FULTON COUNTY

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*

PURCHASING DEPARTMENT
INVITATION TO BID NO. 08ITB61876K-DB

S118 BIG CREEK WATER RECLAMATION FACILITY
EFFLUENT FILTER REHABILITATION

For

DEPARTMENT OF PUBLIC WORKS

BID DUE TIME AND DATE: 11:00 A.M. JUNE 23, 2008
BID ISSUANCE DATE: MAY 13, 2008
PURCHASING CONTACT: DARLENE BANKS at (404) 730-7879
E-MAIL: darlene.banks@fultoncountyga.gov

LOCATION: FULTON COUNTY DEPARTMENT OF PURCHASING & CONTRACT COMPLIANCE
130 PEACHTREE STREET, S.W., SUITE 1168
ATLANTA, GA 30303

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INVITATION TO BID

S118 BIG CREEK WRF EFFLUENT FILTER REHABILITATION

Sealed Bids for furnishing all materials, labor, tools, equipment and appurtenances necessary for the construction of BIG CREEK WRF EFFLUENT FILTER REHABILITATION 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, June 23, 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 rehabilitation of twelve existing deep bed sand filters at the Big Creek Water Reclamation Facility (WRF) in Fulton County, GA. Filter rehabilitation includes removal of existing filter media and appurtenances, replacement of underdrain system and media, replacement and rehabilitation of existing filter valves, replacement of filter control consoles and main control panel, modification of existing backwash blowers, replacement of existing backwash pumps, and all associated electrical, instrumentation, mechanical and structural work.

Permits / Easements

No easements are required to perform the work. Permit requirements are defined in the specifications in Section 01060.

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
2129 Northwest Parkway
STE 105
Marietta, Georgia 30067

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 $75.00 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 Darlene Banks, Fulton County Department of Purchasing and Contract Compliance at 404-730-7879, darlene.banks@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 **365** 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: Darlene Banks, Assistant Purchasing Agent
Fulton County Public Safety Building
130 Peachtree Street, S.W. Suite 1168
Atlanta, GA 30303

Phone: (404) 730-7879
Fax: (404) 893-1745
Reference Bid # 08ITB61876K-DB

Or darlene.banks@fultoncountyga.gov

Basis of Award

The Contract, if awarded, will be awarded to the lowest responsive and responsible bidder, not including alternates. 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:	**MAY 28, 2008**
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 ITB**-08ITB61876K-DB S118 BIG CREEK WRF EFFLUENT FILTER REHABILITATION.**

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

5:00 PM, June 9, 2008. 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: Darlene Banks, Assistant Purchasing Agent
Fulton County Public Safety Building
130 Peachtree Street, S.W., 1168
Atlanta, GA 30303
Fax: (404) 893-1745
darlene.banks@fultoncountyga.gov
Reference Bid # 08ITB61876K-DB

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 scheduled site visit for this project. It will be held on June 3, 2008, at 10:00A.M. Bidders are not required to attend, however they are encouraged to attend as there will limited access to the plant site outside of this scheduled visit.
The plant is located at:
Big Creek WRF, 1030 Marietta Hwy (SR 120)
Roswell GA 30075
We will meet at the Administration Building, which is in the entrance, turn left at the crossroads, at the top of the hill on the left.

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, if awarded. Award will be made on the basis of the prices given in the Base Bid, not including alternates.

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. **Georgia Security and Immigration Compliance Act**

1. Effective as of July 1, 2007, and pursuant to O.C.G.A. 13-10-91, every public employer, every contractor of a public employer, and every subcontractor of a public employer's contractor must register and participate in a federal work authorization program as follows:

    a. No public employer shall enter into a contract for the physical performance of services within this state unless the contractor registers and participates in a federal work authorization program to verify the work eligibility information all new employees.

    b. No contractor or subcontractor who enters into a contract with a public employer shall enter into such a contract or subcontract in connection with the physical performance of services within this state unless such contractor or subcontractor registers and participates in a federal work authorization program to verify the work eligibility information of all new employees.

2. In accordance with O.C.G.A. 13-10-91, the requirements of paragraphs (a) and (b) of paragraph (1) shall apply to public employers, their contractors and subcontractors, as follows:

    a. On or after July 1, 2007, to public employers, contractors, or subcontractors of 500 or more employees;

    b. On or after July 1, 2008, to public employers, contractors or subcontractors of 100 or more employees; and

    c. On or after July 1, 2009, to all other public employers, their contractors, or subcontractors.

See Section 00420, Purchasing Forms & Instructions for declarations and affidavits.

T. **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. Unless clearly shown as "no substitute" or words to that effect, any items in this invitation to Bid which have been identified, described or referenced by a brand name or trade name are 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. Each item Bid must be individually identified as to whether it is a specified item or an equivalent item by typing or printing after the item(s): The brand

name; model or manufacturer's number, or identification regularly used in the trade. Deviations from the specifications must be clearly and fully listed on the Bid sheet, including photographs or cuts, specifications, and dimensions of the proposed "alternate". Fulton County is the sole judge of "exact equivalent", or "alternate". The factors to be considered are: function, design, materials, construction, workmanship, finishes, operating features, overall quality, local service facilities, warranty terms and service, and other relevant features of item(s) Bid.

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”.

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) Form A - Non-Collusion Affidavit of Prime Bidder/Offeror Form B - Certificate of Acceptance of Request for Bid/Proposal Requirements Form C - Georgia Utility Contractor License Form D - Certificate Regarding Debarment Form E - Disclosure Form & 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	
5	Office of Contract Compliance Requirements (Section 00430) Exhibit A - Promise of Non-Discrimination (for Prime and each Sub) Exhibit B - Employment Record (for Prime and each Sub) Exhibit C - Schedule of Intended Subcontractor Utilization Exhibit D - Letter of Intent to Perform as Subcontractor Exhibit E - Declaration Regarding Subcontractor Practices Exhibit F - Joint Venture Disclosure Affidavit Exhibit G - Prime Contractor/Subcontractor Utilization Report 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: **S118 BIG CREEK WRF EFFLUENT FILTER REHABILITATION**
08ITB61876K-DB

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 BID 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), NOT INCLUDING ALTERNATE NO. 1, 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.

ITEM 1 – EFFLUENT FILTER REHABILITATION

Includes furnishing all products, materials and equipment and performing all labor necessary to complete rehabilitation of the existing effluent filters, including all work shown on the Drawings and/or specified and not included in Items 2 through 3 below.	LUMP SUM	$_____

ITEM 2 - EQUIPMENT ALLOWANCES

a.	Filters, Filter Media, and Appurtenances	$	1,228,900.00
b.	Filter Valves	$	292,782.00

ITEM 3 - CASH ALLOWANCES – FOR USE AS ORDERED BY THE ENGINEER

a.	Materials Testing	$	10,000.00
b.	Unforeseen Conditions	$	50,000.00
c.	Pump Vibration Testing	$	10,000.00

*** ALTERNATE NO. 1 ***

[DEDUCT \ ADD,] [CIRCLE ONE], FOR FURNISHING ALL PRODUCTS, MATERIALS AND EQUIPMENT AND PERFORMING ALL LABOR NECESSARY TO MODIFY THE EXISTING FILTER BUILDING WALKWAYS, AS SHOWN ON THE DRAWINGS, THE AMOUNT OF:

_____

_____ DOLLARS ($_____).

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 **365** 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
S118 BIG CREEK WRF EFFLUENT FILTER REHABILITATION
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 **S118 BIG CREEK WRF EFFLUENT FILTER REHABILITATION,** 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 ITB, 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).
- A combination of specific policies written with an umbrella policy covering liabilities in excess of the required limits is acceptable to achieve the applicable insurance coverage levels.

Upon award, the Contractor/Vendor must maintain at their expense, insurance with policy limits equal to or greater than the limits described below. Proof of insurance must be provided to Fulton County Government prior to the start of any activities/construction as described in the bid document(s). 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

To Include Per Project/Location Aggregate and Completed Operations for 3 Years after final payment

3. **BUSINESS AUTOMOBILE LIABILITY INSURANCE**

Combined Single Limits	Each Occurrence	$1,000,000

(Including operation of non-owned, owned, and hired automobiles).
Broadened Pollution Endorsement CA9948 and MCS 90

4. **UMBRELLA LIABILITY**

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

5. PROFESSIONAL LIABILITY

Per Claim/Aggregate $5,000,000

(To be provided when the Contract includes specified Professional Services, and will be written with all Environmental/Pollution exclusions deleted).
Completed Operations: Statute of Repose for state of GA

6. CONTRACTORS POLLUTION LIABILITY

Each Occurrence $2,000,000

7. FIDELITY BOND AND CRIME

(Employee Dishonesty) (Theft) Each Occurrence $100,000
Above to include 3rd Party Coverage

8. **BUILDERS RISK**: To be written on a Builders Risk "All-risk" form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism, malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than caused by flood), and such other perils or causes of loss as may be specifically required by Supplementary Conditions) 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	$500
Ordinance of Law (Increased Cost of Construction)	$1,000,000
Flood and Earthquake	TBD – Full Contract Value

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 sixty (60) 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.

The Contractor agrees to name the Owner and all other parties required of the Contractor/Vendor shall be included as insureds on the CGL, using ISO Additional Insured Endorsement forms CG 2010 11/85 or its equivalent coverage to the additional insureds. This insurance for the additional insureds shall be as broad as the coverage provided for the named insured Subcontractor. It shall apply as Primary Insurance before any other insurance or self-insurance, including any deductible, non-contributory, and Waiver of Subrogation provided to the Additional Insureds.

Additional Insured under the General Liability, Auto Liability, Umbrella Policies (with exception of Workers Compensation and Professional Liability), with no Cross Suits exclusion.

Important:
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

To the fullest extent of the Law, 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

S118 BIG CREEK WRF EFFLUENT FILTER REHABILITATION
08ITB61876K-DB

Contractor: _____ Project No. _____

Address: _____ Telephone: _____

Contact: _____ Facsimile: _____

THIS AGREEMENT is effective as of the _____ day of _____, 2008, 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: S118

BIG CREEK WRF EFFLUENT FILTER REHABILITATION

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 **365** 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 $ 500.00 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 **S118 BIG CREEK WRF EFFLUENT FILTER REHABILITATION**, 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 **S118 BIG CREEK WRF EFFLUENT FILTER REHABILITATION**, 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, or 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 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

Part 1 General

1.01 Description

A. The Work to be performed under this Contract shall consist of furnishing all labor, materials, tools, equipment and incidentals and performing all Work required to construct complete in place and ready to operate twelve existing rehabilitated deep bed sand filters at the Big Creek Water Reclamation Facility (WRF). Filter rehabilitation includes removal of existing filter media and appurtenances, replacement of underdrain system and media, replacement and rehabilitation of existing filter valves, replacement of filter control consoles and main control panel, modification of existing backwash blowers, replacement of existing backwash pumps, and all associated electrical, instrumentation, mechanical and structural work.

B. All Work described above shall be performed as shown on the Drawings and as specified.

1.02 Project Location

The project is located in the City of Roswell: Big Creek Water Reclamation Facility, 1030 Marietta Highway, Roswell, Georgia 30075.

1.03 Quantities

The Owner reserves the right to alter the quantities of work to be performed or to extend or shorten the improvements at any time when and as found necessary, and the Contractor shall perform the work as altered, increased or decreased. Payment for such increased or decreased quantity will be made in accordance with the Contract Agreement. No allowance will be made for any change in anticipated profits nor shall such changes be considered as waiving or invalidating any conditions or provisions of the Contract and Bond.

1.04 Partial Owner Occupancy

The existing facilities to which these improvements are being made will continue operation during the period of construction.

END OF SECTION

Part 1 General

1.01 Scope

The scope of this Section is to convey to the Contractor unique and unusual stipulations and requirements which have been established for this Project. Some of the stipulations and requirements are a result of negotiations with various entities and organizations which have an interest in this Project. Some requirements are based on technical aspects of the Project which are not otherwise conveyed to the Contractor. The provisions of this Section shall supersede the provisions of the Specifications but shall not supersede the Bidding Requirements, Contract Forms or Conditions of the Contract.

1.02 Submittals

A. Sequence Submittal

1. Submit a proposed sequence in accordance with Section 01340 with appropriate times of starting and completion of tasks to Engineer for review.

2. The Contractor may propose alternatives to the sequencing constraints to that shown in this Section in an attempt to reduce the disruption of the operation of the existing facility or streamline the tasks of this Contract. The Owner and Engineer are not obligated to accept any of these alternatives.

1.04 Existing Facility Operations

A. The Contractor shall coordinate the work with the Owner so that the construction will not restrain or hinder the operation of the existing facilities. If, at any time, any portion of the facilities are out of service, the Contractor must obtain approval from the Owner as to the date, time and length of time that portion of the facilities are out of service.

B. Connections to the existing facilities or alteration of existing facilities will be made at times when the facility involved is not in use or at times, established by the Owner, when the use of the facility can be conveniently interrupted for the period of time needed to make the connection or alteration.

C. After having coordinated the work with the Owner, the Contractor shall prepare a submittal in accordance with Section 01340 to include the time, time limits and methods of each connection or alteration and have the approval of the Engineer before any work is undertaken on the connections or alterations.

1.04 Sequencing

A. General

1. The Contractor shall be solely responsible for all construction sequencing.

2. The completion of specific preliminary sequencing tasks indicated will be required prior to any significant site demolition.

B. Notify the Owner at least ten days prior to starting to relocate piping or taking existing components out of service.

1.06 Sequencing Constraints

A. The following construction sequencing constraints are to emphasize critical tasks of the Work in this Contract. It is not a complete list of all work to be completed.

B. All modifications including instrumentation modifications, valve replacement and adjustments, and filter appurtenance modifications shall be done with only two filters out of service at any one time, with an exception for the first pair of filters rehabilitated. Filters No. 1 and 12 are currently out of service and thus must be rehabilitated first. Filter rehabilitation shall begin with either the Filter No. 1 and 3 pair or the Filter No. 10 and 12 pair. Filters No. 1, 3, 10, and 12 shall be rehabilitated and returned to service prior to working on any other filter pair. Rehabilitation of the remaining filters, in pairs, may proceed in any order, with no fewer than ten filters maintained in service at any time.

C. Waterproofing to address the leaking of water in electrical room shall be done concurrently with Filter No. 12 modifications.

D. Refer to Section 17000, Article 1.04, Paragraph D, for sequencing the migration from existing control system to new control system.

1.06 Scheduling and Sequencing Work

The Contractor shall coordinate the scheduling and sequencing of operations closely with the requirements of the Plant operations. Some work may need to be performed in stages and the other work may be delayed. It is anticipated that most work can be completed within the Contract Time. No claims for additional payment due to delays, re-mobilization or other problems incurred in scheduling and sequencing work will be considered.

END OF SECTION

Part 1 General

1.01 Partial Occupancy By Owner

Whenever, in the opinion of the Engineer, any section or portion of the Work or any structure is in suitable condition, it may be put into use upon the written order of the Engineer and such usage will not be held in any way as an acceptance of said Work or structure, or any part thereof, or as a waiver of any of the provisions of these Specifications and the Contract. Pending final completion and acceptance of the Work, all necessary repairs and replacements, due to defective materials or workmanship or operations of the Contractor, for any section of the Work so put into use shall be performed by the Contractor at Contractor's own expense.

END OF SECTION

Part 1 General

1.01 Scope

A. The Contractor shall furnish and install the equipment identified in the Equipment Allowances. Equipment identified in the Equipment Allowances shall be subject to all provisions of these Specifications.

B. In the event of failure of manufacture to perform, whether products, service or schedule for such, the Contractor's sole remedy shall be against the manufacturer under the terms and conditions of its purchase order with the manufacturer. The Owner and Engineer do not warrant the performance of the manufacturer.

1.02 Costs

A. The Contractor shall include, in the Bid Total, the Equipment Allowances specified in the Bid for the purchase of equipment which has been pre-selected by the Owner. These allowances shall cover the cost of the equipment and services, as specified in the indicated Specification Sections, and, for new products, Freight-on-Board (FOB) Job Site.

B. The Contractor's applicable taxes, including but not limited to sales tax, unloading, storage, handling, labor, installation, and overhead costs, plus profit and other expenses contemplated for the allowances shall be included in Item 1 of the Bid and not in the allowances.

C. If the terms and conditions of purchase of equipment and services differ from those given in these Contract Documents, then the Contractor shall include the cost of differences in Item 1 of the Bid.

1.03 Adjustment of Costs

A. Should the final invoice amount from the equipment manufacturer be more or less than the specified amount of the allowance, the Contract will be adjusted by a change order. Such adjustment shall be limited to the cost directly attributable to changes authorized by the Engineer and Owner for a change in scope.

B. The amount of change order will not recognize any changes in unloading, storage, handling, labor, installation, and overhead costs, nor profit and other expenses caused by the adjustment of the final invoice amount. The change order will recognize changes in applicable taxes.

1.04 Documentation

A. Submit copies of new invoices from the equipment manufacturer with each periodic payment request.

1.05 Schedule of Equipment Allowances

A. Filter and Appurtenances, Filter Media: Allow the amount specified in the Bid for equipment and services provided by Severn Trent Water Purification, Inc. as specified in Sections 13221 and 13226 of these Specifications.

B. Valves: Allow the amount specified in the Bid for equipment and services provided by Eco-Tech, Inc. as specified in Section 15100 of these Specifications. Equipment and services included are for butterfly valves only, both new valves and rehabilitation of existing valves. New valves are FOB Job Site, the cost for shipment of existing valves to be rehabilitated and return shipment to the job site are not included in the allowance.

END OF SECTION

Part 1 General

1.01 Scope

A. The Bid lists each item of the Project for which payment will be made. No payment will be made for any items other than those listed in the Bid.

B. Required items of work and incidentals necessary for the satisfactory completion of the work which are not specifically listed in the Bid, and which are not specified in this Section to be measured or to be included in one of the items listed in the Bid, shall be considered as incidental to the work. All costs thereof, including Contractor's overhead costs and profit, shall be considered as included in the lump sum or unit prices bid for the various Bid items. The Contractor shall prepare the Bid accordingly.

C. Work includes furnishing all plant, labor, equipment, tools and materials, which are not furnished by the Owner and performing all operations required to complete the work satisfactorily, in place, as specified and as indicated on the Drawings.

1.02 Descriptions

A. Measurement of an item of work will be by the unit indicated in the Bid.

B. Final payment quantities shall be determined from the record drawings.

C. Payment will include all necessary and incidental related work not specified to be included in any other item of work listed in the Bid.

D. Unless otherwise stated in individual sections of the Specifications or in the Bid, no separate payment will be made for any item of work, materials, parts, equipment, supplies or related items required to perform and complete the work. The costs for all such items required shall be included in the price bid for item of which it is a part.

E. Payment will be made by extending unit prices multiplied by quantities provided and then summing the extended prices to reflect actual work. Such price and payment shall constitute full compensation to the Contractor for furnishing all plant, labor, equipment, tools and materials not furnished by the Owner and for performing all operations required to provide to the Owner the entire Project, complete in place, as specified and as indicated on the Drawings.

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

1.03 Effluent Filter Rehabilitation

The lump sum bid for EFFLUENT FILTER REHABILITATION shall include furnishing all products, materials and equipment and performing all labor necessary to complete and put into operation rehabilitated existing effluent filters, including all work shown on the Drawings and/or specified and not included in other items in the Bid.

1.04 Alternate No. 1

The lump sum bid for Alternate No. 1 shall include all furnishing all products, materials and equipment and performing all labor associated with modifying the existing filter building walkways, as shown on drawing P0.8.

1.05 Cash Allowances

A. General

1. The Contractor shall include in the Bid Total all allowances stated in the Contract Documents. These allowances shall cover the net cost of the services provided by a firm selected by the Owner. The Contractor's handling costs, labor, overhead, profit and other expenses contemplated for the original allowance shall be included in the items to which they pertain and not in allowances.

2. No payment will be made for nonproductive time on the part of testing personnel due to the Contractor's failure to properly coordinate testing activities with the work schedule or the Contractor's problems with maintaining equipment in good working condition. The Contractor shall make all necessary excavations and shall supply any samples of materials necessary for conducting compaction and density tests.

