cycle is complete. If at any time, the grinder runs for more than sixty seconds without experiencing a high phase current, the reversal counter is reset.

c. Drum Motor: If a jam is sensed on the drum motor, the motor stops momentarily and then restarts in the opposite direction of rotation. If the jam is cleared, the controller shall return the screen to normal operation. One (1) additional screen reversal (2 times total) may occur within 30 seconds before the controller de-energizes the screen motor and activates the screen fail indicator and relay. The grinder and other screen drum shall continue operation during a screen fail condition.

8. Submersible Motor High Temperature:

a. Grinder and drum motors are disabled to prevent thermal damage to the motor and the common trouble alarm and the appropriate high temperature light are activated. After the temperature switch resets (automatically), the grinder and actuator are to resume operation in the hand or automatic mode depending on the position of the selector switch.

9. Submersible Motor Seal Failure: Equipment continues to run in the current mode of operation (HAND or AUTO). The appropriate seal failure light is activated and the common trouble alarm is activated.

10. If a power failure occurs while a grinder and screen is running, operation will resume when power is restored.

11. If a power failure occurs while the grinder and screen is in a fail condition the fail indicator shall reactivate when power is restored.

12. Provide logic to maintain all alarm and fail condition indication and contact outputs as well as the common FAIL contact output(s) until they are manually reset at the LCP by pressing the RESET pushbutton.

## 2.04 TOOLS, SUPPLIES AND SPARE PARTS

A. Furnish all special tools necessary to disassemble, service, repair and adjust the equipment, and a one year supply of all recommended lubricating oils and greases.

B. Furnish spare parts as recommended by the equipment manufacturers in addition to those listed below. Materials are to be properly packed, labeled and stored where directed by the Engineer.

C. The spare parts, which are to be identical and interchangeable with the original parts, are to be furnished in clearly identifiable and labeled containers:

- One (1) complete set of cutters;
- One (1) complete gasket set;
- Two (2) bearing/seal assembly;
- Three (3) fuses; and
- One (1) current sensing relay.

PART 3 -- EXECUTION

3.01 GENERAL

A. Isolate individual channels by closing the slide gates upstream and downstream. Dewater the channel and direct the discharge of the dewatering operations upstream of the screening devices that are still in service. Anticipate leakage around slide gate seals and plan work accordingly.

B. Install the grinder and accessories in accordance with the manufacturer's printed instructions, recommendations and approved shop drawings. Install the channel frames with SS fasteners. Grout the floor of the channel so that it slopes up to the frame of the grinder at 6:1 slope (H:V).

C. After installation, the equipment is to be aligned, balanced, and adjusted as required for proper operation and proper alignment.

D. Guide Rails: Install guide rails plumb and parallel.

E. Access Hatches: Aluminum frames of access hatches in contact with concrete to be coated with bituminous paint prior to being cast into concrete.

F. Install cable grips on the submersible cables and attach to a SS eyebolt installed in the vertical face of the concrete under the access hatch. Loop the submersible cable from the grips, under the roof, and up through the conduit to the Local Control Panel.

3.02 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Furnish services of manufacturer's trained, competent, technical representative who has knowledge of the proper installation, operation, and maintenance of the equipment to perform the following:

1. Inspect the completed installation for conformance with manufacturer's recommended installation requirements;

2. Supervise operational test of each unit;

3. Instruct Owner's personnel in operation and maintenance of equipment; and

4. Prepare and certify field inspection report.

B. Inspection: Manufacturer's technical service representative to perform, at a minimum, the following for each unit:

1. Check seal chamber oil level and lubrication of seals;

2. Check proper rotation;

3. Check power supply voltage;

4. Megger each unit for insulation breaks or moisture;

5. Measure motor no-load current; and

6. Manually trip sensors and check complete cycle of control operation.

C. The services of a qualified manufacturer's technical representative are to be provided for a period of not less than two (2) days as follows:

1. At least one trip of one (1) day to check and supervise the equipment installation and field test.

2. One trip of one (1) day to supervise initial start-up and operation and to instruct the Owner's personnel in proper operation and maintenance of the equipment.

D. Field Tests:

1. General: The equipment is to be field tested in the presence of the Owner and manufacturer's representative, to demonstrate that 1) the equipment can continuously grind materials likely to be encountered in service without vibration, jamming or overheating and perform its specified function satisfactorily, and 2) the equipment can be easily removed and reinstalled within the channel.

2. The grinding test is to include:

   a. Grinding of typical solid materials in the wastewater stream (disposable diapers, wood, etc.)

   b. Fineness of grind and uniformity of resultant particle size.

   c. Control systems performance and repeatability (system is to be intentionally jammed to test reversing and alarm system).

3. The removal and reinstallation test is to include:

   a. Each grinder is to be removed completely from the channel and through the access hatch above ensuring adequate clearance and alignment of access hatch, as well as, installation and alignment of grinder frame.

   b. Each grinder is to be reinstalled through the access hatch and into the channel ensuring proper seating of the unit in the channel.

4. All labor, materials, and test apparatus necessary for conducting the field acceptance tests are to be furnished by the Contractor at no additional cost to the Owner.

- END OF SECTION -