3. No payment shall be provided for services that fail to verify required results.

B. Should the net cost be more or less than the specified amount of the allowance, the Contract will be adjusted accordingly by change order. The amount of change order will not recognize any changes in handling costs at the site, labor, overhead, profit and other expenses caused by the adjustment to the allowance.

C. Documentation

1. Submit copies of the invoices with each periodic payment request from the firm providing the services.

2. Submit results of services provided which verify required results.

D. Schedule of Cash Allowances

1. Materials Testing: Allow the amount provided in the Bid for the services of a testing laboratory to verify material composition as directed by the Engineer.

2. Unforeseen Conditions – Allow the amount specified in the Bid to resolve any unforeseen issues, utility conflicts (including relocating and/or replacement), or similar issues, only when directed by the Engineer.

3. Pump Vibration Testing: Allow the amount provided in the Bid for the services of an independent, qualified specialty subcontractor to pump vibration testing and monitoring, when directed by the Engineer. This allowance is solely for the use of the Engineer for verification of the Contractor's proper installation of and the proper operation of the pumps. The presence of this cash allowance in no way relieves the Contractor of the responsibility of installing the work and ensuring that the pumps perform accurately.

END OF SECTION

Part 1 General

1.01 Scope

A. Construction staking shall include all of the surveying work required to layout the Work and control the location of the finished Project. The Contractor shall have the full responsibility for constructing the Project to the correct horizontal and vertical alignment, as shown on the Drawings, as specified, or as ordered by the Engineer. The Contractor shall assume all costs associated with rectifying work constructed in the wrong location.

B. From the information shown on the Drawings and the information to be provided as indicated under Project Conditions below, the Contractor shall:

1. Be responsible for setting reference points and/or offsets, establishment of baselines, and all other layout, staking, and all other surveying required for the construction of the Project.

2. Safeguard all reference points, stakes, grade marks, horizontal and vertical control points, and shall bear the cost of re establishing same if disturbed.

3. Stake out the permanent and temporary easements or the limits of construction to ensure that the Work is not deviating from the indicated limits.

4. Be responsible for all damage done to reference points, baselines, center lines and temporary bench marks, and shall be responsible for the cost of re establishment of reference points, baselines, center lines and temporary bench marks as a result of the operations.

C. Baselines shall be defined as the line to which the location of the Work is referenced, i.e., edge of pavement, road centerline, property line, right of way or survey line.

D. Record Drawing surveys shall be performed in accordance with Section 01720 of these Specifications.

1.02 Project Conditions

A. The Drawings provide the location and/or coordinates of principal components of the Project. The alignment of some components of the Project may be indicated in the Specifications. The Engineer may order changes to the location of some of the components of the Project or provide clarification to questions regarding the correct alignment.

B. The survey points, control points, and baseline to be provided to the Contractor shall be limited to only that information which can be found on the Project site by the Contractor.

1.03 Quality Assurance

A. The Contractor shall furnish documentation, prepared by a surveyor currently registered in the State of Georgia, confirming that staking is being done to the horizontal and vertical alignment shown in the Contract Documents. This requires that the Contractor hire, at the Contractor's own expense, a currently

registered surveyor, acceptable to the Owner, to provide ongoing construction staking or confirmation of such.

B. Any deviations from the Drawings shall be confirmed by the Engineer prior to construction of that portion of the Project.

C. Construction Surveying Cash Allowance

1. This cash allowance is solely for the use of the Engineer for verification of the Contractor's reference points, centerlines and work performed and is not to be used by the Contractor to provide cut sheets.

2. The presence of this cash allowance in no way relieves the Contractor of the responsibility of installing reference points, centerlines, temporary bench marks, verifying that the work has been performed accurately, and all other work covered by this Section.

END OF SECTION

Part 1 General

1.01 Scope

A. Permits and Responsibilities: The Contractor shall, without additional expense to the Owner, be responsible for obtaining all necessary licenses and permits, including building permits, and for complying with any applicable federal, state, county and municipal laws, codes and regulations, in connection with the prosecution of the Work.

B. The Contractor shall take proper safety and health precautions to protect the Work, the workers, the public and the property of others.

C. The Contractor shall also be responsible for all materials delivered and work performed until completion and acceptance of the Work, except for any completed unit of construction thereof which may heretofore have been accepted.

END OF SECTION

Part 1 General

1.01 Description

A. Whenever reference is made to conforming to the standards of any technical society, organization, body, code or standard, it shall be construed to mean the latest standard, code, specification or tentative specification adopted and published at the time of advertisement for Bids. This shall include the furnishing of materials, testing of materials, fabrication and installation practices. In those cases where the Contractor's quality standards establish more stringent quality requirements, the more stringent requirement shall prevail. Such standards are made a part hereof to the extent which is indicated or intended.

B. The inclusion of an organization under one category does not preclude that organizations' standards from applying to another category.

C. In addition, all work shall comply with the applicable requirements of local codes, utilities and other authorities having jurisdiction.

D. All material and equipment, for which a UL Standard, an AGA or NSF approval or an ASME requirement is established, shall be so approved and labeled or stamped. The label or stamp shall be conspicuous and not covered, painted, or otherwise obscured from visual inspection.

E. The standards which apply to this Project are not necessarily restricted to those organizations which are listed in Article 1.02.

1.02 Standard Organizations

A. Piping and Valves

ACPA	American Concrete Pipe Association
ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
AWWA	American Water Works Association
CISPI	Cast Iron Soil Pipe Institute
DIPRA	Ductile Iron Pipe Research Association
FCI	Fluid Controls Institute
MSS	Manufacturers Standardization Society
NCPI	National Clay Pipe Institute
NSF	National Sanitation Foundation
PPI	Plastic Pipe Institute
Uni Bell PVC Pipe Association	

B. Materials

AASHTO	American Association of State Highway and Transportation Officials
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials

C. Painting and Surface Preparation

NACE	National Association of Corrosion Engineers
SSPC	Steel Structures Painting Council

D. Electrical and Instrumentation

AEIC	Association of Edison Illuminating Companies
AIEE	American Institute of Electrical Engineers
EIA	Electronic Industries Association
ICEA	Insulated Cable Engineers Association
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronic Engineers
IES	Illuminating Engineering Society
IPC	Institute of Printed Circuits
IPCEA	Insulated Power Cable Engineers Association
ISA	ISA – The Instrumentation, Systems, and Automation Society
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
REA	Rural Electrification Administration
TIA	Telecommunications Industries Association
UL	Underwriter's Laboratories
VRCI	Variable Resistive Components Institute

E. Aluminum

AA	Aluminum Association
AAMA	American Architectural Manufacturers Association

F. Steel and Concrete

ACI	American Concrete Institute
AISC	American Institute of Steel Construction, Inc.
AISI	American Iron and Steel Institute
CRSI	Concrete Reinforcing Steel Institute
NRMA	National Ready Mix Association
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute

G. Welding

ASME	American Society of Mechanical Engineers
AWS	American Welding Society

H. Government and Technical Organizations

AIA	American Institute of Architects
APHA	American Public Health Association
APWA	American Public Works Association
ASA	American Standards Association
ASAE	American Society of Agricultural Engineers
ASCE	American Society of Civil Engineers
ASQC	American Society of Quality Control
ASSE	American Society of Sanitary Engineers
CFR	Code of Federal Regulations
CSI	Construction Specifications Institute
EDA	Economic Development Administration
EPA	Environmental Protection Agency
FCC	Federal Communications Commission
FmHA	Farmers Home Administration

FS	Federal Specifications
IAI	International Association of Identification
ISEA	Industrial Safety Equipment Association
ISO	International Organization for Standardization
ITE	Institute of Traffic Engineers
NBFU	National Board of Fire Underwriters
(NFPA)	National Fluid Power Association
NBS	National Bureau of Standards
NISO	National Information Standards Organization
OSHA	Occupational Safety and Health Administration
SI	Salt Institute
SPI	The Society of the Plastics Industry, Inc.
USDC	United States Department of Commerce
WEF	Water Environment Federation

I. General Building Construction

AHA	American Hardboard Association
AHAM	Association of Home Appliance Manufacturers
AITC	American Institute of Timber Construction
APA	American Parquet Association, Inc.
APA	American Plywood Association
BHMA	Builders Hardware Manufacturers Association
BIFMA	Business and Institutional Furniture Manufacturers Association
DHI	Door and Hardware Institute
FM	Factory Mutual Fire Insurance Company
HPMA	Hardwood Plywood Manufacturers Association
HTI	Hand Tools Institute
IME	Institute of Makers of Explosives
ISANTA	International Staple, Nail and Tool Association
ISDSI	Insulated Steel Door Systems Institute
IWS	Insect Screening Weavers Association
MBMA	Metal Building Manufacturers Association
NAAMM	National Association of Architectural Metal Manufacturers
NAGDM	National Association of Garage Door Manufacturers
NCCLS	National Committee for Clinical Laboratory Standards
NFPA	National Fire Protection Association
NFSA	National Fertilizer Solutions Association
NKCA	National Kitchen Cabinet Association
NWMA	National Woodwork Manufacturers Association
NWWDA	National Wood Window and Door Association
RMA	Rubber Manufacturers Association
SBC	SBCC Standard Building Code
SDI	Steel Door Institute
SIA	Scaffold Industry Association
SMA	Screen Manufacturers Association
SPRI	Single Ply Roofing Institute
TCA	Tile Council of America
UBC	Uniform Building Code

J. Roadways

AREA	American Railway Engineering Association
DOT	Department of Transportation
SSRBC	Standard Specifications for Construction of Transportation Systems, Georgia Department of Transportation

K. Plumbing

AGA	American Gas Association
NSF	National Sanitation Foundation
PDI	Plumbing Drainage Institute
SPC	SBCC Standard Plumbing Code

L. Refrigeration, Heating, and Air Conditioning

AMCA	Air Movement and Control Association
ARI	American Refrigeration Institute
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
CGA	Compressed Gas Association
CTI	Cooling Tower Institute
HEI	Heat Exchange Institute
IIAR	International Institute of Ammonia Refrigeration
NB	National Board of Boilers and Pressure Vessel Inspectors
PFMA	Power Fan Manufacturers Association
SAE	Society of Automotive Engineers
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SMC	SBCC Standard Mechanical Code
TEMA	Tubular Exchangers Manufacturers Association

M. Equipment

AFBMA	Anti Friction Bearing Manufacturers Association, Inc.
AGMA	American Gear Manufacturers Association
ALI	Automotive Lift Institute
CEMA	Conveyor Equipment Manufacturers Association
CMAA	Crane Manufacturers Association of America
DEMA	Diesel Engine Manufacturers Association
MMA	Monorail Manufacturers Association
OPEI	Outdoor Power Equipment Institute, Inc.
PTI	Power Tool Institute, Inc.
RIA	Robotic Industries Association
SAMA	Scientific Apparatus Makers Association

1.03 Symbols

Symbols and material legends shall be as scheduled on the Drawings.

END OF SECTION

Part 1 General

1.01 Scope

A. Work under this Section includes all scheduling and administering of pre construction and progress meetings as herein specified and necessary for the proper and complete performance of this Work.

B. Scheduling and Administration by Engineer:

1. Prepare agenda.
2. Make physical arrangements for the meetings.
3. Preside at meetings.
4. Record minutes and include significant proceedings and decisions.
5. Distribute copies of the minutes to participants.

1.02 Preconstruction Conference

A. The Engineer shall schedule the preconstruction conference prior to the issuance of the Notice to Proceed.

B. Representatives of the following parties are to be in attendance at the meeting:

1. Owner.
2. Engineer.
3. Contractor and superintendent.
4. Major subcontractors.
5. Representatives of governmental or regulatory agencies when appropriate.

C. The agenda for the preconstruction conference shall consist of the following as a minimum:

1. Distribute and discuss a list of major subcontractors and a tentative construction schedule.
2. Critical work sequencing.
3. Designation of responsible personnel and emergency telephone numbers.
4. Processing of field decisions and change orders.
5. Adequacy of distribution of Contract Documents.
6. Schedule and submittal of shop drawings, product data and samples.
7. Pay request format, submittal cutoff date, pay date and retain age.

8. Procedures for maintaining record documents.

9. Use of premises, including office and storage areas and Owner's requirements.

10. Major equipment deliveries and priorities.

11. Safety and first aid procedures.

12. Security procedures.

13. Housekeeping procedures.

14. Work hours.

1.03 Project Coordination Meetings

A. Schedule regular meetings as directed by the Engineer.

B. Hold called meetings as the progress of the Work dictates.

C. The meetings shall be held at the location indicated by the Engineer.

D. Representatives of the following parties are to be in attendance at the meetings:

1. Engineer.

2. Contractor and superintendent.

3. Major subcontractors as pertinent to the agenda.

4. Owner's representative as appropriate.

5. Representatives of governmental or other regulatory agencies as appropriate.

E. The minimum agenda for progress meetings shall consist of the following:

1. Review and approve minutes of previous meetings.

2. Review work progress since last meeting.

3. Note field observations, problems and decisions.

4. Identify problems which impede planned progress.

5. Review off site fabrication problems.

6. Review Contractor's corrective measures and procedures to regain plan schedule.

7. Review Contractor's revision to the construction schedule as outlined in the Supplementary Conditions.

8. Review submittal schedule; expedite as required to maintain schedule.

9. Maintenance of quality and work standards.

10. Review changes proposed by Owner for their effect on the construction schedule and completion date.

11. Complete other current business.

END OF SECTION

Part 1 General

1.01 Scope

A. The work under this Section includes preparing, furnishing, distributing, and periodic updating of the construction schedules as specified herein.

B. The purpose of the schedule is to demonstrate that the Contractor can complete the overall Project within the Contract Time and meet all required interim milestones.

1.02 Submittals

A. Overall Project Schedule (OPS)

1. Submit the schedule within 10 days after date of the Notice to Proceed.

2. The Engineer will review the schedule and return it within 10 days after receipt.

3. If required, resubmit within 10 days after receipt of a returned copy.

B. Near Term Schedule (NTS)

1. Submit the first Near Term Schedule within 10 days of the Notice to Proceed.

2. The Engineer will review the schedule and return it within 10 days after receipt.

C. Submit an update of the OPS and NTS with each progress payment request.

D. Submit the number of copies required by the Contractor, plus four copies to be retained by the Engineer.

1.03 Approval

Approval of the Contractor's detailed construction program and revisions thereto shall in no way relieve the Contractor of any of Contractor's duties and obligations under the Contract. Approval is limited to the format of the schedule and does not in any way indicate approval of, or concurrence with, the Contractor's means, methods and ability to carry out the Work.

1.04 Overall Project Schedule (OPS)

A. The Contractor shall submit to the Owner for approval a detailed Overall Project Schedule of the Contractor's proposed operations for the duration of the Project. The OPS shall be in the form of a Gantt/bar chart.

B. Gantt/Bar Chart Schedule

1. Each activity with a duration of five or more days shall be identified by a separate bar. Activities with a duration of more than 20 days shall be sub divided into separate activities.

2. The schedule shall include activities for shop drawing preparation and review, fabrication, delivery, and installation of major or critical path materials and equipment items.

3. The schedule shall show the proposed start and completion date for each activity. A separate listing of activity start and stop dates and working day requirements shall be provided unless the information is shown in text form on the Gantt/bar chart.

4. The schedule shall identify the Notice to Proceed date, the Contract Completion date, major milestone dates, and a critical path.

5. The schedule shall be printed on a maximum 11 x 17 inch size paper. If the OPS needs to be shown on multiple sheets, a simplified, one page, summary bar chart showing the entire Project shall be provided.

6. The schedule shall have a horizontal time scale based on calendar days and shall identify the Monday of each week.

7. The schedule shall show the precedence relationship for each activity.

1.05 Near Term Schedule (NTS)

A. The Contractor shall develop and refine a detailed Near Term Schedule showing the day to day activities with committed completion dates which must be performed during the upcoming 30 day period. The detailed schedule shall represent the Contractor's best approach to the Work which must be accomplished to maintain progress consistent with the Overall Project Schedule.

B. The Near Term Schedule shall be in the form of Gantt/bar chart and shall include a written narrative description of all activities to be performed and describe corrective action to be taken for items that are behind schedule.

1.06 Updating

A. Show all changes occurring since previous submission of the updated schedule.

B. Indicate progress of each activity and show actual completion dates.

C. The Contractor shall be prepared to provide a narrative report at the Project Coordination Meetings. The report shall include the following:

1. A description of the overall Project status and comparison to the OPS.

2. Identify activities which are behind schedule and describe corrective action to be taken.

3. A description of changes or revisions to the Project and their effect on the OPS.

4. A description of the Near Term Schedule of the activities to be completed during the next 30 days. The report shall include a description of all activities requiring participation by the Engineer and/or Owner.

END OF SECTION

Part 1 General

1.01 Scope

A. The Contractor shall furnish all equipment and labor materials required to provide the Owner with digital construction photographs of the Project. Photographs shall be provided on a compact disk.

B. Photo files shall become the property of the Owner and none of the photographs herein shall be published without express permission of the Owner.

1.02 Pre and Post Construction Photographs

A. Prior to the beginning of any work, the Contractor shall take photographs of the work area to record existing conditions.

B. Following completion of the work, photos shall be made showing the same areas and features as in the pre construction photographs.

C. All conditions which might later be subject to disagreement shall be shown in sufficient detail to provide a basis for decisions.

D. The pre construction photographs shall be submitted to the Engineer within 25 calendar days after the date of receipt by the Contractor of Notice to Proceed. Post construction photographs shall be provided prior to final acceptance of the project.

1.03 Progress Photographs and Submittals

A. Progress photograph files shall be provided on compact discs as well as hard copies.

B. The file name of each photograph shall at a minimum contain the date the photograph was taken. All photographs shall be labeled to indicate date, time taken, and description of work shown.

C. A minimum of 10 photographs shall be submitted with each request for payment. The view selection will be as agreed to with the Engineer. One copy of each photograph shall be submitted. Failure to include photographs may be cause for rejection of the payment request.

END OF SECTION

Part 1 General

1.01 Scope

A. The work under this Section includes submittal to the Engineer of shop drawings, product data and samples required by the various sections of these Specifications.

B. Submittal Contents: The submittal contents required are specified in each section.

C. Definitions: Submittals are categorized as follows:

1. Shop Drawings

a. Shop drawings shall include technical data, drawings, diagrams, procedure and methodology, performance curves, schedules, templates, patterns, test reports, calculations, instructions, measurements and similar information as applicable to the specific item for which the shop drawing is prepared.

b. Provide newly prepared information, on reproducible sheets, with graphic information at accurate scale (except as otherwise indicated) or appropriate number of prints hereof, with name or preparer (firm name) indicated. The Contract Drawings shall not be traced or reproduced by any method for use as or in lieu of detail shop drawings. Show dimensions and note dimensions that are based on field measurement. Identify materials and products in the work shown. Indicate compliance with standards and special coordination requirements. Do not allow shop drawings to be used in connection with the Work without appropriate final “Action” markings by the Engineer.

c. Drawings shall be presented in a clear and thorough manner. Details shall be identified by reference to sheet and detail, specification section, schedule or room numbers shown on the Contract Drawings.

d. Minimum assembly drawings sheet size shall be 24 x 36 inches.

e. Minimum detail sheet size shall be 8 1/2 x 11 inches.

f. Minimum Scale:

i. Assembly Drawings Sheet, Scale: 1 inch = 30 feet.

ii. Detail Sheet, Scale: 1/4 inch = 1 foot.

2. Product Data

a. Product data includes standard printed information on materials, products and systems, not specially prepared for this Project, other than the designation of selections from among available choices printed therein.

b. Collect required data into one submittal for each unit of work or system, and mark each copy to show which choices and options

are applicable to the Project. Include manufacturer's standard printed recommendations for application and use, compliance with standards, application of labels and seals, notation of field measurements which have been checked and special coordination requirements.

3. Samples

a. Samples include both fabricated and un fabricated physical examples of materials, products and units of work, both as complete units and as smaller portions of units of work, either for limited visual inspection or, where indicated, for more detailed testing and analysis.

b. Provide units identical with final condition of proposed materials or products for the work. Include “range” samples, not less than three units, where unavoidable variations must be expected, and describe or identify variations between units of each set. Provide full set of optional samples where the Engineer's selection is required. Prepare samples to match the Engineer's sample where indicated. Include information with each sample to show generic description, source or product name and manufacturer, limitations and compliance with standards. Samples are submitted for review and confirmation of color, pattern, texture and “kind” by the Engineer. Engineer will note “test” samples, except as otherwise indicated, for other requirements, which are the exclusive responsibility of the Contractor.

4. Miscellaneous submittals related directly to the Work (non administrative) warranties, maintenance agreements, workmanship bonds, project photographs, survey data and reports, physical work records, statements of applicability, quality testing and certifying reports, copies of industry standards, record drawings, field measurement data, operating and maintenance materials, overrun stock, security/protection/safety keys and similar information, devices and materials applicable to the Work but not processed as shop drawings, product data or samples.

1.02 Specific Category Requirements

A. General: Except as otherwise indicated in the individual work sections, comply with general requirements specified herein for each indicated category of submittal. Submittals shall contain:

1. The date of submittal and the dates of any previous submittals.

2. The Project title.

3. Numerical submittal numbers, starting with 1.0, 2.0, etc. Revisions to be numbered 1.1, 1.2, etc.

4. The Names of:

a. Contractor

b. Supplier

c. Manufacturer

5. Identification of the product, with the Specification section number, permanent equipment tag numbers and applicable Drawing No.

6. Field dimensions, clearly identified as such.

7. Relation to adjacent or critical features of the Work or materials.

8. Applicable standards, such as ASTM or Federal Specification numbers.

9. Notification to the Engineer in writing, at time of submissions, of any deviations on the submittals from requirements of the Contract Documents.

10. Identification of revisions on resubmittals.

11. An 8 x 3 inch blank space for Contractor and Engineer stamps.

12. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of products, field measurements and field construction criteria and coordination of the information within the submittal with requirements of the Work and of Contract Documents.

13. Submittal sheets or drawings showing more than the particular item under consideration shall have all but the pertinent description of the item for which review is requested crossed out.

1.03 Routing of Submittals

A. Submittals and routine correspondence shall be routed as follows:

1. Supplier to Contractor (through representative if applicable)
2. Contractor to Engineer
3. Engineer to Contractor and Owner
4. Contractor to Supplier

Part 2 Products

2.01 Shop Drawings

A. Unless otherwise specifically directed by the Engineer, make all shop drawings accurately to a scale sufficiently large to show all pertinent features of the item and its method of connection to the Work.

B. Submit all shop drawings in the form of six hard copies and one pdf file.

C. One reproducible for all submittals larger than 11 x 17 inches and no more than three prints of other submittals will be returned to the Contractor.

2.02 Manufacturer's Literature

A. Where content of submitted literature from manufacturers includes data not pertinent to this submittal, clearly indicate which portion of the contents is being submitted for the Engineer's review.

B. Submit the number of copies which are required to be returned (not to exceed three) plus three copies which will be retained by the Engineer.

2.03 Samples

A. Samples shall illustrate materials, equipment or workmanship and established standards by which completed work is judged.

B. Unless otherwise specifically directed by the Engineer, all samples shall be of the precise article proposed to be furnished.

C. Submit all samples in the quantity which is required to be returned plus one sample which will be retained by the Engineer.

2.04 Colors

A. Unless the precise color and pattern is specifically described in the Contract Documents, wherever a choice of color or pattern is available in a specified product, submit accurate color charts and pattern charts to the Engineer for review and selection.

B. Unless all available colors and patterns have identical costs and identical wearing capabilities, and are identically suited to the installation, completely describe the relative costs and capabilities of each.

Part 3 Execution

3.01 Contractor's Coordination of Submittals

A. Prior to submittal for the Engineer's review, the Contractor shall use all means necessary to fully coordinate all material, including the following procedures:

1. Determine and verify all field dimensions and conditions, catalog numbers and similar data.

2. Coordinate as required with all trades and all public agencies involved.

3. Submit a written statement of review and compliance with the requirements of all applicable technical Specifications as well as the requirements of this Section.

4. Clearly indicate in a letter or memorandum on the manufacturer's or fabricator's letterhead, all deviations from the Contract Documents.

B. Each and every copy of the shop drawings and data shall bear the Contractor's stamp showing that they have been so checked. Shop drawings submitted to the Engineer without the Contractor's stamp will be returned to the Contractor for conformance with this requirement.

C. The Owner may back charge the Contractor for costs associated with having to review a particular shop drawing, product data or sample more than two times to receive a “No Exceptions Taken” mark.

D. Grouping of Submittals

1. Unless otherwise specifically permitted by the Engineer, make all submittals in groups containing all associated items.

2. No review will be given to partial submittals of shop drawings for items which interconnect and/or are interdependent. It is the Contractor's responsibility to assemble the shop drawings for all such interconnecting and/or interdependent items, check them and then make one submittal to the Engineer along with Contractor's comments as to compliance, non compliance or features requiring special attention.

E. Schedule of Submittals

1. Within 30 days of Contract award and prior to any shop drawing submittal, the Contractor shall submit a schedule showing the estimated date of submittal and the desired approval date for each shop drawing anticipated. A reasonable period shall be scheduled for review and comments. Time lost due to unacceptable submittals shall be the Contractor's responsibility and some time allowance for resubmittal shall be provided. The schedule shall provide for submittal of items which relate to one another to be submitted concurrently.

3.02 Timing of Submittals

A. Make all submittals far enough in advance of scheduled dates for installation to provide all required time for reviews, for securing necessary approvals, for possible revision and resubmittal, and for placing orders and securing delivery.

B. In scheduling, allow sufficient time for the Engineer's review following the receipt of the submittal.

3.03 Reviewed Shop Drawings

A. Engineer Review

1. Allow a minimum of 30 days for the Engineer's initial processing of each submittal requiring review and response, except allow longer periods where processing must be delayed for coordination with subsequent submittals. The Engineer will advise the Contractor promptly when it is determined that a submittal being processed must be delayed for coordination. Allow a minimum of two weeks for reprocessing each submittal. Advise the Engineer on each submittal as to whether processing time is critical to progress of the Work, and therefore the Work would be expedited if processing time could be foreshortened.

2. Acceptable submittals will be marked “No Exceptions Taken”. A minimum of three copies will be retained by the Engineer for Engineer's and the Owner's use and the remaining copies will be returned to the Contractor.

3. Submittals requiring minor corrections before the product is acceptable will be marked “Make Corrections Noted”. The Contractor may order, fabricate and ship the items included in the submittals, provided the indicated corrections are made. Drawings must be resubmitted for review and marked “No Exceptions Taken” prior to installation or use of products.

4. Submittals marked “Amend and Resubmit” must be revised to reflect required changes and the initial review procedure repeated.

5. The “Rejected See Remarks” notation is used to indicate products which are not acceptable. Upon return of a submittal so marked, the Contractor shall repeat the initial review procedure utilizing acceptable products.

6. Only two copies of items marked “Amend and Resubmit” and “Rejected See Remarks” will be reviewed and marked. One copy will be retained by the Engineer and the other copy with all remaining unmarked copies will be returned to the Contractor for resubmittal.

B. No work or products shall be installed without a drawing or submittal bearing the “No Exceptions Taken” notation. The Contractor shall maintain at the job site a complete set of shop drawings bearing the Engineer's stamp.

C. Substitutions: In the event the Contractor obtains the Engineer's approval for the use of products other than those which are listed first in the Contract Documents, the Contractor shall, at the Contractor's own expense and using methods approved by the Engineer, make any changes to structures, piping and electrical work that may be necessary to accommodate these products.

D. Use of the “No Exceptions Taken” notation on shop drawings or other submittals is general and shall not relieve the Contractor of the responsibility of furnishing products of the proper dimension, size, quality, quantity, materials and all performance characteristics, to efficiently perform the requirements and intent of the Contract Documents. The Engineer's review shall not relieve the Contractor of responsibility for errors of any kind on the shop drawings. Review is intended only to assure conformance with the design concept of the Project and compliance with the information given in the Contract Documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site. The Contractor is also responsible for information that pertains solely to the fabrication processes or to the technique of construction and for the coordination of the work of all trades.

3.04 Resubmission Requirements

A. Shop Drawings

1. Revise initial drawings as required and resubmit as specified for initial submittal, with the resubmittal number shown.

2. Indicate on drawings all changes which have been made other than those requested by the Engineer.

B. Project Data and Samples: Resubmit new data and samples as specified for initial submittal, with the resubmittal number shown.

END OF SECTION

Part 1 General

1.01 Scope

A. This Section includes testing which the Owner may require, beyond that testing required of the manufacturer, to determine if materials provided for the Project meet the requirements of these Specifications.

B. This work also includes all testing required by the Owner to verify work performed by the Contractor is in accordance with the requirements of these Specifications, i.e., concrete strength and slump testing, soil compaction, etc.

C. This work does not include materials testing required in various sections of these Specifications to be performed by the manufacturer, e.g., testing of pipe.

D. The testing laboratory or laboratories will be selected by the Owner. The testing laboratory or laboratories will work for the Owner.

1.02 Payment for Testing Services

A. The cost of testing services required by the Contract to be provided by the Contractor shall be paid for by the Owner through the CASH ALLOWANCE, i.e., concrete testing, soil compaction, and asphalt testing.

B. The cost of additional testing services not specifically required in the Specifications, but requested by the Owner or Engineer, shall be paid for by the Owner through the CASH ALLOWANCE.

C. The cost of material testing described in various sections of these Specifications or as required in referenced standards to be provided by a material manufacturer, shall be included in the price bid for that item and shall not be paid for by the Owner.

D. The cost of retesting any item that fails to meet the requirements of these Specifications shall be paid for by the Contractor. Retesting shall be performed by the testing laboratory working for the Owner.

1.03 Laboratory Duties

A. Cooperate with the Owner, Engineer and Contractor.

B. Provide qualified personnel promptly on notice.

C. Perform specified inspections, sampling and testing of materials.

1. Comply with specified standards, ASTM, other recognized authorities, and as specified.

2. Ascertain compliance with requirements of the Contract Documents.

D. Promptly notify the Engineer and Contractor of irregularity or deficiency of work which are observed during performance of services.

E. Promptly submit three copies (two copies to the Engineer and one copy to the Contractor) of report of inspections and tests in addition to those additional copies required by the Contractor with the following information included:

1. Date issued
2. Project title and number
3. Testing laboratory name and address
4. Name and signature of inspector
5. Date of inspection or sampling
6. Record of temperature and weather
7. Date of test
8. Identification of product and Specification section
9. Location of Project
10. Type of inspection or test
11. Results of test
12. Observations regarding compliance with the Contract Documents

F. Perform additional services as required.

G. The laboratory is not authorized to release, revoke, alter or enlarge on requirements of the Contract Documents, or approve or accept any portion of the Work.

1.04 Contractor Responsibilities

A. Cooperate with laboratory personnel, provide access to Work and/or manufacturer's requirements.

B. Provide to the laboratory, representative samples, in required quantities, of materials to be tested.

C. Furnish copies of mill test reports.

D. Furnish required labor and facilities to:

1. Provide access to Work to be tested;
2. Obtain and handle samples at the site;
3. Facilitate inspections and tests;
4. Build or furnish a holding box for concrete cylinders or other samples as required by the laboratory.

E. Notify the laboratory sufficiently in advance of operation to allow for the assignment of personnel and schedules of tests.

F. Laboratory Tests: Where such inspection and testing are to be conducted by an independent laboratory agency, the sample(s) shall be selected by such laboratory or agency, or the Engineer, and shipped to the laboratory by the Contractor at Contractor's expense.

G. Copies of all correspondence between the Contractor and testing agencies shall be provided to the Engineer.

1.05 Quality Assurance

Testing shall be in accordance with all pertinent codes and regulations and with procedures and requirements of the American Society for Testing and Materials (ASTM).

1.06 Product Handling

Promptly process and distribute all required copies of test reports and related instructions to insure all necessary retesting or replacement of materials with the least possible delay in the progress of the Work.

1.07 Furnishing Materials

The Contractor shall be responsible for furnishing all materials necessary for testing.

1.08 Code Compliance Testing

Inspections and tests required by codes or ordinances or by a plan approval authority, and made by a legally constituted authority, shall be the responsibility of, and shall be paid for by the Contractor, unless otherwise provided in the Contract Documents.

1.09 Contractor's Convenience Testing

Inspection or testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

1.10 Schedules for Testing

A. Establishing Schedule

1. The Contractor shall, by advance discussion with the testing laboratory selected by the Owner, determine the time required for the laboratory to perform its tests and to issue each of its findings, and make all arrangements for the testing laboratory to be on site to provide the required testing.

2. Provide all required time within the construction schedule.

B. When changes of construction schedule are necessary during construction, coordinate all such changes of schedule with the testing laboratory as required.

C. When the testing laboratory is ready to test according to the determined schedule, but is prevented from testing or taking specimens due to incompleteness of the Work, all extra costs for testing attributable to the delay will be back charged to the Contractor and shall not be borne by the Owner.

1.11 Taking Specimens

Unless otherwise provided in the Contract Documents, all specimens and samples for tests will be taken by the testing laboratory or the Engineer.

1.12 Transporting Samples

The Contractor shall be responsible for transporting all samples, except those taken by testing laboratory personnel, to the testing laboratory.

END OF SECTION

Part 1 General

1.01 Scope

A. Temporary facilities required for this work include, but are not necessarily limited to:

1. Temporary utilities such as water and electricity.

2. First aid facilities.

3. Sanitary facilities.

4. Potable water.

5. Temporary enclosures and construction facilities.

B. Temporary utilities for field offices shall be as specified in Section 01590 of these Specifications.

1.02 General

A. First aid facilities, sanitary facilities and potable water shall be available on the Project site on the first day that any activities are conducted on site. The other facilities shall be provided as the schedule of the Project warrants.

B. Maintenance: Use all means necessary to maintain temporary facilities in proper and safe condition throughout progress of the Work. In the event of loss or damage, immediately make all repairs and replacements necessary, at no additional cost to the Owner.

C. Removal: Remove all such temporary facilities and controls as rapidly as progress of the Work will permit.

1.03 Temporary Utilities

A. General

1. Provide and pay all costs for all water, electricity and other utilities required for the performance of the Work.

2. Pay all costs for temporary utilities until Project completion.

3. Costs for temporary utilities shall include all power, water and the like necessary for testing equipment as required by the Contract Documents.

B. Temporary Water: Provide all necessary temporary piping, and upon completion of the Work, remove all such temporary piping. Provide and remove water meters.

C. Temporary Electricity

1. Provide all necessary wiring for the Contractor's use.

2. Furnish, locate and install area distribution boxes such that the individual trades may use, their own construction type extension cords to obtain

adequate power, and artificial lighting at all points where required by inspectors and for safety.

1.04 First Aid Facilities

The Contractor shall provide a suitable first aid station, equipped with all facilities and medical supplies necessary to administer emergency first aid treatment. The Contractor shall have standing arrangements for the removal and hospital treatment of any injured person. All first aid facilities and emergency ambulance service shall be made available by the Contractor to the Owner and the Engineer's personnel.

1.05 Sanitary Facilities

Prior to starting the Work, the Contractor shall furnish, for use of Contractor's personnel on the job, all necessary toilet facilities which shall be secluded from public observation. These facilities shall be either chemical toilets or shall be connected to the Owner's sanitary sewer system. All facilities, regardless of type, shall be kept in a clean and sanitary condition and shall comply with the requirements and regulations of the area in which the Work is performed. Adequacy of these facilities will be subject to the Engineer's review and maintenance of same must be satisfactory to the Engineer at all times.

1.06 Potable Water

The Contractor shall be responsible for furnishing a supply of potable drinking water for employees, subcontractors, inspectors, engineers and the Owner who are associated with the Work.

1.07 Enclosures and Construction Facilities

Furnish, install and maintain for the duration of construction, all required scaffolds, tarpaulins, canopies, steps, bridges, platforms and other temporary construction necessary for proper completion of the Work in compliance with all pertinent safety and other regulations.

1.08 Parking Facilities

Parking facilities for the Contractor's and Contractor's subcontractors' personnel shall be the Contractor's responsibility. The storage and work facilities provided by the Owner will not be used for parking by the Contractor's or subcontractor's personnel.

END OF SECTION

Part 1 General

1.01 Barricades, Lights and Signals

A. The Contractor shall furnish and erect such barricades, fences, lights and danger signals and shall provide such other precautionary measures for the protection of persons or property and of the Work as necessary. Barricades shall be painted in a color that will be visible at night. From sunset to sunrise, the Contractor shall furnish and maintain at least one light at each barricade and sufficient numbers of barricades shall be erected to keep vehicles from being driven on or into any Work under construction.

B. The Contractor will be held responsible for all damage to the Work due to failure of barricades, signs and lights and whenever evidence is found of such damage, the Contractor shall immediately remove the damaged portion and replace it at Contractor's cost and expense. The Contractor's responsibility for the maintenance of barricades, signs and lights shall not cease until the Project has been accepted by the Owner.

END OF SECTION

Part 1 General

1.01 Scope

Limit blowing dust caused by construction operations by applying water or employing other appropriate means or methods to maintain dust control, subject to the approval of the Owner. As a minimum, this may require the use of a water wagon twice a day to suppress dusty conditions.

1.02 Protection of Adjacent Property

A. The Contractor shall visit the site and note the buildings, landscaping, roads, parking areas and other facilities near the Work site that may be damaged by their operations. The Contractor shall make adequate provision to fully protect the surrounding area and will be held fully responsible for all damages resulting from Contractor's operations.

B. Protect all existing facilities (indoors or out) from damage by dust, fumes, spray or spills (indoors or out). Protect motors, bearings, electrical gear, instrumentation and building or other surfaces from dirt, dust, welding fumes, paint spray, spills or droppings causing wear, corrosion, malfunction, failure or defacement by enclosure, sprinkling or other dust palliatives, masking and covering, exhausting or containment.

END OF SECTION

Part 1 General

1.01 Scope

A. The Contractor shall be responsible for conducting all Work in a safe manner and shall take reasonable precautions to ensure the safety and protection of workers, property and the general public. The Contractor's responsibility for protection is described in Article 25 of the General Conditions.

B. All construction shall be conducted in accordance with the latest applicable requirements for Part 1926 of the Occupational Safety and Health Act, Safety and Health Regulations for Construction, Section 107 of the Contract Work Hours and Safety Standards Act, as well as any other local, state or federal safety codes and regulations.

C. The Contractor shall designate a trained and qualified employee who is to be responsible for ensuring that the Work is performed safely and in conformance with all applicable regulations.

D. The Contractor shall determine the safety hazards involved in prosecuting the Work and the precautions necessary to conduct the Work safely. If the Contractor is unsure as to any special hazards which may be unique to the various processes and facilities involved in wastewater conveyance and treatment, it shall be Contractor's responsibility to determine such information prior to beginning the Work.

E. The Contractor shall bear all risks associated with performing the Work and shall fully indemnify and hold harmless the Owner and Engineer.

1.02 Special Requirements

A. The Contractor's attention is directed to the fact that construction activities involving existing wastewater facilities and sewer systems will occasionally involve work in potentially hazardous environments in which oxygen deficient, toxic or explosive conditions may exist. Additional hazards arise from the presence of pathogens in the wastewater and sludge and from the slime and scum layer that coat walking, working and other surfaces. In dealing with these hazards, the Contractor shall take special precautions to ensure worker safety. Such precautions shall include, but are not limited to, the following, as applicable:

1. Installing temporary forced air ventilation equipment and ducts for fresh air in enclosed areas.

2. Using pneumatic tools and equipment instead of electric driven equipment in hazardous areas.

3. Avoiding the use of cutting torches, field welding and grinders in hazardous areas.

4. Cleaning and disinfecting working surfaces with hot water, high pressure washers prior to commencing work.

5. Installing sealed wooden baffles or bulkheads to isolate working areas from hazardous atmospheres.

6. Providing portable oxygen meters, combustible gas detectors and hydrogen sulfide detectors to continuously monitor the atmosphere in enclosed working areas.

7. Providing safety harnesses, safety lines and recovery crews for workers in hazardous areas.

8. Providing self contained breathing apparatus with spare air cylinders for workers in hazardous areas.

9. Providing dry chemical fire extinguishers and connected fire hoses in areas where a danger of fire or explosion exists.

10. Providing adequate, oxygen equipped, first aid facilities.

11. Providing suitable wash up areas and facilities for workers.

12. Installing temporary lighting using explosion proof fixtures in hazardous environments.

13. Installing approved warning and hazard signs and posting safety procedures.

14. Instructing all workers as to the hazards present, the procedures to be followed and the proper function and use of all safety and emergency equipment furnished.

B. Prior to commencing Work on existing facilities and equipment, the Contractor shall notify the system/facility superintendent and shall ensure that the source of electrical energy to all affected equipment is shut off and locked out at the appropriate motor control center. Local switches and pushbutton stations, where provided, shall be locked in the “off” position.

C. Prior to entering or commencing work in a hazardous area, the Contractor shall ensure that all safety and emergency equipment is in place and in satisfactory operating condition.

END OF SECTION

Part 1 General

1.01 Scope

A. The work under this Section shall include providing a field office for the Contractor's use and for Project Meetings. The site for the field office shall be located on or conveniently near the Project site.

B. Furnish, install and maintain storage and work sheds needed for construction.

1.02 Requirements

A. General

1. The materials, equipment, and furnishings provided under this Section may be new or used, but must be serviceable, adequate for the required purpose, and must not violate applicable codes or regulations.

2. The Contractor shall make all provisions, and pay all costs for installation, utilities, rent, permit fees, and sitework for field offices and facilities.

B. Construction

1. Structurally sound, weathertight with floors raised above ground.

2. Temperature transmission resistance shall be compatible with occupancy and storage requirements.

3. Portable or mobile buildings may be used. Mobile trailers, when used, shall be modified for office use. Mobile trailers may not be used for living quarters.

B. Contractor's Field Office and Facilities

1. Size: As required for general use and to provide space for Project Meetings.

2. Minimum Services

a. Lighting: 50 foot candles at desk top height.

b. Exterior lighting at entrance door.

c. Automatic heating and cooling equipment sufficient to maintain comfort conditions of 78 degrees F inside in winter with outside air temperature of 20 degrees F and 72 degrees F inside in summer with outside air temperature of 100 degrees F.

d. Minimum of four 110 volt duplex electric convenience outlets, at least one on each wall.

e. Convenient access to drinking water (water cooler) and toilet facilities with sink.

3. Telephone: As required for Contractor's operations.

4. Racks and files for Project Record Documents.

5. Minimum Furnishings

   a. One plan table (39 x 72 inches x 36 inches high)

   b. Four chairs

   c. One wastebasket

6. One 10 inch outdoor type thermometer.

7. Two rain gauges with one for the Project Inspector's use.

1.03 Parking Facilities

A. Parking facilities for the Contractor's field office shall be the Contractor's responsibility. Storage and work facilities provided by the Owner will not be used.

B. The Contractor shall provide a minimum of three additional parking spaces, either graveled or paved, for use by the Engineer and Owner.

1.04 Use of Permanent Facilities

Permanent facilities shall not be used for field offices or for storage.

Part 2 Products (Not Used)

Part 3 Execution

3.01 Preparation

Fill and grade sites for temporary structures to provide surface drainage.

3.02 Installation

A. Construct temporary field offices and storage facilities on proper foundations and provide connections for utility services.

   1. Secure portable or mobile buildings when used.

   2. Provide steps and landings at entrance doors.

   3. Provide tie downs for 100 mile per hour gusts and winds.

B. Mount thermometer at convenient outside location, not in direct sunlight.

C. Mount rain gauges in accessible open area

D. Locate construction office facilities at locations within the Project area approved by the Engineer and Owner.

3.03 Maintenance and Cleaning

Provide periodic maintenance and cleaning for temporary structures, furnishings, equipment and services.

3.04 Removal

A. Remove temporary field offices, contents and services at a time when no longer needed. Offices and contents shall be the property of the Contractor.

B. Remove foundations and debris; grade site to required elevations and clean areas.

END OF SECTION

Part 1 General

1.01 Scope

A. The Contractor shall provide transportation of all equipment, materials and products furnished under these Contract Documents to the Work site. In addition, the Contractor shall provide preparation for shipment, loading, unloading, handling and preparation for installation and all other work and incidental items necessary or convenient to the Contractor for the satisfactory prosecution and completion of the Work.

B. All equipment, materials and products damaged during transportation or handling shall be repaired or replaced by the Contractor at no additional cost to the Owner prior to being incorporated into the Work.

1.02 Transportation

A. All equipment shall be suitably boxed, crated or otherwise protected during transportation.

B. Where equipment will be installed using existing cranes or hoisting equipment, the Contractor shall ensure that the weights of the assembled sections do not exceed the capacity of the cranes or hoisting equipment.

C. Small items and appurtenances such as gauges, valves, switches, instruments and probes which could be damaged during shipment shall be removed from the equipment prior to shipment, packaged and shipped separately. All openings shall be plugged or sealed to prevent the entrance of water or dirt.

1.03 Handling

A. All equipment, materials and products shall be carefully handled to prevent damage or excessive deflections during unloading or transportation.

B. Lifting and handling drawings and instructions furnished by the manufacturer or supplier shall be strictly followed. Eyebolts or lifting lugs furnished on the equipment shall be used in handling the equipment. Shafts and operating mechanisms shall not be used as lifting points. Spreader bars or lifting beams shall be used when the distance between lifting points exceeds that permitted by standard industry practice.

C. Under no circumstances shall equipment or products such as pipe, structural steel, castings, reinforcement, lumber, piles, poles, etc., be thrown or rolled off of trucks onto the ground.

D. Slings and chains shall be padded as required to prevent damage to protective coatings and finishes.

END OF SECTION

Part 1 General

1.01 Scope

The work under this Section includes, but is not necessarily limited to, the furnishing of all labor, tools and materials necessary to properly store and protect all materials, equipment, products and the like, as necessary for the proper and complete performance of the Work.

1.02 Storage and Protection

A. Storage

1. Maintain ample way for foot traffic at all times, except as otherwise approved by the Engineer.

2. All property damaged by reason of storing of material shall be properly replaced at no additional cost to the Owner.

3. Packaged materials shall be delivered in original unopened containers and so stored until ready for use.

4. All materials shall meet the requirements of these Specifications at the time that they are used in the Work.

5. Store products in accordance with manufacturer's instructions.

B. Protection

1. Use all means necessary to protect the materials, equipment and products of every section before, during and after installation and to protect the installed work and materials of all other trades.

2. All materials shall be delivered, stored and handled to prevent the inclusion of foreign materials and damage by water, breakage, vandalism or other causes.

3. Substantially constructed weathertight storage sheds, with raised floors, shall be provided and maintained as may be required to adequately protect those materials and products stored on the site which may require protection from damage by the elements.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary for the approval of the Engineer and at no additional cost to the Owner.

D. Equipment and products stored outdoors shall be supported above the ground on suitable wooden blocks or braces arranged to prevent excessive deflection or bending between supports. Items such as pipe, structural steel and sheet construction products shall be stored with one end elevated to facilitate drainage.

E. Unless otherwise permitted in writing by the Engineer, building products and materials such as cement, grout, plaster, gypsumboard, particleboard, resilient flooring, acoustical tile, paneling, finish lumber, insulation, wiring, etc., shall be stored indoors in a dry location. Building products such as rough lumber,

plywood, concrete block and structural tile may be stored outdoors under a properly secured waterproof covering.

F. Tarps and other coverings shall be supported above the stored equipment or materials on wooden strips to provide ventilation under the cover and minimize condensation. Tarps and covers shall be arranged to prevent ponding of water.

1.03 Extended Storage

In the event that certain items of major equipment such as air compressors, pumps and mechanical aerators have to be stored for an extended period of time, the Contractor shall provide satisfactory long-term storage facilities which are acceptable to the Engineer. The Contractor shall provide all special packaging, protective coverings, protective coatings, power, nitrogen purge, desiccants, lubricants and exercising necessary or recommended by the manufacturer to properly maintain and protect the equipment during the period of extended storage.

END OF SECTION

Part 1 General

1.01 Scope

This Section outlines the restrictions and requirements for substitutions, product and manufacturer options, and construction method options.

1.02 Definitions

A. For the purposes of these Contract Documents, a “substitute item” shall be defined as one of the following:

1. A product or manufacturer offered as a replacement to a specified product or manufacturer.

2. A product or manufacturer offered in addition to a specified product or manufacturer.

B. For the purposes of these Contract Documents, a “substitute construction method” shall be defined as one of the following:

1. A mean, method, technique, sequence or procedure of construction offered as a replacement for a specified mean, method, technique, sequence or procedure of construction.

2. A mean, method, technique, sequence or procedure of construction offered in addition to a specified mean, method, technique, sequence or procedure of construction.

1.03 General

A. An item or construction method, which is offered where no specific product, manufacturer, mean, method, technique, sequence or procedure of construction is specified or shown on the Drawings, shall not be considered a substitute and shall be at the option of the Contractor, subject to the provisions in the Contract Documents for that item or construction method.

B. For products specified only by a referenced standard, the Contractor may select any product by any manufacturer, which meets the requirements of the Specifications, unless indicated otherwise in the Contract Documents.

C. If the manufacturer is named on the Drawings or in the Specifications as an acceptable manufacturer, products of that manufacturer meeting all requirements of the Specifications and Drawings are acceptable.

D. Whenever the Engineer's design is based on a specific product of a particular manufacturer, that manufacturer will be shown on the Drawings and/or listed first in the list of approved manufacturers in the Specifications. Any Bidder intending to furnish products of other than the first listed manufacturer, or furnish substitute items, shall

1. Verify that the item being furnished will fit in the space allowed, perform the same functions and have the same capabilities as the item specified.

2. Include in its Bid the cost of all accessory items which may be required by the other listed substitute product,

3. Include the cost of any architectural, structural, mechanical, piping, electrical or other modifications required, and

4. Include the cost of required additional work by the Engineer, if any, to accommodate the item.

E. Whenever a product is identified on the Drawings or in the Specifications 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.

1.04 Approvals

Approval, of a substitution as an acceptable manufacturer, of the Engineer is dependent on determination that the product offered is essentially equal in function, performance, quality of manufacture, ease of maintenance, reliability, service life and other criteria to that on which the design is based; and will require no major modifications to structures, electrical systems, control systems or piping systems.

1.05 Substitutions and Options

A. No substitutions will be considered for the manufacturers listed in the Bid Form.

B. After Notice to Proceed

1. Substitute items will be considered only if the term “equal to” precedes the names of acceptable manufacturers in the Specification.

2. Where items are specified by referenced standard or specified as indicated in Article 1.03, Paragraph A. above, such items shall be submitted to the Engineer for review.

3. The Contractor shall submit shop drawings on the substitute item for the Engineer's review in accordance with the Section 01340.

C. Prior to Opening of Bids

1. No consideration or approvals will be made for products specified by a referenced standard, or specified as indicated in Article 1.02, Paragraph A. above. Such consideration may occur only after the Notice to Proceed.

2. No consideration or approvals will be made for products being offered where the term “equal to” precedes the name of an approved product. Such substitution consideration may occur only after the Notice to Proceed.

3. If the term “or equal” follows the names of acceptable manufacturers, then other manufacturers desiring approval as an acceptable manufacturer may submit the product information to the Engineer for

approval during the bidding phase, as indicated below. With the exception of where the phrase “no substitutions” is associated with a list of manufacturers, where a list of acceptable manufacturers is not preceded by the phrase “equal to”, the list of acceptable manufacturers shall be considered as having the phrase “or equal” following the list, and the list being subject to the “or equal” provisions of this section.

4. The manufacturer shall include the following items in its “or equal” submittal:

   a. Descriptive literature including information on materials used, 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.

   b. Performance specifications applicable to the manufacturer's standard design which indicates the level of performance to be expected from the product.

   c. A complete set of submittal drawings of similar products which have been completed and placed into operation.

   d. 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.

   e. Evidence of technical ability of the manufacturer to design and manufacture products meeting Project requirements.

   f. Evidence submitted shall include, as a minimum, descriptions of engineering and manufacturing staff capabilities.

   g. 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.

   h. 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.

   i. A complete list of all requirements of the Drawings and Specifications with which the manufacturer cannot conform, including reasons why alternate features are considered equivalent.

   j. 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.

k. Where additional information is submitted to supplement the submittal, all changes to the list of exceptions shall be specifically noted.

l. All other information necessary to fully evaluate the product for consideration.

5. This “or equal” submittal shall reach the Engineer no later than 14 days prior to the Bid date. 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. Manufacturers will be advised of approval or rejection in writing no later than 10 days prior to the Bid date. Rejected submittals may be supplemented with additional information and resubmitted no later than five days prior to the Bid date. Manufacturers making supplementary submittals will be advised of approval or rejection in writing no later than one day prior to the Bid date.

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

END OF SECTION

Part 1 General

1.01 Scope

These general equipment stipulations apply, in general, to all equipment and piping. They supplement the detailed equipment Specifications, but in case of conflict, the detailed equipment Specifications shall govern.

1.02 Coordination

The Contractor shall assume full responsibility for the coordination of the installation of all equipment, materials and products furnished under these Contract Documents. The Contractor shall be completely responsible for verification that all structures, piping and equipment components furnished by the Contractor and/or subcontractors and suppliers are compatible. The Contractor shall start-up each equipment system and shall make all necessary alterations. All such alterations shall be made at the Contractor's expense.

1.03 Adaptation and Location of Equipment

A. No responsibility for alteration of a planned structure to accommodate other types of equipment will be assumed by the Owner. Equipment which requires alteration of the structures will be considered only if the Contractor assumes all responsibility for making and coordinating all necessary alterations. All such alterations shall be made at the Contractor's expense.

B. The Contractor shall install the work in such manner that the equipment, piping, vents, conduit, panels, ductwork, etc., be as neatly installed and out-of-the-way as physically possible. All equipment, piping, ductwork, conduit, etc., shall be installed to provide needed maintenance and passage space.

1.04 Patent Royalties

All royalties and fees for patents covering materials, articles, apparatus, devices or equipment shall be included in prices Bid by the Contractor.

1.05 Equipment Warranty

The Contractor shall warrant all equipment against faulty or inadequate design, improper assembly or erection, defective materials, breakage or other failure. The warranty period shall be defined in Section 01740 of these Specifications.

1.06 Workmanship and Materials

A. All equipment shall be designed, fabricated and assembled in accordance with the most modern engineering and shop practice. Individual parts shall be manufactured to standard sizes and gauges so that repair parts, furnished at any time, can be installed in the field. Like parts of duplicate units shall be interchangeable. Equipment shall be new and shall not have been in service at any time prior to delivery, except as required by tests.

B. Materials shall be suitable for service conditions. Iron castings shall be tough, close grained, gray iron free from blowholes, flaws or excessive shrinkage and shall conform to ASTM A 48, Class 30 minimum. Plugging of defective castings shall not be permitted. Castings shall be annealed to remove internal stresses

prior to machining and shall have the mark number and heat number cast on them.

C. Except where otherwise specified, structural and miscellaneous fabricated steel used in items of equipment shall conform to the Standards of the American Institute of Steel Construction. All structural members shall be considered as subject to shock or vibratory loads.

D. All replaceable or expendable elements such as filters, screens, drive belts, fuses, lamps, etc., shall be easily accessible and replaceable without need of dismantling equipment or piping. All such items shall be of a standard type that is readily available from multiple suppliers.

E. Threaded openings for drains or vents in pump volutes, compressor or fan scrolls, air receivers, and heat exchangers which are plugged during normal operation shall be provided with stainless steel plugs.

1.07 Lubrication and Lubrication Fittings

A. Equipment shall be adequately lubricated by systems which require attention no more frequently than weekly during continuous operation. Lubrication systems shall not require attention during start-up or shutdown and shall not waste lubricants.

B. Lubricants of the type recommended by the equipment manufacturer shall be provided in sufficient quantity by the Contractor to fill all lubricant reservoirs and to replace all lubricants consumed during testing, start-up and initial operation. The Contractor shall provide sufficient quantities of lubricants to lubricate all equipment for one year of normal service before final acceptance of the equipment will be made by the Owner.

C. Where special run-in oil or storage lubricants are used, they shall be flushed out and replaced with the required service lubricant by the Contractor.

D. Tag each piece of equipment with a cloth tag showing proper type lubricant, period between lubrications, date of lubrication and worker's initials. Have space for 10 lubrication notations.

E. Except for rotating shaft couplings, all lubrication fittings shall be brought to the outside of all equipment so that they are readily accessible from the outside without the necessity of removing covers, plates, housings or guards. Fittings shall be accessible from safe, permanent platforms or walk areas. Fittings shall be of the bull-neck, check type for use with a portable high pressure grease gun. Connection from a remote fitting to the point of use shall be with minimum 3/16-inch stainless steel tubing, securely mounted parallel to equipment lines and protected where exposed to damage.

1.08 Safety Guards

All belt or chain drives, fan blades, couplings and other moving or rotating parts shall be covered on all sides by a safety guard. Safety guards shall be fabricated from 16 USS gauge or heavier galvanized or aluminum-clad sheet steel or 1/2-inch mesh galvanized expanded metal. Expanded metal safety guards shall be banded to eliminate sharp edges. Each guard shall be designed for easy installation and removal. All necessary supports and accessories shall be provided for each guard. Supports and accessories, including bolts, shall be

galvanized. All safety guards in outdoor locations shall be designed to prevent the entrance of rain and dripping water. All safety guards shall comply with OSHA General Industry Standards, Part 1910, Subpart O, Machinery and Machine Guarding. Provide tachometer access on shaft ends.

1.09 Equipment Bases

A. Where shown on the Drawings, equipment shall be installed on a raised, reinforced concrete base. The base shall be a minimum of 4-inches in height and shall extend beyond the equipment baseplate approximately 2-inches on all sides.

B. The Engineer shall be consulted concerning electrical conduit locations prior to pouring the concrete base.

C. Unless otherwise specified, a cast iron or welded steel baseplate shall be provided for each pump, compressor and any other item of equipment which is to be installed on a concrete base. Each unit and drive assembly shall be supported on a single baseplate of neat design. Baseplates shall have pads for anchoring all components and adequate grout holes. Baseplates for pumps shall have a raised lip all around and a threaded drain connection. Baseplates shall be anchored to the concrete base with suitable anchor bolts and the space beneath filled with epoxy or non-shrink grout as specified in the grouting section.

D. On direct coupled equipment, motor and driven equipment shall be doweled to a common base with a minimum of two dowels each.

1.10 Alignment of Motors and Equipment

A. In every case where a drive motor is connected to a driven piece of equipment by a flexible coupling, the coupling halves shall be disconnected and the alignment between the motor and the equipment checked and corrected. Machinery shall first be properly aligned and leveled by means of steel wedges and shims or jacking screws near anchor bolts. Anchor bolts shall be tightened against the shims on wedges or jacking screws and the equipment shall again be checked for level and alignment before placing grout. Wedges shall not be placed between machined surfaces.

B. In general, checking and correcting the alignment shall follow the procedures set up in the Standards of the Hydraulic Institute, Instructions for Installation, Operation, and Maintenance of Centrifugal Pumps. Equipment shall be properly leveled and brought into angular and parallel alignment.

C. Equipment shall be installed in such a way that no strain is transmitted to the equipment by piping systems or adjacent equipment.

1.11 Grouting

A special epoxy, non-shrink, or sand-cement grout shall be used in the placement of all pump, motor and equipment baseplates or bedplates, column baseplates, other miscellaneous baseplates and other grouting applications as shown on the Drawings.

1.12 Welding and Brazing

A. All welds shall be sound and free from embedded scale and slag. All butt welds shall be continuous, and where exposed to view, shall be ground smooth. All continuous welds shall be gas and liquid-tight. Welds in piping shall have full penetration and shall be smooth on the inside of the pipe. Intermittent welds shall have an effective length of at least 2-inches and shall be spaced not more than 6-inches apart.

B. All welding of steel and aluminum, including materials, welding techniques, general safety practices, appearance and quality of welds, and methods of correcting defective work, shall conform to the latest requirements of AWS Specifications. Structural steel welding shall conform to the requirements of the AWS Structural Welding Code. The general recommendations and requirements of the AWS Structural Welding Code shall also apply to welded aluminum structures. The welding process and welding operators shall meet qualification tests and welding performance tests in accordance with the latest provisions of ASME Boiler and Pressure Vessel Code, Section IX, Welding and Brazing Qualifications. Welding process and qualification procedures for welding of pipe shall conform to the latest requirements of ANSI B31.1, Section 327, Welding, and Section 328, Brazing and Soldering. All welding qualification tests shall be witnessed by the Engineer, except as provided herein. All costs associated with the qualification or testing of welders and welding operators shall be borne by the Contractor.

C. Reports certifying that the welding procedures, welders and welding operators that the Contractor intends to use meet the requirements specified above. These reports shall be submitted to the Engineer prior to beginning the Work. In the case of welder qualifications for shop welding and for carbon steel field welding, welders presenting certified qualification papers validated within the preceding six month period will not be required to take the qualification tests. In the case of field welding of stainless steel or aluminum, all welders shall be required to take the qualification tests regardless of past experience or availability of certified qualification papers.

D. Field welding practices shall conform to OSHA construction standards, Part 1926, Subpart J, Welding and Cutting. Shop welding practices shall conform to OSHA General Industry Standards, Part 1910, Subpart Q, Welding, Cutting, and Brazing.

E. Welding electrodes for structural steel shall conform to the standard recommendations of the AISC. Welding electrodes for stainless steel shall conform to applicable AWS Specifications and shall be as recommended by “Welded Austenitic Chromium-Nickel Stainless Steels, Techniques and Properties”, published by the International Nickel Company, New York, New York. Welding electrodes for aluminum shall conform to applicable AWS Specifications.

F. Each welder and welding operator must identify all welds with welder's assigned symbol.

G. Welders performing unsatisfactory work shall be removed from the welding process.

H. The Owner may inspect any weld by radiographic or other means. Welds not in accordance with the requirements specified herein shall be repaired or replaced

at the Contractor's expense. Excessive porosity, nonmetallic inclusions, lack of fusion, incomplete penetration and cracking shall constitute grounds for rejection of welds.

1.13 Erection and Setting

A. In the erection and setting of all fabricated equipment, the Contractor shall exercise care to ensure that each item of equipment is adequately supported so as not to bend or distort under its own weight until adequate foundation support and anchorage are provided. Where lifting lugs, angles or clips are provided on equipment, they shall be used in erecting and setting the equipment. Erection and setting of equipment and structural steel shall conform to the requirements of OSHA Construction Standards, Part 1926, Subpart R, Steel Erection, Subpart H, Material Handling, Storage, Use, and Disposal, and Subpart N, Cranes, Derricks, Hoists, and Conveyors. Erection of structural steel shall conform to the latest requirements of the AISC Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings.

B. During placement and prior to any grouting or connection of adjacent piping, the equipment shall be leveled and aligned true to level, plumb, alignment and grade with all parts bearing or fitting the structure or equipment accurately and securely. It shall not be permitted to cock out of alignment, nor shall the Contractor redrill, reshape or force fit any fabricated items.

C. The Contractor shall take all measurements necessary to properly fit Contractor's work in the field, and Contractor shall be governed by and responsible for these measurements and the proper working out of all details. The Contractor shall be responsible for the correct fitting of all work in the field and the accurate placement of all anchor bolts installed by Contractor.

D. The Contractor shall bring all parts to be erected or assembled into close contact. Before assembly, all surfaces to be in contact with each other shall be thoroughly cleaned. Drift pins may be used only for bringing members into position, never to enlarge or distort holes. Torching or burning of holes or cutting of fabricated items to correct misalignment or shop errors shall not be permitted. Enlargement of holes necessary to make field connections shall be done only with the Engineer's approval by reaming with twist drills and in a manner acceptable to Engineer.

E. All equipment shall be furnished with suitable eyebolt lifting lugs or lifting angles to facilitate handling.

1.14 Special Tools and Accessories

Equipment requiring periodic repair and adjustment shall be furnished complete with all special tools, instruments and accessories required for proper maintenance. Special tools and accessories shall include those tools and accessories not normally available in an industrial hardware or mill supply house. Equipment requiring special devices for lifting or handling shall be furnished complete with those devices.

1.15 Shop Priming and Painting

All equipment shop priming and painting, including surface preparation, workmanship and materials, shall be as specified in Section 09900 of these Specifications.

1.16 Field Priming

All iron and carbon steel surfaces not specified to be galvanized or shop primed and all ferrous or nonferrous surfaces specified to be field primed and painted shall be coated in the field with one or more coats of primer in accordance with the requirements of Section 09900 of these Specifications.

1.17 Field Painting

Except for interior surfaces of vessels and enclosed equipment not specified to be field painted, all ferrous and nonferrous surfaces of equipment which have received one or more coats of shop or field applied primer shall be field painted after installation in accordance with the requirements of Section 09900 of these Specifications.

1.18 Galvanizing

A. All galvanizing shall be done by the hot-dip process after fabrication in conformity with requirements of ASTM A 123, A 153, A 384 and A 385. Articles to be galvanized shall be pickled before galvanizing.

B. Where galvanized bolts are specified or required by the Drawings, cadmium or zinc plated bolts will be acceptable provided cadmium plating conforms to ASTM A 165, Type NS and zinc plating conforms to ASTM A 164, Type GS.

C. Areas of galvanizing damaged by welding or burning or otherwise damaged shall be thoroughly stripped and cleaned and recoated with zinc to the required thickness by the hot dip process.

D. Galvanized articles shall be free from uncoated spots, blisters, flux, black spots, dross, projections and other defects not consistent with acceptable galvanizing practice.

E. Zinc and cadmium plating shall be subject to visual examination to determine uniformity of coating. The Engineer may require that the coating uniformity be tested in accordance with ASTM A 239.

1.19 Protection and Storage

A. All equipment shall be boxed, crated or otherwise completely enclosed and protected during shipment, handling and storage. All equipment shall be protected from exposure to the elements and shall be kept thoroughly dry at all times. Compressors, blowers, pumps, motors, valves, control panels, instrumentation, electrical equipment and other equipment having antifriction or sleeve bearings shall be stored in weathertight warehouses which are maintained at a temperature of at least 60 degrees F. Other equipment may be stored outside under cover. All equipment shall be stored above ground level and adequately supported on wood blocking or other approved support material. Printed storage instructions of the manufacturers shall be strictly adhered to.

B. Painted, anodized or otherwise coated surfaces shall be protected against impact, abrasion, discoloration and other damage. All coated surfaces which are damaged prior to acceptance of equipment shall be cleaned and coated to the satisfaction of the Engineer with the same or equivalent coating used in the original application.

C. Electrical equipment, motors, controls, and insulation shall be protected against moisture or water damage. All space heaters provided in the equipment shall be kept connected and operating at all times until equipment is placed in service. Electrical equipment stored without space heaters shall be provided with desiccants to protect against moisture damage. Desiccant shall be silica gel in porous bags at not less than 1 ounce per cubic foot of volume. Desiccant shall be replaced periodically.

D. Electrical equipment and instrumentation shall be stored in a location that is free from excessive or injurious amounts of vibration.

E. Rotating equipment such as pumps, motors, fans and compressors shall be rotated periodically. In the absence of specific exercising instructions by the equipment manufacturers, each item of rotating equipment shall be rotated a minimum of 10 revolutions at intervals not to exceed 20 days. When shafts are too difficult to rotate by hand, nonmetallic grips shall be used to turn the shafts.

F. Vehicles such as trucks, forklifts, tractors, lawn mowers and other engine-powered equipment shall be started up and operated at intervals not to exceed 15 days. Equipment shall be run until engine temperatures and pressures are in normal operating ranges. All lifting, lowering, tilting, loading and unloading accessories shall be operated at least once during the exercise period. Equipment shall be moved under power from the parked position and run a sufficient distance so as to ensure proper lubrication of drive train and suspension components. All operators employed to exercise the vehicles shall be qualified and thoroughly familiar with the proper operation of the equipment. Forklifts, tractors, lawn mowers and other small engine-powered equipment shall be stored indoors in garages or other suitable structures. Trucks stored outdoors shall be washed using approved materials at intervals not to exceed 15 days. All exercising and storage of vehicular equipment shall be conducted in a manner acceptable to the Engineer.

G. Interiors of gear and bearing cases housing oil-lubricated gears and bearings shall be filled with a rust inhibiting oil prior to storage or, if extended storage is anticipated, coated periodically with a rust inhibiting oil mist at intervals of time acceptable to the Engineer. Interiors of large pumps and compressors shall be protected using vapor phase inhibitor paper or porous bags of rust inhibiting, vapor emitting crystals. Exposed shafts shall be coated with rust preventative compound, then wrapped with oil-impregnated paper and polyethylene film and sealed with waterproof tape prior to shipment.

H. Individually packaged, unpainted steel parts shall be protected by a wrapping of vapor phase inhibiting or oil-impregnated paper and polyethylene film prior to shipment.

I. Parts and equipment not requiring periodic inspection or maintenance shall be stored unopened in their original packaging until used.

J. Parts, instruments, controls and small items of equipment shall be stored above ground or floor level on suitable shelves or racks in a heated, watertight warehouse.

K. Flanged openings on equipment shall be covered with suitable solid wooden or metal blanks securely bolted to the flange using a minimum of four bolts and a suitable rubber gasket. Ends of threaded pipe and fittings shall be sealed

watertight with metal or plastic caps. Threaded openings shall be sealed watertight with metal or plastic plugs. Other openings shall be sealed with two layers of 6 mil polyethylene securely taped in place with waterproof tape.

L. A maintenance log on each item of mechanical and electrical equipment requiring periodic attention in storage shall be maintained by the Contractor. Oil and grease changes, exercising, desiccant replacement, nitrogen purge checks, heater checks, insulation checks and other periodic maintenance shall be entered in the log. The maintenance log shall be made available to the Engineer on request.

M. A resistance test shall be performed on all motor windings and heater elements following storage and prior to installation as a check for insulation deterioration or moisture damage during storage.

N. Immediately prior to installation, equipment shall be cleaned of any protective coatings used during storage and any rust, dirt, grit or other foreign material shall be removed.

O. After installation and prior to start-up, all grease-lubricated joints, shaft couplings and bearings shall be flushed out and regreased. All oil reservoirs and sumps shall be completely drained and flushed and refilled with the proper lubricant. Screens and filters shall be checked for contamination and replaced if necessary. The equipment shall then be tagged, signed and dated, indicating that the equipment has been properly lubricated for start-up.

P. After storage, rubber parts such as valve seats, diaphragms, expansion joints, gaskets, hoses and shaft couplings shall be checked for hardening or cracking. Deteriorated parts shall be replaced prior to start-up by the Contractor at Contractor's own expense.

1.20 Vibration Testing

A. Unless specified otherwise in the Specifications, each pump or blower having a rated power of 50 HP, or greater, shall be tested in the field for acceptable vibration levels. Vibration testing shall be performed by an experienced, factory-trained and authorized vibration analysis expert (not a sales representative) retained by the Contractor for this work. Each unit 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 certified copies of vibration test data for each test performed.

B. Where specified in the Specifications, equipment which is assembled and tested on the manufacturer's floor shall also be checked triaxially for vibration by the manufacturer. The results of these tests, along with location of vibration check points, shall be submitted to the Engineer. All readings shall be made on an X-Y recorder with appropriate scales indicated and an explanation thereon of any recordings exceeding specified limits. The field tests shall include substantiation of the manufacturer's test data.

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 drives, tests shall be conducted under various loading conditions as determined by the Engineer.

D. Rotating equipment shall be tested for vibration in the field after installation by the following method. Equipment, complete with drive systems, in place at the job site, shall not vibrate more than the values allowed herein, unless otherwise specified in the detailed equipment specifications. All field tests shall be running tests with the equipment operating on the product for which it is intended or a substitute acceptable to the Engineer. The term displacement, as used herein, shall mean total peak-to-peak movement of vibrating equipment, in mils; velocity shall mean the peak velocity or speed of the vibrating equipment, in inches per second; acceleration shall mean the maximum acceleration which occurs during the vibration cycle, measured in G's. Displacement and velocity shall be measured by an IRD Mechanalysis Vibration Meter Model 306, Bently-Nevada Model TK-8, or equal. Acceleration shall be measured by suitable IRD Mechanalysis, Bently-Nevada, or equal equipment, subject to approval of the Engineer. 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.

E. For all equipment tested, vibration shall be checked in the radial and axial directions. For pumps, vibration shall not exceed that permitted by the Hydraulic Institute.

F. Critical speeds of all rotating equipment shall meet the following:

1. For stiff shaft designs, the first critical speed of the rotating equipment shall be at least 25 percent above the maximum design operating speed.

2. For flexible shaft designs, critical speeds shall be at least two percent above or below normal design operating speeds.

G. The Contractor shall be responsible for unit and system assembly vibration testing and their results, which shall be within the specified limits. Copies of test results shall be submitted to the Engineer for review. Should the vibration field test results exceed shop test results or the limits specified herein, the Contractor shall correct the deficiencies within 30 days. After corrections have been completed, the vibration testing shall be rerun and the results resubmitted to the Engineer for review.

1.21 Hydraulic Systems

A. All pipes, tubes and hoses for hydraulic fluid shall be securely restrained against movement.

B. All hydraulic fluid reservoirs for hydraulic power packs shall be equipped with a low level shut-off mechanism which shall stop operation of the power pack when the level of fluid in the reservoir reaches a predetermined low level.

C. All hydraulic systems shall be equipped with an alarm to notify the operator of system malfunction.

1.22 Noise Criteria

A. Unless otherwise specified, noise levels for all operating equipment shall not exceed 90 dB at 5 feet from the equipment when measured on the A scale of a calibrated sound level meter at slow response.

B. Noise criteria shall be met without the use of special external barriers or enclosures.

1.23 Installation Check

A. An experienced, competent and authorized service representative of the manufacturer of each item of equipment, or other person acceptable to the Engineer, shall visit the site of the Work and inspect, check and adjust, if necessary, and approve the equipment installation. In each case, the equipment manufacturer's representative or other person authorized by the Engineer to perform the installation check shall be present when the equipment is placed in operation and shall revisit the jobsite as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of the Engineer.

B. Each equipment manufacturer's representative or other person authorized by the Engineer to perform the installation check shall furnish to the Owner, through the Engineer, a written report certifying the following:

1. The equipment has been properly installed and lubricated.

2. The equipment is in accurate alignment.

3. The equipment is free from any undue stress imposed by connecting piping or anchor bolts.

4. The equipment has been operated under full load conditions and that it operated satisfactorily. The Work described under these Contract Documents will not be accepted as complete until satisfactory installation certifications have been submitted in accordance with the requirements of this Section.

C. The Contractor shall properly coordinate the visits by the manufacturer's representatives, particularly where an equipment item's operation is dependent on the operation of other equipment. Prior to calling the manufacturer's representative, the Contractor shall ensure that all necessary related equipment, structures, piping and electrical work is complete. The Contractor shall pay for any revisits to the site by the manufacturer's representative made necessary due to the Contractor's failure to properly coordinate the visits.

D. The Contractor shall provide the Engineer with a minimum of 72 hour notification of any impending visits of manufacturer's representatives so that the Engineer's representative can arrange to be present at the site to witness the installation check.

E. The Contractor shall secure the manufacturer's representative's services at the Work site for as long as is necessary to check the installation and place the equipment in satisfactory operation.

F. Electrical connections to equipment shall be made only upon approval of the manufacturer's representative.

G. All costs for this work shall be included in the Contract Price and no separate payment will be made.

1.24 Field Testing

A. After installation and checkout, all equipment shall be field tested in the presence of the Engineer and in accordance with applicable technical Specifications. During the field tests, the equipment shall be subjected to various full load and partial load conditions and emergency operating and shutdown conditions. The ability of the equipment to operate in the prescribed manner without overheating, jamming, excessive noise or vibration, or evidence of excessive wear in accordance with the technical Specifications shall be demonstrated to the Engineer.

B. All equipment shall be tested before it is covered or insulated. All accessory equipment which may be damaged by conditions during the test shall be isolated or otherwise protected.

C. All testing instruments and gauges necessary for conducting the tests shall be furnished by the Contractor. Installed instruments and gauges shall be used whenever possible if calibrated and approved for the purpose. Calibrate all installed instruments and gauges and attach a cloth tag showing date of calibration. Portable test equipment used in field testing shall be calibrated in the presence of the Engineer or suitable written evidence attesting to the accuracy of the equipment shall be submitted.

D. A record shall be made of each field test showing operating temperatures and pressures, motor current and voltage, speed, flow rate and other pertinent data. Information recorded for fans, blowers, compressors and pumps shall include static pressures entering and leaving the equipment, fluid temperature entering and leaving the equipment, ambient temperature, barometric pressure and relative humidity, rpm and discharge flow rate. Four copies of all recorded test data and information shall be submitted to the Engineer.

E. All equipment handling or operating in water, wastewater, sludge or corrosive or toxic materials shall be field tested using clean water at normal operating temperatures. Water used shall be potable water unless other sources are approved in writing by the Engineer.

F. Unless otherwise specified, the Contractor shall furnish all labor, materials, water, air, oil, power, fuel, chemicals, test equipment and other items required to conduct the field tests, including any retests.

G. Should the results of the tests indicate that the equipment has failed to perform in accordance with the requirements of the applicable Specifications, the Contractor shall make at Contractor's own expense such modifications or adjustments as required for satisfactory operation, including replacement of any or all components, if necessary. Following the modifications or adjustments, the Contractor shall repeat the field tests as specified herein. This procedure shall be repeated until the results of the field tests indicate that the equipment has satisfied the requirements of the applicable Specification section.

H. The cost of all field testing shall be included in the Contract Price and no separate payment will be made.

1.25 Identification of Piping and Equipment

A. All piping and equipment shall be identified as follows:

1. All equipment and piping specified to be painted shall be color coded. The colors shall be as specified in Section 09900 of these Specifications. Insulated piping shall be identified using plastic bands, arrows, and letters, colored and sized in accordance with Section 09900.

2. All major items of equipment shall have an identification nameplate. The Contractor shall submit a suitable list of all items of major equipment to the Engineer, who will furnish the Contractor with an identification numbering system. The nameplates shall be of Type 304 stainless steel, No. 6 finish, and not less than No. 16 gauge with indented stamped lettering. Nameplates shall be attached to equipment bases in easily visible and accessible locations. Nameplates shall be fastened in a permanent manner, arranged not to damage the equipment, with not less than four stainless steel fasteners. All nameplates shall contain as a minimum the following information, where applicable:

a. Name of equipment (from equipment specifications).

b. Manufacturer.

c. Model designation.

d. Serial number.

e. Rated horsepower.

f. Service factor.

g. Electrical and insulation specifications.

h. Speed (rpm).

i. Capacity and head (discharge pressure).

j. Net weight.

k. Lettering shall be upper case, block style in size and spacing to suit the nameplate. The identification nameplates shall not be painted.

B. All valves shall be identified with a round stainless steel disc, approximately 1-1/2-inches in diameter and not less than No. 14 gauge, coated with a clear lacquer. Discs shall be fastened to valves in a permanent manner; attachment by chain to handwheels or other operators shall not be acceptable. Discs shall be stamped using indented numerals and/or letters with a valve number corresponding to its identification number in the valve schedule to be included in the operation and maintenance manual.

C. All pushbutton stations, switches, motor controllers, transmitters and other control equipment shall have identification nameplates of the engraved, laminated plastic type affixed to or adjacent to the switch, pushbutton station, etc.

D. All manufacturer's nameplates, identification nameplates and ASME code plates located on areas of equipment to be insulated shall be removed and reattached on uninsulated areas in a manner acceptable to the Engineer, in the Engineer's presence.

1.26 Safety Signs

A. Permanent safety signs shall be furnished and installed on all mechanical and electrical equipment where a hazard may exist. Signs shall be made in accordance with current OSHA requirements and shall be suitable for exterior use. Mounting details shall be in accordance with manufacturer's recommendations; location in accordance with governing agency regulations. Fasteners shall be stainless steel.

B. Safety signs shall be approximately 10-inches high by 14-inches wide, colored yellow and black on minimum 0.080-inch aluminum stock.

C. Safety signs shall be furnished and will include, but not be limited to, the following:

1. The following sign shall be affixed to all equipment which may be started automatically from a remote location:

CAUTION
THIS EQUIPMENT MAY START AUTOMATICALLY BY REMOTE CONTROL

2. The following sign shall be affixed to all electrical equipment or instrument panels, as applicable:

CAUTION - SHOCK HAZARD
THIS EQUIPMENT IS POWERED BY MULTIPLE SOURCES
CONTACTS MAY BE ENERGIZED AFTER LOCAL POWER IS DISCONNECTED

3. The following sign shall be provided at all areas where oxygen or flammable materials are stored or used (colored red, white and black):

DANGER
NO SMOKING, MATCHES OR OPEN FLAMES

4. The following sign shall be affixed to all entrance hatches or access manways on covered tanks and vessels:

CAUTION
OXYGEN DEFICIENT OR TOXIC CONDITIONS MAY EXIST
FOLLOW PRESCRIBED PROCEDURES BEFORE ENTRY

5. The following sign shall be provided at all compressor vents and equipment blowoffs:

CAUTION
LOUD BLOWDOWN MAY OCCUR WITHOUT WARNING

END OF SECTION

Part 1 General

1.01 Scope

A. The work under this Section defines the minimum scope of services to be provided by the Contractor using factory representatives of the manufacturers of the equipment to be installed during installation, start-up, and operator training.

B. Equipment manufacturers assigned unit responsibility for systems comprised of several components shall provide the services of factory representatives from each component manufacturer to perform the duties required under these Specifications. The equipment manufacturer assigned unit responsibility shall be responsible for coordinating the activities of the system component manufacturers.

1.02 Qualification

A. Qualification of the representatives for installation, start-up, and operator training purposes shall be appropriate for the equipment being installed and shall be subject to the approval of the Engineer. Where equipment has significant process complexity, furnish the services of engineering personnel knowledgeable in the process involved and the function of the equipment.

B. References in various equipment sections of the terms “factory representative” or “field representative” shall mean an employee of the equipment manufacturer who is completely knowledgeable of the construction, installation, operation and maintenance of the equipment. A sales representative does not qualify. Any field or factory representative not an active employee of the manufacturer must provide documentation from the manufacturer stating that the individual, by name, has been formally trained in the installation, operation and maintenance of the equipment and is authorized to make the required certification to perform the required services.

1.03 Coordination

A. The Contractor shall coordinate the visits of factory representatives during installation, start-up and operator training in accordance with the requirements of Section 01655 of these Specifications.

B. The Contractor shall notify the Engineer 72 hours prior to any impending visit by factory representatives so that the Engineer can be present.

C. The Contractor shall coordinate the visits of all factory representatives for operator training with the Owner. The Contractor shall provide the Engineer and Owner with a training schedule a minimum of 30 days prior to the start of the training period.

D. When approved by the Engineer, the period of service on more than one item furnished by the same manufacturer may run concurrently.

1.04 Installation Inspection Services

A. The Contractor shall furnish the services of a competent factory representative to inspect the installation of each piece of equipment prior to start-up and functional testing in accordance with the requirements of these Specifications. The time

required shall be shown in the equipment sections of these Specifications, but shall be no less than one, eight-hour day.

B. The factory representative shall certify that the equipment has been installed in accordance with the manufacturers' recommendations and is ready for start-up.

1.05 Start-Up Services

A. The Contractor shall furnish the services of a competent factory representative to supervise the start-up, functional testing, and field performance testing for each item or system installed in accordance with Section 01655 and the equipment sections shown in Divisions 2 through 17 of these Specifications. The time required shall be shown in the equipment sections, but shall be no less than one, eight-hour day.

1.06 Operator Training Services

A. The Contractor shall furnish the services of a factory representative to train the Owner's personnel in the operation and maintenance of each item installed under these Specifications. The time required shall be shown in the equipment sections, but shall be no less than one, eight-hour day.

B. The Contractor shall provide the services of an experience audio-visual firm, to be approved by the Engineer, to professionally video record all operator instruction(s), training sessions and seminar(s). The video shall be recorded digitally. The Contractor shall provide the Owner with four DVD Compact Disk copies of the videos for each occasion or each piece of equipment. The disks shall be properly labeled and logged as to their contents. The Contractor shall fully inform all subcontractors, suppliers and manufacturers of this requirement prior to award of their work. No exemptions from this requirement will be allowed.

END OF SECTION

Part 1 General

1.01 Scope

A. The work under this Section includes, but is not necessarily limited to, the provision of all labor and material required to perform start-up of all equipment and mechanical systems installed under this Contract.

B. The work defined under this Section includes providing the services of a factory representative in accordance with the requirements of Section 01645 of these Specifications.

C. Certification of start-up and full testing shall be performed by the manufacturer using the services of a factory representative trained in this type service.

D. Unless otherwise specified, the Contractor shall furnish all labor, materials, water, air, oil, power, fuel, chemicals, test equipment and other items required to conduct the field tests, including any retests.

E. The cost of all field testing shall be included in the Contract Price and no separate payment will be made.

1.02 Coordination

A. The Contractor shall not proceed with any functional test or operating test until the operation and maintenance manuals for the equipment have been submitted and been designated “No Exceptions Taken”. The Contractor shall coordinate all activities required for starting of systems including the visits by the factory representatives, particularly where an equipment item's operation is dependent on the operation of other equipment. Prior to calling the factory representative, the Contractor shall ensure that all necessary related equipment, structures, piping and electrical work is complete. Any required revisits to the site by the factory representative shall be provided by the Contractor.

1.03 Pre Start-Up Maintenance

A. After installation and prior to start-up, all grease- lubricated joints, shaft couplings and bearings shall be flushed out and re-greased. All oil reservoirs and sumps shall be completely drained and flushed and refilled with the proper lubricant. All operating fluid and gas reservoirs shall be filled with the proper fluid and gases. Screens and filters shall be checked for contamination and replaced if necessary. The equipment shall then be tagged, signed and dated, indicating that the equipment has been properly lubricated or prepared for start-up.

1.04 Installation Inspection

A. Prior to energizing any piece of equipment or performing a functional test, a factory representative of the equipment manufacturer shall inspect the installation of the equipment. The factory representative shall determine if the equipment has been installed in accordance with the manufacturer's recommendations, pre-start-up maintenance has been performed, and is ready for start-up and the initiation of the functional test.

B. Should the installation inspection indicate that the equipment has been improperly installed or prepared for start-up, the Contractor shall provide such modifications or adjustments as required for the equipment to operate properly.

C. The factory representative shall certify that the equipment has been installed in accordance with the Drawings, Specifications, and the manufacturer's recommendations and that the equipment is ready for start-up and functional testing to be performed.

1.05 Functional Test

A. Following the installation inspection by factory representative, perform a functional test on each piece of equipment. The functional test shall consist of operation of the equipment on a normal duty cycles for a sufficient period of time to determine satisfactory operation. Time required for functional testing shall be as specified in the equipment specifications or a minimum one continuous eight-hour period, whichever is longer. To the maximum extent practical, exercise the full capabilities of all equipment including remote operation, instrumented control schemes, alternate modes of operation and emergency operation.

B. Should the results of the functional test indicate that the equipment has failed to perform in accordance with the Specifications, the Contractor shall make, at no additional cost to the Owner, all modifications or adjustments as required for satisfactory operation, including replacement of any or all components, if necessary. Following the modifications or adjustments, the Contractor shall repeat the functional test. This procedure shall be repeated until the results of the test indicates that the equipment has satisfied the requirements of the applicable Specification section.

C. After the functional test is completed, each manufacturer shall certify, in writing, that tests were made in accordance with the Specifications and the manufacturer’s recommendations, that the functional tests and start-up operation have been satisfactory and that the equipment is fully operational and capable of meeting operating requirements.

1.06 Certification

A. Upon completion of start up, the Contractor shall provide written certification from all equipment manufacturer’s factory representatives. Written certification shall indicate that tests were made in accordance with the manufacturer's recommendations, that the test and start-up operation has been satisfactory completed and that the equipment is fully operational under design requirements. Written certification shall be filed with the Engineer on the manufacturers stationary.

END OF SECTION

Part 1 General

1.01 Scope

This Section covers the general cleaning which the Contractor shall be required to perform both during construction and before final acceptance of the Project unless otherwise shown on the Drawings or specified elsewhere in these Specifications.

1.02 Quality Assurance

A. Daily, and more often if necessary, conduct inspections verifying that requirements of cleanliness are being met.

B. In addition to the standards described in this Section, comply with all pertinent requirements of governmental agencies having jurisdiction.

1.03 Hazardous Material and Waste

A. The Contractor shall handle hazardous waste and materials in accordance with applicable local, state, and federal regulations. Waste shall also be disposed of in approved landfills as applicable.

B. The Contractor shall prevent accumulation of wastes which create hazardous conditions.

C. Burning or burying rubbish and waste materials on the site shall not be allowed.

D. Disposal of hazardous wastes or materials into sanitary or storm sewers shall not be allowed.

1.04 Disposal of Surplus Materials

Unless otherwise shown on the Drawings, specified or directed, the Contractor shall legally dispose off the site all surplus materials and equipment from demolition and shall provide suitable off site disposal site, or utilize a site designated by the Owner.

Part 2 Products

2.01 Cleaning Materials and Equipment

Provide all required personnel, equipment and materials needed to maintain the specified standard of cleanliness.

2.02 Compatibility

Use only the cleaning materials, methods and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the material or as approved by the Engineer.

Part 3 Execution

3.01 Progress Cleaning

A. General

1. Do not allow the accumulation of scrap, debris, waste material and other items not required for construction of this Work.

2. At least each week, and more often if necessary, completely remove all scrap, debris and waste material from the job site.

3. Provide adequate storage for all items awaiting removal from the job site, observing all requirements for fire protection and protection of the environment.

B. Site

1. Daily, and more often if necessary, inspect the site and pick up all scrap, debris and waste material. Remove all such items to the place designated for their storage.

2. Restack materials stored on site weekly.

3. At all times maintain the site in a neat and orderly condition which meets the approval of the Engineer.

C. Structures

1. Weekly, and more often if necessary, inspect the structures and pick up all scrap, debris and waste material. Remove all such items to the place designated for their storage.

2. Weekly, and more often if necessary, sweep all interior spaces clean. “Clean”, for the purpose of this subparagraph, shall be interpreted as meaning free from dust and other material capable of being removed by using a hand held broom.

3. As required preparatory to installation of successive materials, clean the structures or pertinent portions as recommended by the manufacturer of the successive material.

4. Following the installation of finish floor materials, clean the finish floor daily. “Clean”, for the purpose of this paragraph, shall be interpreted as meaning free from all foreign material which, in the opinion of the Engineer, may be injurious to the finish floor material.

5. Schedule cleaning operation so that dust and other contaminants resulting from cleaning operations will not fall on wet, recently painted surfaces.

3.02 Final Cleaning

A. Definitions: Unless otherwise specifically specified, “clean” for the purpose of this Article shall be interpreted as the level of cleanliness generally provided by

commercial building maintenance subcontractors using commercial quality building maintenance equipment and materials.

B. General: Prior to completion of the Work, remove from the job site all tools, surplus materials, equipment, scrap, debris and waste. Conduct final progress cleaning as described in 3.01 above.

C. Site: Unless otherwise specifically directed by the Engineer, hose down all paved areas on the site and all public sidewalks directly adjacent to the site; rake clean other surfaces of the grounds. Completely remove all resultant debris.

D. Structures

1. Remove all traces of soil, waste material, splashed material, and other foreign matter to provide a uniform degree of exterior cleanliness. Visually inspect all exterior surfaces and remove all traces of soil, waste material, and other foreign matter. Remove all traces of splashed materials from adjacent surfaces. If necessary to achieve a uniform degree of exterior cleanliness, hose down the exterior of the structure. In the event of stubborn stains not removable with water, the Engineer may require light sandblasting or other cleaning at no additional cost to the Owner.

2. Visually inspect all interior surfaces and remove all traces of soil, waste material, smudges and other foreign matter. Remove all paint droppings, spots, stains and dirt from finished surfaces.

3. Clean all glass inside and outside.

4. Polish all surfaces requiring the routine application of buffed polish. Provide and apply polish as recommended by the manufacturer of the material being polished.

E. Post Construction Cleanup: All evidence of temporary construction facilities, haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, or any other evidence of construction, as directed by the Engineer.

F. Restoration of Landscape Damage: Any landscape feature damaged by the Contractor shall be restored as nearly as possible to its original condition at the Contractor's expense. The Engineer will decide what method of restoration shall be used.

G. Timing: Schedule final cleaning as approved by the Engineer to enable the Owner to accept the Project.

3.03 Cleaning During Owner's Occupancy

Should the Owner occupy the Work or any portion thereof prior to its completion by the Contractor and acceptance by the Owner, responsibilities for interim and final cleaning of the occupied spaces shall be as determined by the Engineer in accordance with the General Conditions of the Contract Documents.

END OF SECTION

Part 1 General

1.01 Scope

A. The work under this Section includes, but is not necessarily limited to, the compiling, maintaining, recording and submitting of project record documents as herein specified.

B. Record documents include, but are not limited to:

1. Drawings;
2. Specifications;
3. Change orders and other modifications to the Contract;
4. Engineer field orders or written instructions, including Requests for Information (RFI) and Clarification Memorandums;
5. Reviewed shop drawings, product data and samples;
6. Test records.

C. The Contractor shall maintain on the Project site throughout the Contract Time an up to date set of Record Drawings.

1.02 Maintenance of Documents and Samples

A. Storage

1. Store documents and samples in the Contractor's field office, apart from documents used for construction.
2. Provide files and racks for storage of documents.
3. Provide locked cabinet or secure storage space for storage of samples.

B. File documents and samples in accordance with format of these Specifications.

C. Maintenance

1. Maintain documents in a clean, dry, legible condition and in good order.
2. Do not use record documents for construction purposes.
3. Maintain at the site for the Owner one copy of all record documents.

D. Make documents and samples available at all times for inspection by Engineer.

E. Failure to maintain the Record Documents in a satisfactory manner may be cause for withholding of a certificate for payment.

1.03 Quality Assurance

A. Unless noted otherwise, Record Drawings shall provide dimensions, distances and coordinates to the nearest 0.1 foot.

B. Unless noted otherwise, Record Drawings shall provide elevations to the nearest 0.01 foot for all pertinent items constructed by the Contractor.

1.04 Recording

A. Label each document “Project Record” in neat, large printed letters.

B. Recording

1. Record information concurrently with construction progress.

2. Do not conceal any work until required information is recorded.

1.05 Record Drawings

A. The Contractor shall provide one set of the Contract drawings, with all changes recorded in that one set.

B. Legibly mark drawings to record actual construction, including:

1. All Construction

a. Changes of dimension and detail.

b. Changes made by Requests for Information (RFI), field order, clarification memorandums or by change order.

c. Details not on original Drawings.

1.06 Specifications

A. Legibly mark each section to record:

1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.

2. Changes made by Requests for Information (RFI), field order, clarification memorandums, or by change order.

1.07 Submittal

A. At contract closeout, deliver Record Documents to the Engineer for the Owner.

B. Accompany submittal with transmittal letter, in duplicate, containing:

1. Date

2. Project title and number

3. Contractor's name and address

4. Title and number of each record document

5. Signature of Contractor or Contractor's authorized representative

END OF SECTION

Part 1 General

1.01 Scope

A. The Contractor shall provide five copies of a complete and comprehensive reference manual (Operating and Maintenance Manual) containing operating and maintenance data to enable operators and plant engineers to correctly operate, service and maintain all equipment and accessories covered by the Specifications and Drawings. The data contained in the manual shall explain and illustrate clearly and simply all principles and theory of operation, operating instructions, maintenance procedures, calibration procedures and safety precautions and procedures for the equipment involved.

B. No separate payment will be made for the Operating and Maintenance Manuals and the cost of said manual shall be included in the Contract Price.

1.02 Submittal Schedule

A. The Contractor shall submit, for the Engineer's approval, two preliminary drafts of proposed formats and outlines of contents of manuals within 60 calendar days after the Notice to Proceed. The Engineer will notify the Contractor, in writing, of any deficiencies in the manual and will return one copy of the manual for completion and/or correction.

B. Submit two preliminary copies of manuals before the work covered by the Contract Documents is 35 percent complete. The Engineer will notify the Contractor, in writing, of any deficiencies in the manuals and will return one copy of the manual for completion and/or correction.

C. Before the work covered by the Contract Documents is 50 percent complete, the Contractor must submit five copies of the revised and completed manual, complete in detail as specified below. The Contractor shall also submit one copy of the manual in digital format as specified below.

D. Digital Copies of Manuals: Operations and Maintenance Manuals shall be provided by the Contractor in digital format. Materials available in digital format shall be furnished in accordance with the following:

1. All textual data shall be provided as an electronic file in searchable Adobe Acrobat Portable Document Format (PDF). The PDF file(s) shall be fully indexed using the Table of Contents, searchable with thumbnails generated. File(s) shall be identified by utilization of an “eight dot three” convention (XXXXX.YY.pdf) where X is the five digit number corresponding to the specification section, and YY is an identification number. All documents shall be scanned at 300dpi or greater utilizing optical character recognition (OCR) software. All text in the document must be text selectable with the exception of pages which are in their entirety drawings or diagrams. Word searches of the PDF document must function successfully. PDF files that fail to comply with the indexing and searchable features described above will not be acceptable. All drawing data shall be provided in digital format compatible with AutoCAD Version 14.

2. Materials not available in original digital format (available only in paper format) shall be scanned as noted above into a PDF format and cleaned to remove smudges, fingerprints, artifacts, and other extraneous marks.

All notes, version stamps, etc. shall be preserved. Color maps shall be scanned in not less than the number of colors of the document or 16 colors, whichever is greater. Color photographs shall be saved in not less than 256 colors. Black and white or monochrome scans (non-text) shall not be less than 16 gray scale levels. Color maps, color photographs, and black and white and gray scale photograph files shall be saved as GIF or JPG files, compatible with Adobe Photoshop Version 4.0. Documents shall be scanned in the existing color format of the document, i.e. color documents shall be scanned in color, and black and white or monochrome in gray scale.

3. After the documents are in correct digital format, they shall be furnished to the Engineer as a 120 mm, 680mb, 74-minute CD ROM. All media transmittals shall be accompanied by a detailed paper printout of the files on the media. This printout shall consist of a file name, file size, date of creation, submittal number, and a brief but accurate description of the file. Files shall not be transmitted by modem. Two copies of the CD for each Operation and Maintenance Manual shall be provided to the Engineer.

1.03 Submittal Format

A. Each hard copy of the manual shall be assembled in one or more loose leaf binders, each with title page, typed table of contents, typed list of tables, typed list of figures, and heavy section dividers with reinforced holes and numbered plastic index tabs. Binders shall be uniform for all manuals and shall be 3-ring, hardback type, with transparent vinyl pocket front cover suitable for inserting identifying cover and with a transparent vinyl pocket on the spine for label. All data shall be punched for binding. Composition and printing shall be arranged so that punching does not obliterate any data. The cover and binding edge of each manual shall have the project title, specification section number and title, and manual title printed thereon, all as approved by the Engineer.

B. All copies of shop drawings, figures and diagrams shall be reduced to either 8-1/2 x 11-inches or to 11-inches in the vertical dimension and as near as practical to 17-inches in the horizontal dimensions. Such sheets shall be folded to 8-1/2 x 11-inches. The manual and other data shall be printed on first quality paper, 8-1/2 x 11-inch size with standard 3-hole punching. Binders shall be labeled Vol. 1, Vol. 2, etc., where more than one is required. The table of contents for the entire set, identified by volume number, shall appear in each binder. Text, figures and drawings shall be clearly legible and suitable for dry process reproductions.

C. Each submittal shall have a cover sheet that includes the following information:

1. The date of submittal and the dates of any previous submittals.

2. The Project title.

3. Submittal numbering shall be in accordance with Section 01350 of these Specifications.

4. The names of:

a. Contractor

b. Supplier

c. Manufacturer

5. Identification of the product, with the Specification section number, permanent equipment tag numbers and applicable Drawing No.

D. The Engineer will not recommend final acceptance of the Work until the Operating and Maintenance Manual is complete and satisfactory to Engineer.

1.04 Contents of Operating and Maintenance Manual

A. Each manual shall include a title page which includes all information specified in Article 1.03, Paragraph C. of this Section. In addition, the title page shall include manufacturer's address, phone number, facsimile number, and contact; manufacturer's equipment name and model number; supplier's address, phone number, facsimile number, and contact.

B. Each manual shall include a table of contents identifying the location of each item listed below, for each component supplied. For items not applicable to a component, the table of contents shall list N/A for the page number.

C. For all equipment, the Contractor shall furnish a complete, detailed listing of all equipment, components and accessories showing component name, manufacturer, model number and quantity information shall be furnished for each component as outlined below:

1. A summary page shall be provided for each piece of equipment detailing the following information:

a. Equipment Number

b. Equipment Description

c. Serial Number

d. Model Number

e. Manufacturer

i. Address
ii. Phone
iii. Representative

f. Supplier

i. Address
ii. Phone
iii. Representative

g. Local Service Provider

i. Address
ii. Phone
iii. Representative

h. Location of Equipment

i. Equipment Design Criteria

i. HP
ii. Flow Rate, etc.

j. Performance Data

k. Normal Operating Characteristics

l. Limiting Conditions

2. Detailed disassembly, overhaul and reassembly, installation, alignment, adjustment and checking instructions.

3. Detailed operating instructions for start-up, calibration, routine and normal operation, regulation and control, safety, shutdown and emergency conditions. Detailed list of settings for relays, pressure switches, temperature switches, level switches, thermostats, alarms, relief valves, rupture discs, etc.

4. Detailed preventative maintenance procedures and schedules, including detailed lubrication instructions and schedules, identification of required lubricants and operating fluids (description, specification and trade name of at least two manufacturers), and diagrams illustrating lubrication points.

5. Detailed guide to equipment and/or process “troubleshooting”.

6. Detailed parts lists identified by title, materials of construction, manufacturer's part number, list of recommended spare parts identified as specified above, current cost list for recommended spare parts, predicted life of parts subject to wear, and an exploded or concise cut-away view of each equipment assembly.

7. Electrical and instrumentation schematics, including motor control centers, control panels, wiring diagrams, instrument panels and analyzer panels.

8. List of all special tools supplied and description of their use. Special tools include any tool not normally available in an industrial hardware or mill supply house.

9. List of names and addresses of nearest service centers for parts, overhaul and service.

10. Procedures for storing, handling and disposing of any chemicals or products used with the equipment or system.

11. For equipment and systems, also provide the following:

a. Control and wiring diagrams provided by the controls manufacturer.

b. Sequence of operations by the controls manufacturer.

c. Charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

12. The supplier's operation and maintenance information will address the particular equipment furnished, with specific details on operation and maintenance practices. General data is not acceptable. Information contained in the manual which is not appropriate to the Project shall be marked out and noted as “N/A”.

END OF SECTION

Part 1 General

1.01 Project Maintenance and Warranty

A. Maintain and keep in good repair the Work covered by these Drawings and Specifications until acceptance by the Owner.

B. The Contractor shall warrant for a period of one year from the date of Owner's written acceptance of certain segments of the Work and/or Owner's written final acceptance of the Project, as defined in the Contract Documents, that the completed Work is free from all defects due to faulty products or workmanship and the Contractor shall promptly make such corrections as may be necessary by reason of such defects. The Owner will give notice of observed defects with reasonable promptness. In the event that the Contractor should fail to make such repairs, adjustments or other work that may be made necessary by such defects, the Owner may do so and charge the Contractor the cost thereby incurred. The Performance Bond shall remain in full force and effect throughout the warranty period.

C. The Contractor shall not be obligated to make replacements which become necessary because of ordinary wear and tear, or as a result of improper operation or maintenance, or as a result of improper work or damage by another Contractor or the Owner, or to perform any work which is normally performed by a maintenance crew during operation.

D. In the event of multiple failures of major consequences prior to the expiration of the one year warranty described above, the affected unit shall be disassembled, inspected and modified or replaced as necessary to prevent further occurrences. All related components which may have been damaged or rendered non serviceable as a consequence of the failure shall be replaced. A new 12 month warranty against defective or deficient design, workmanship, and materials shall commence on the day that the item is reassembled and placed back into operation. As used herein, multiple failure shall be interpreted to mean two or more successive failures of the same kind in the same item or failures of the same kind in two or more items. Major failures may include, but are not limited to, cracked or broken housings, piping, or vessels, excessive deflections, bent or broken shafts, broken or chipped gear teeth, premature bearing failure, excessive wear or excessive leakage around seals. Failures which are directly and clearly traceable to operator abuse, such as operations in conflict with published operating procedures or improper maintenance, such as substitution of unauthorized replacement parts, use of incorrect lubricants or chemicals, flagrant over or under lubrication and using maintenance procedures not conforming with published maintenance instructions, shall be exempted from the scope of the one year warranty. Should multiple failures occur in a given item, all products of the same size and type shall be disassembled, inspected, modified or replaced as necessary and rewarranted for one year.

E. The Contractor shall, at Contractor's own expense, furnish all labor, materials, tools and equipment required and shall make such repairs and removals and shall perform such work or reconstruction as may be made necessary by any structural or functional defect or failure resulting from neglect, faulty workmanship or faulty materials, in any part of the Work performed by the Contractor. Such repair shall also include refilling of trenches, excavations or embankments which show settlement or erosion after backfilling or placement.

F. Except as noted on the Drawings or as specified, all structures such as embankments and fences shall be returned to their original condition prior to the completion of the Contract. Any and all damage to any facility not designated for removal, resulting from the Contractor's operations, shall be promptly repaired by the Contractor at no cost to the Owner.

G. The Contractor shall be responsible for all road and entrance reconstruction and repairs and maintenance of same for a period of one year from the date of final acceptance. In the event the repairs and maintenance are not made immediately and it becomes necessary for the owner of the road to make such repairs, the Contractor shall reimburse the owner of the road for the cost of such repairs.

H. In the event the Contractor fails to proceed to remedy the defects upon notification within 15 days of the date of such notice, the Owner reserves the right to cause the required materials to be procured and the work to be done, as described in the Drawings and Specifications, and to hold the Contractor and the sureties on Contractor's bond liable for the cost and expense thereof.

I. Notice to Contractor for repairs and reconstruction will be made in the form of a registered letter addressed to the Contractor at Contractor's home office.

J. Neither the foregoing paragraphs nor any provision in the Contract Documents, nor any special guarantee time limit implies any limitation of the Contractor's liability within the law of the place of construction.

END OF SECTION

Part 1 General

1.01 Scope

The Work in this Section consists of furnishing all material and equipment and performing all labor necessary for demolishing and disposing of designated facilities indicated on the Drawings.

1.02 Submittals

The Contractor shall submit a written request, to include a detailed demolition procedure, to the Owner for approval at least 10 days before demolition is started. The demolition procedure shall include a detailed description of the methods and equipment to be used for each operation and the sequence of Work. The demolition procedures shall provide for safe conduct of Work, protection of the property, which is to remain undisturbed and coordination with other Work or operation which may be in progress.

Part 2 Products (NOT USED)

Part 3 Execution

3.01 Demolition

A. The Contractor shall be responsible for removing all existing connections to the buildings or site and permanently plugging the pipes where required in accordance with requirements of the utility companies concerned.

B. The Contractor will be responsible for any damage caused to other structures, and shall be held liable for any and all repairs, replacement of parts or renovations required to restore any structure, portion of structure, equipment or items, not intended for demolition. The Contractor shall restore any damaged facilities to their condition prior to demolition provided the damage was result of the demolition. If the Contractor does not repair any such damage immediately or if the repairs are not suitable to the Owner, the Owner reserves the right to have such repairs made by another party and deduct the cost of required repairs from money due Contractor.

C. Dust-tight, weathertight partitions shall be erected to protect existing facilities from dust and weather while wrecking is in progress and until such time as closures have been made. Partitions may be constructed of wood and shall have a covering of tarred roofing felt on the weather side.

F. All salvageable metal materials shall remain the property of the Owner and shall be cleaned and stored on the Owner's property as directed by the Owner.

3.02 Disposal

A. All materials, which are not delivered to the Owner as specified above, shall become the property of the Contractor, and shall be demolished, moved or otherwise disposed of at the option of the Contractor by a method approved by the Owner.

B. All demolished equipment and materials shall be removed from the Work site by the Contractor.

C. All demolished equipment and materials which are either left in place or removed to the disposal site shall be in a non-hazardous condition.

D. Manhole frames and covers to be removed are the property of the Owner and shall be delivered to a place designated by the Owner.

END OF SECTION

Part 1 General

1.01 Scope

A. Furnish all labor, materials, tools, equipment and related items required to perform tests of gravity pipelines and perform integrity and leakage tests of pressure and vacuum piping.

B. The testing requirements covered under this Section shall apply to all piping systems covered under Section 15062 of these Specifications.

1.02 Submittals

Submittals shall conform to the requirements of Section 01340 of these Specifications and shall include a description of the testing procedures to be employed and the report form to be furnished.

Part 2 Products

2.01 Test Mediums

The Owner will provide the necessary water required for testing the Work. The Contractor shall furnish all other test mediums. The Contractor shall furnish all equipment, necessary piping and required labor to transport water from its source to the test location for use in testing.

2.02 Test Equipment

The Contractor shall furnish all labor and equipment, including required pumps with regulated bypass meters and gauges, for conducting of the piping tests.

Part 3 Execution

3.01 General

A. The entire length of all pressurized piping shall be field tested for tightness by a test as described in this Section.

B. The timing and sequence of testing shall be scheduled by the Contractor, subject to the approval of the Engineer. The Contractor shall provide the Engineer with a minimum of 24 hours notice prior to the start of any test. All tests must be observed by the Engineer.

C. The Contractor shall repair any leaks discovered during the initial filling of the piping and during the testing sequence. All known and visible leaks shall be repaired, whether or not the leakage rate is within allowable limits.

3.02 Major Piping

A. All piping shall be tested in accordance with Article 3.03. This shall include non-potable water lines, whether cast iron, ductile iron, steel, copper or PVC. Storm drains shall be exempted from testing required by this Section.

B. Clean and test lines before requesting final acceptance. Where any obstruction is met, clean the lines by means of rods, swabs, or other instruments. When requested by the Engineer, flush out lines and manholes before final inspection.

C. Pressure Piping

1. All sections of pipeline subject to internal pressure shall be pressure tested in accordance with AWWA C600. A section of line will be considered ready for testing after completion of all thrust restraint and backfilling.

2. Each segment of pipeline between line valves shall be tested individually.

3. Test Preparation

a. For pipelines less than 24-inches in diameter, flush pipeline section thoroughly at flow velocities greater than 2.5 feet per second, adequate to remove debris from pipe and valve seats. For pipelines 24-inches in diameter and larger, the main shall be carefully swept clean and mopped, if directed by the Engineer. Partially operate valves to clean out seats. Provide correctly sized temporary outlets in number adequate to achieve flushing velocities.

b. Provide temporary blocking, bulkheads, flanges and plugs as necessary, to assure all new pipe, valves and appurtenances will be pressure tested.

c. Before applying test pressure, air shall be completely expelled from the pipeline and all appurtenances. Unless permanent air vents are in place, insert temporary corporation stops at highpoints to expel air as line is filled with water.

d. Fill pipeline slowly with water. Provide a suitable pump with an accurate water meter to pump the line to the specified pressure. Differential pressure at valves and hydrants shall equal the maximum possible, but shall not exceed manufacturer's pressure rating. Where necessary, provide temporary back pressure to meet the differential pressure restrictions.

e. Valves and hydrants shall not be operated in either the opening or closing direction at differential pressures above their rated pressure.

4. The test pressure shall be measured at the lowest point in the test segment and shall be maintained for a minimum of two hours. Test piping in accordance with the minimum test pressures shown below:

Pipe Designation	Pipe Size, inches	Test Pressure, psi
UW, FM, etc.	8,10,12 etc.	150
Line “A”	15,16,21	75
PW	6	200

5. The test pressure shall not vary by more than 5 psi for the test duration. Should the pressure drop more than 5 psi at any time during the test period, the pressure shall be restored to the specified test pressure. Provide an accurate pressure gage with graduation not less than 5 psi.

6. Leakage: Leakage shall be defined as the quantity of water that must be pumped into the test section equal to the sum of the water, to maintain pressure within 5 psi of the specified test pressure for the test duration plus water required to return line to test pressure at the end of the test. Leakage shall be the total cumulative amount measured on a water meter.

7. Test Results: No test section shall be accepted if the leakage exceeds the limits determined under Section 4 of AWWA C600. The leakage test shall be repeated until the test section is accepted. All visible leaks shall be repaired regardless of leakage test results.

8. Completion: After a pipeline section has been accepted, relieve test pressure. Record type, size and location of all outlets on record drawings.

3.03 Major Air Piping

A. All air piping, 4-inches and larger, subject to internal pressure not listed under Article 3.03 of this Section shall be tested in accordance with this Article.

B. Each segment of pipeline between line valves shall be tested individually.

C. Test Preparation

1. For pipelines less than 24-inches, the pipeline shall be cleaned using a pig or swab to remove all dirt and debris. For pipelines 24-inches in diameter and larger, the pipeline shall be carefully swept. Partially operate valves to clean out seats.

2. Provide temporary blocking, bulkheads, flanges, and plugs as necessary to assure all new pipe, valves, and appurtenances will be pressure tested. Provide an air tap as required for filling the pipeline.

3. Test equipment to be provided by the Contractor shall include Air-Lock balls, braces, air hoses, air source, timer, cut-off valves, 30 psi pressure gauge with minimum graduations of 0.2 psi and an accuracy of ±2 percent.

4. Fill the pipeline slowly with air until the test pressure has been reached. Allow the pressure to stabilize for 15 minutes.

D. Test the pipeline at a test pressure of 25 psi for one hour. If a measurable pressure drop is observed by the end of the test period, the pipeline has failed the test. All leaks shall be located and repaired and the system retested until no measurable pressure drop is observed.

E. Completion: After a pipeline has been accepted, relieve the test pressure. Submit a copy of the test results to the Engineer for review and approval.

3.04 Repairs

If the leakage exceeds the specified allowable limits, the point or points of leakage shall be sought out and remedied by the Contractor at no additional cost to the Owner. Repair methods must be approved by the Engineer.

3.05 Flushing and Cleaning

The systems shall not be used, except for chemical cleaning, until the Engineer has been assured that cleaning has been accomplished.

3.06 Final Acceptance

A. No pipeline installation shall be accepted until all known and visible leaks have been repaired, whether or not the leakage is within the maximum allowable limits.

B. The Contractor will certify that all required tests have been successfully completed before the Work is accepted.

END OF SECTION

Part 1 General

1.01 Scope

Furnish all labor, materials, tools, equipment and related items required to perform integrity and leakage tests of hydraulic structures.

1.02 Submittals

Submittals shall conform to the requirements of Section 01340 of these Specifications and shall include a description of the testing procedures to be employed and the report form to be furnished.

Part 2 Products

2.01 Test Mediums

The Owner will provide the necessary non-potable water required for testing the Work. The Contractor shall furnish all other test mediums. The Contractor shall furnish all equipment, necessary piping and required labor to transport water from its source to the test location for use in testing.

2.02 Test Equipment

The Contractor shall furnish all labor and equipment, including required pumps with regulated bypass meters and gauges, for conducting tests. The Contractor shall provide portable generator for power supply of pumps.

Part 3 Execution

3.01 General

A. The timing and sequence of testing shall be scheduled by the Contractor, subject to the approval of the Engineer. The Contractor shall coordinate the timing and sequence of testing with the Owner's operating schedule. The Contractor shall provide the Engineer with a minimum of 24 hours notice prior to the start of any test. All tests must be observed by the Engineer.

B. The Contractor shall repair any leaks discovered during the initial filling and during the testing sequence. All known and visible leaks shall be repaired, whether or not the leakage rate is within allowable limits.

C. The Contractor shall dispose of water used for testing purposes to the nearest plant drain. All discharges shall be coordinated with the operating schedule of the facility.

3.02 Concrete Structures

A. Concrete structures shall be tested for 24 hours. Water shall be allowed to stand in concrete structures for 24 hours prior to the beginning of the 24 hour test period to allow for absorption of water by the surface of the concrete in contact with the water. Accurate and precise measurements of the water level shall be made at the beginning and at the end of the 24 hour test period. The structure shall be filled with water to its maximum depth. The drop in the water surface shall not exceed 1/4-inch. During the test period, close observation of the structure will be made for purpose of detecting leakage.

B. The following structures shall be tested under this Section:

1. Filter No. 1 through Filter No. 12.

3.05 Repairs

A. If the leakage exceeds the specified allowable limits, the point or points of leakage shall be sought out and remedied by the Contractor at no additional cost to the Owner. Repair methods must be approved by the Engineer.

B. Leaks in liquid retaining structures shall be repaired under test by injection, or other methods acceptable to the Engineer.

3.06 Acceptance

A. No hydraulic structure shall be accepted until all known and visible leaks have been repaired, whether or not the leakage is within the maximum allowable limits.

B. The Contractor will certify that all required tests have been successfully completed before the work is accepted.

END OF SECTION

Part 1 General

1.01 Scope

A. The work covered by this Section consists of furnishing all labor, equipment and material required to place topsoil, seed, commercial fertilizer, agricultural limestone and mulch material, including seedbed preparation, harrowing, compacting and other placement operations on graded earthen areas as described herein and/or shown on the Drawings. In general, seeding operations shall be conducted on all newly graded earthen areas not covered by structures, pavement or sidewalks; all cleared or grubbed areas which are to remain as finish grade surfaces; and on all existing turf areas which are disturbed by construction operations and which are to remain as finish grade surfaces. Areas disturbed by borrow activities shall also be seeded according to these Specifications.

B. The work shall include temporary seeding operations to stabilize earthen surfaces during construction or inclement weather and to minimize stream siltation and erosion. Temporary seeding shall be performed at the times and locations as directed by the Engineer.

1.02 Quality Assurance

A. Prior to seeding operations, the Contractor shall furnish to the Engineer labels or certified laboratory reports from an accredited commercial seed laboratory or a state seed laboratory showing the analysis and germination of the seed to be furnished. Acceptance of the seed test reports shall not relieve the Contractor of any responsibility or liability for furnishing seed meeting the requirements of this Section.

B. Prior to topsoil operations, the Contractor shall obtain representative samples and furnish soil test certificates including textural, pH, and organic analysis from the State University Agricultural Extension Services or other certified testing laboratory.

Part 2 Products

2.01 Acceptable Manufacturers

A. All materials shall conform to the requirements and standards of this Section.

B. Wood-cellulose fiber mulch shall be manufactured by Weyerhauser Company or Conway Corporation.

2.02 Topsoil

A. Utilizing designated stockpiles or borrow areas on site, the Contractor shall place a minimum of 4-inches of topsoil over all graded earthen areas and over any other areas to be seeded. Sources of topsoil shall be approved by the Engineer prior to disturbance. Importing topsoil from offsite sources shall be at the discretion of the Engineer and shall be justification for additional compensation to the Contractor. A

change order properly authorized by the Owner shall be agreed upon prior to importing offsite topsoil. No additional compensation will be allowed for spreading of topsoil.

B. Topsoil shall be a friable loam containing a large amount of humus and shall be original surface soil of good, rich, uniform quality, free from any material such as hard clods, stiff clay, hardpan, partially disintegrated stone, pebbles larger than 1/2-inch in diameter, lime, cement, bricks, ashes, cinders, slag, concrete, bitumen or its residue, boards, sticks, chips or other undesirable material harmful or unnecessary to plant growth. Topsoil shall be reasonably free from perennial weeds and shall not contain objectionable plant material, toxic amounts of either acid or alkaline elements or vegetable debris undesirable or harmful to plant life.

C. Topsoil shall be natural topsoil without admixture of subsoil material, and shall be classifiable as loam, silt loam, clay loam, sandy loam or a combination thereof. The pH shall range from 5.5 to 7.0. Topsoil shall contain not less than five percent nor more than 20 percent, by weight, of organic matter as determined by loss on ignition of oven-dried samples to 65 degrees C.

2.03 Seed

A. Seed shall be delivered in new bags or bags that are sound and labeled in accordance with the U.S. Department of Agriculture Federal Seed Act.

B. All seed shall be from the last crop available at time of purchase and shall not be moldy, wet or otherwise damaged in transit or storage.

C. Seed shall bear the growers analysis testing to 98 percent for purity and 90 percent for germination. At the discretion of the Engineer, samples of seed may be taken for verification against the grower's analysis.

D. Species, rate of seeding, fertilization and other requirements are shown on the Drawings.

2.04 Fertilizer and Liming Materials

A. Fertilizer and liming materials shall comply with applicable state, local and federal laws concerned with their production and use.

B. Commercial fertilizer shall be a ready mixed material equivalent to the grade or grades specified in the Seeding Schedule shown on the Drawings. Container bags shall have the name and address of the manufacturer, the brand name, net weight and chemical composition.

C. Agricultural limestone shall be a pulverized dolamitic limestone having a calcium carbonate content of not less than 85 percent by weight. Agricultural limestone shall be crushed so that at least 85 percent of the material will pass a No. 10 mesh screen and 50 percent will pass a No. 40 mesh screen.

2.05 Mulch Material

A. All mulch materials shall be air dried and reasonably free of noxious weeds and weed seeds or other materials detrimental to plant growth.

B. Mulch shall be composed of wood cellulose fiber, straw or stalks, as specified herein. Mulch shall be suitable for spreading with standard mulch blowing equipment.

C. Straw mulch shall be partially decomposed stalks of wheat, rye, oats or other approved grain crops.

D. Stalks shall be the partially decomposed, shredded residue of corn, cane, sorghum or other approved standing field crops.

2.06 Mulch Binder

A. Mulch on slopes exceeding 3 to 1 ratio shall be held in place by the use of an approved mulch binder. The mulch binder shall be non-toxic to plant life and shall be acceptable to the Engineer.

B. Emulsified asphalt binder shall be Grade SS-1, ASTM D 977. Cutback asphalt binder shall be Grade RC 70 or RC 250.

2.07 Inoculants for Legumes

All leguminous seed shall be inoculated prior to seeding with a standard culture of nitrogen-fixing bacteria that is adapted to the particular seed involved.

2.08 Water

Water shall be clean, clear water free from any objectionable or harmful chemical qualities or organisms and shall be furnished by the Contractor.

Part 3 Execution

3.01 Securing and Placing Topsoil

A. Topsoil shall be secured from areas from which topsoil has not been previously removed, either by erosion or mechanical methods. Topsoil shall not be removed to a depth in excess of the depth approved by the Engineer.

B. The area or areas from which topsoil is secured shall possess such uniformity of soil depth, color, texture, drainage and other characteristics as to offer assurance that, when removed the product will be homogeneous in nature and will conform to the requirements of these Specifications.

C. All areas from which topsoil is to be secured, shall be cleaned of all sticks, boards, stones, cement, ashes, cinders, slag, concrete, bitumen or its residue and any other refuse which will hinder or prevent growth.

D. In securing topsoil from a designated pit, or elsewhere, should strata or seams of material occur which do not come under the requirements for topsoil, such material shall be removed from the topsoil or if required by the Engineer, the pit shall be abandoned.

E. Before placing or depositing topsoil upon any areas, all improvement within the area shall be completed, unless otherwise approved by the Engineer.

F. The areas in which topsoil is to be placed or incorporated shall be prepared before securing topsoil for use.

3.02 Seedbed Preparation

A. Before fertilizing and seeding, the topsoil surfaces shall be trimmed and worked to true line from unsightly variation, bumps, ridges and depressions and all detrimental material, roots and stones larger than 3-inches in any dimension shall be removed from the soil.

B. Not earlier than 24 hours before the seed is to be sown, the soil surface to be seeded shall be thoroughly cultivated to a depth of not less than 4-inches with a weighted disc, tiller, pulvimixer or other equipment, until the surface is smooth and in a condition acceptable to the Engineer.

C. If the prepared surface becomes eroded as a result of rain or for any other reason, or becomes crusted before the seed is sown, the surface shall again be placed in a condition suitable for seeding.

D. Ground preparation operations shall be performed only when the ground is in a tillable and workable condition, as determined by the Engineer.

3.03 Fertilization and Liming

A. Following seedbed preparation, fertilizer shall be applied to all areas to be seeded so as to achieve the application rates shown on the Drawings.

B. Fertilizer shall be spread evenly over the seedbed and shall be lightly harrowed, raked, or otherwise incorporated into the soil for a depth of 1-inch.

C. Fertilizer need not be incorporated in the soil as specified above when mixed with seed in water and applied with power sprayer equipment. The seed shall not remain in water containing fertilizer for more than 30 minutes when a hydraulic seeder is used.

D. Agricultural limestone shall be thoroughly mixed into the soil according to the rates shown in the Seeding Schedule shown on the Drawings. The specified rate of application of limestone may be reduced by the Engineer if pH tests indicate this to be desirable. It is the responsibility of the Contractor to obtain such tests and submit the results to the Engineer for adjustment in rates.

E. It is the responsibility of the Contractor to make one application of a maintenance fertilizer according to the recommendations listed in the Seeding Schedule shown on the Drawings.

3.04 Seeding

A. Seed of the specified group shall be sown as soon as preparation of the seedbed has been completed. No seed shall be sown during high winds, nor until the surface is suitable for working and is in a proper condition. Seeding shall be performed during the dates shown on the Drawings unless otherwise approved by the Engineer. Seed mixtures may be sown together provided they are kept in a thoroughly mixed condition during the seeding operation.

B. Seed shall be uniformly sown by any approved mechanical method suitable for the slope and size of the areas to be seeded, preferably with a broadcast type seeder, windmill hand seeder or approved mechanical power drawn seed drills. Hydro-seeding and hydro-mulching may be used on steep embankments, provided full coverage is obtained. Care shall be taken to adjust the seeder for seedings at the proper rate before seeding operations are started and to maintain their adjustment during seeding. Seed in hoppers shall be agitated to prevent segregation of the various seeds in a seeding mixture.

C. Immediately after sowing, the seeds shall be covered and compacted to a depth of 1/8 to 3/8-inch by a cultipacker or suitable roller.

D. Leguminous seeds shall be inoculated prior to seeding with an approved and compatible nitrogen-fixing inoculant in accordance with the manufacturer's mixing instructions.

3.05 Mulching

A. All seeded areas shall be uniformly mulched in a continuous blanket immediately after seeding. The mulch shall be applied evenly so as to permit sunlight to penetrate and the air to circulate and at the same time shade the ground, reduce erosion and conserve soil moisture. Approximately 45 percent of the ground shall be visible through the mulch blanket.

B. One of the following mulches shall be spread evenly over the seeded areas at the following application rates:

1. Wood Cellulose Fiber: 1,400 pounds/acre.

2. Straw: 4,000 pounds/acre.

3. Stalks: 4,000 pounds/acre.

4. These rates may be adjusted at the discretion of the Engineer at no additional cost to the Owner, depending on the texture and condition of the mulch material and the characteristics of the seeded area.

C. Mulch on slopes greater than 3 to 1 ratio shall be held in place by the use of an approved mulch binder. Binder shall be thoroughly mixed and applied with the mulch. Emulsified asphalt or cutback asphalt shall be applied at the approximate rate of five gallons per 1,000 square feet as required to hold the mulch in place.

D. The Contractor shall cover structures, poles, fences and appurtenances if the mulch binder is applied in such a way that it would come in contact with or discolor the structures.

E. Mulch and binder shall be applied by suitable blowing equipment at closely controlled application rates in a manner acceptable to the Engineer.

3.06 Watering

A. The Contractor shall be responsible for maintaining the proper moisture content of the soil to insure adequate plant growth until a satisfactory stand is obtained. If necessary, watering shall be performed to maintain an adequate water content in the soil.

B. Watering shall be accomplished by hoses, tank truck or sprinklers in such a way to prevent erosion, excessive runoff and over-watered spots.

3.07 Maintenance

A. Upon completion of seeding operations, the Contractor shall clear the area of all equipment, debris and excess material and the premises shall be left in a neat and orderly condition.

B. The Contractor shall maintain all seeded areas without additional payment until final acceptance of the work by the Owner, and any regrading, refertilizing, reliming, reseeding or remulching shall be done at Contractor's own expense. Seeding work shall be repeated on defective areas until a satisfactory uniform stand is accomplished. Damage resulting from erosion, gulleys, washouts or other causes shall be repaired by filling with topsoil, compacting and repeating the seeding work at Contractor's expense.

END OF SECTION

Part 1 General

1.01 Scope

Furnish and install the concrete reinforcement as shown and indicated on the Drawings and specified in this Section, complete in place.

1.02 Submittals

A. Shop Drawings

1. All shop drawings shall be of the same size. Reproductions of the Drawings for use as shop drawings is not permitted. Shop drawings shall include placing drawings, bending details, and bar lists with bar marks. All details and notes appearing on the Drawings, giving information for the placing of reinforcing steel, shall be shown on the shop drawings. Shop drawings will not be reviewed without such information.

2. Wall reinforcing shall be shown in elevation.

3. Show location and size of all penetrations greater than 6-inches in diameter or across the opening with the corresponding added reinforcing around the penetrations.

4. Submittals shall be complete for each structure. Partial submittals are not permitted and will be returned unmarked. Each submittal shall clearly indicate the structure and Drawing numbers that the work is for. The identifying numbers of the shop drawings for each structure shall be in numerical order.

5. Location and arrangement of accessories shall be clearly indicated.

6. All shop drawings shall be checked by the fabricator and Contractor before being submitted to the Engineer.

B. Mill tests of reinforcing steel shall be submitted prior to use for each 15 tons or less shipped to the site. Tests shall be conducted in conformance with ASTM A 615, and methods prescribed therein.

1. Cost of mill tests shall be borne by Contractor.

2. Three copies of each test report stating whether the material meets the requirements of the ASTM specifications shall be submitted to the Engineer.

3. Certified copies of the mill tests may be considered evidence of compliance provided such tests are regularly conducted by the reinforcement supplier by experienced, competent personnel using adequate testing equipment. In case of doubt as to the adequacy or accuracy of the mill tests, the Engineer may

require the Contractor to furnish, at no additional cost to the Owner, test results from an independent testing laboratory acceptable to the Engineer on mill samples or delivered steel reinforcement.

Part 2 Products

2.01 Reinforcing Bars

A. Bar reinforcement shall be deformed-type bars conforming to ASTM A 615. Reinforcement shall be manufactured from new billet steel of American manufacture, Grade 60.

B. Reinforcing steel shall be shop fabricated to shapes and dimensions indicated on the Drawings and in compliance with applicable provisions of ACI 315 and ACI 318.

C. Bars shall be bent cold. Bars shall be pre-fabricated to detail and delivered on the job plainly tagged and ready to set.

2.02 Welded Wire Fabric

Welded wire fabric shall be in flat sheets conforming to ASTM A 185, with wire conforming to ASTM A 82.

2.03 Accessories

A. All chairs and bolsters shall have plastic-covered or galvanized steel legs at formed slabs and beams. For slabs on grade, bare metal is acceptable.

B. For slabs on grade 10-inches or less, all reinforcing shall be supported on chairs and/or bolsters as required to properly position the bars or welded wire fabric. The chairs and/or bolsters shall be supported on precast concrete pads bearing on the subgrade. The concrete pads shall be at least 6 x 6-inches and be no more than 1-1/2-inches thick. Pads shall be cast from Class "A" concrete or from mortar made up of one part cement and two parts sand, with tie wires embedded.

C. For slabs on grade greater than 10-inches, reinforcing shall be supported directly on concrete brick bearing on the subgrade or the system noted above for slabs 8-inches or less.

Part 3 Execution

3.01 Storage of Materials

Reinforcing steel delivered to the site, not immediately placed in forms, shall be protected from mud and excessive rust-producing conditions by storing in a well-drained area and supported off the ground. All reinforcing shall be properly tagged with their bar marks and location in the structure clearly noted.

3.02 Tolerances

A. Allowable tolerances for fabricating steel reinforcement shall be as follows:

Item	Maximum Tolerance, Inches	
Sheared Length of Bars	+1	-1
Depth of Truss Bars	+0.0	-1/2
Outside Dimensions of Stirrups, Ties and Spirals	+1/2	-1/2
Location of Bends	+1	-1

B. Allowable tolerances for placing steel reinforcement shall be as follows:

Item	Maximum Tolerance, Inches	
Concrete Cover from Outside of Bar to Finished Surface	+1/4	-0.0
Lateral Spacing of Bars in Plane of Reinforcement in Beams and Joists	+1/4	-0.0
Lateral Spacing of Bars in Plane of Reinforcement in Slabs and Walls	+1	-1
Spacing of Stirrups, Ties and Spirals Along Longitudinal Axis of Member	+1/2	-1/4
Height of Bottom Bars in Slabs, Beams and Joists	+1/4	-1/4
Height of Top Bars in Slabs, Beams and Joists	+1/4	-1/4
Depth 8" and Less	+1/2	-1/2
Depth 9" - 24"	+1	-1
Depths 25" & Greater		

3.03 Field Fabrication

Field fabrication of reinforcing steel is not permitted.

3.04 Placement and Anchorage

A. Space metal chairs, bolsters, spacers and hangers in accordance with ACI 315.

B. Reinforcement, at the time concrete is placed, shall be free from rust scale or other coatings that will destroy or reduce bond. Bars with kinks or bends not shown on the plans shall not be used.

C. Reinforcement shall be accurately placed in accordance with the Drawings and shall be adequately secured in position with not less than 16 gauge annealed wire or suitable clips at intersections. Reinforcement shall be held securely at the required distance from the forms. Nails shall not be driven into outside forms to support reinforcement.

D. Install welded wire fabric reinforcement for concrete slabs on ground and as otherwise indicated. Lap all joints 6-inches and wire securely. Extend mesh to within 2-inches of sides and ends of slabs. Sheets that do not lay flat when in their intended position will be rejected. Tags designating the wire size and spacing shall be left on each sheet until ready for use. Tuck ends of welded mesh well down into edge of beams or walls. Do not leave unreinforced border strips. Welded wire fabric shall not contain loose rust. All welded wire fabric shall be supported and tied in its proper location.

E. Conduits: Where conduits are permitted in slabs, low conduit shall be wired to the upper side of bottom reinforcing and top conduit shall be wired to lower side of top steel. Where parallel conduits occur, they shall be separated by at least 2-inches clear.

3.05 Concrete Cover

Unless otherwise shown on the Drawings, the following concrete cover shall be provided for reinforcement:

Bottom and Sides of Footing	3-inches
Walls	2"
Slabs (Framed) Bottom Top	 3/4-inch 1-inch
Beams (Stirrups) Bottom and Sides Top	 1-1/2-inches 2-inches
Columns (Ties, Spirals)	2-inches
Slabs on Grade - Liquid Containment Structures Bottom and Sides Top	 3-inches See Drawings
Slabs on Grade - Other Structures	See Drawings

Reinforcement shall be protected by concrete cover as shown and noted on the Drawings.

3.06 Splicing

A. Splicing of reinforcement shall be as shown and indicated on the Drawings. Splices not shown on the Drawings shall be Class "B" splice, in accordance with ACI 318. Any changes to the location and type of splices desired by the Contractor must be specifically requested and must meet with the acceptance of the Engineer before they can be used.

B. Splices shall not be made at point of maximum stress and shall provide sufficient lap to transfer stress between bars by bond.

C. Mechanical splices may be used instead of lap splices provided that their location and type meets with the acceptance of the Engineer.

3.07 Inspection

Inspect all the work in accordance with Section 03300 of these Specifications.

END OF SECTION

Part 1 General

1.01 Scope

Furnish and install the cast-in-place concrete as shown and indicated on the Drawings and as specified in this Section, complete.

1.02 Submittals

A. Mix designs for all groups and classes of concrete.

B. Strength and slump tests results.

C. Certificates of compliance for each of the following:

1. Cement
2. Aggregates
3. Fly ash
4. All admixtures

Part 2 Products

2.01 Cement

Cement shall be standard Portland Cement, of American manufacture, conforming to ASTM C 150, Type I. Only one brand of commercial Portland cement shall be used in the exposed concrete of the structure. Cement reclaimed by cleaning bags or from leaking containers shall not be used in this work. Each bag shall weigh approximately 94 pounds and contain one cubic foot.

2.02 Concrete Aggregates

A. Fine aggregate shall be sand having clean, hard, durable, uncoated grains and free from deleterious substances and shall conform to ASTM C 33.

B. Coarse aggregate shall be crushed stone having clean, hard, durable, uncoated particles conforming to ASTM C 33.

2.03 Water

Water used in mixing concrete shall be clean and free from deleterious amounts of acids, alkalies or organic materials.

2.04 Waterstops

See Section 03250 of these Specifications for waterstops.

2.05 Vapor Barrier

Vapor barrier shall be polyethylene sheeting, minimum 6 mil thickness, conforming to ASTM C 171. Sheeting shall be drilled with 1/2-inch holes at 6 to 10-inch centers each way.

2.06 Admixtures

A. Water reducing admixture shall conform to ASTM C 494, Type A.

B. Water reducing, retarding admixture shall conform to ASTM C 494, Type D.

C. Non-Corrosive, Non-Chloride Accelerator: The admixture shall conform to ASTM C 494, Type C.

D. Air entraining admixture shall conform to ASTM C 260.

E. Fly ash shall conform to ASTM C 618, Type F.

F. High range water reducer (HRWR) shall conform to ASTM C 494, Type F or G and shall be one of the following:

1. Rheobuild 1000 and 716, manufactured by Master Builders

2. Daracem 100, manufactured by W.R. Grace

3. Sikament 320, manufactured by Sika Corporation

4. Eucon 37, manufactured by Euclid Chemical Company

G. Calcium Chloride: Calcium chloride or admixtures containing more than 0.1 percent chloride ions are <u>not</u> permitted.

2.07 Curing and Sealing Compounds

A. Curing compound shall be acrylic based, conforming to ASTM C 309.

B. Sealing compound shall be one of the following:

1. Masterseal 340, manufactured by Master Builders

2. Sikaguard 701W, manufactured by Sika Corporation

3. Super Rez Seal, manufactured by Euclid Chemical Company

Part 3 Execution

3.01 Concrete Quality

A. Two groups of concretes are required. Group I is concrete with a HIGH RANGE WATER REDUCER (HRWR), Group II is concrete without HRWR.

1. Group I: All Group I concrete shall contain the specified fly ash. The combined weight of cement and fly ash shall contain no less than 20 percent nor more than 25 percent of fly ash. The combined weight of cement and fly ash shall be used as the weight of cement in the determining of the water-cement (w/c) ratio. The following class of concrete is required:

Class of Concrete	Compressive Strength @ 28 Days	Slump Range	Maximum W/C Ratio
A	4,000	1" - 2"	0.4

a. The slump range in the above table is required prior to adding the High Range Water Reducer (HRWR). Slump tests shall be made prior to adding the HRWR. The HRWR shall be added to the concrete at the batch plant. The slump range required after the addition of the HRWR is 7 to 10-inches. HRWR shall be capable of maintaining 7 to 10-inch slump in excess of 60 minutes of continuous mixing at 4 to 6 rpm in a truck mixer and workability up to 90 minutes. After introduction of HRWR, concrete temperature shall be maintained within 3 degrees F for 90 minutes when concrete temperatures are in excess of 90 degrees F. Except for the air-entrainment admixture, no other admixture shall be used with the HRWR. Upon 72 hours notice, the HRWR manufacturer shall supply jobsite technical service to the Contractor. The manufacturer shall be consulted for mix proportions and dosage rates. No added chlorides shall be used. The initial set shall not be in excess of six hours at temperatures above 50 degrees F. HRWR shall be used with due consideration given to the air temperature at the time of batching and casting.

b. Air Content: All concrete shall have an air content of 4.0 percent to 7.0 percent.

c. Group I concrete shall be used in all walls and columns for liquid containment structures.

2. Group II: The following classes of concrete are required:

Class of Concrete	Compressive Strength @ 28 Days	Slump Range	Maximum W/C Ratio
A	4,000	3" - 5"	0.45
B	3,000	3" - 5"	0.56
C	1,500	3" - 5"	none specified

a. Air Content: All concrete shall have an air content of 2.5 to 5.0 percent.

b. Admixture Usage: All concrete placed at air temperatures above 50 degrees F shall contain a water reducing admixture or water reducing-retarding admixture. All concrete placed at air temperatures below 50 degrees F shall contain the specified non-corrosive non-chloride accelerator.

c. Group II, Class A concrete shall be used for all work not specified as Group I concrete.

d. Fly ash is required in all slabs for liquid containment structures, either on grade or formed. Provisions for fly ash use in Group I concrete shall apply.

e. The use of fly ash is not required for the remainder of Group II concrete, but is permitted. If used, the provisions for fly ash use in Group I concrete shall apply.

3.02 Mix Designs

A. Mix design shall be proportioned in accordance with ACI 211.1 making maximum use of the coarse aggregate. The proportioning shall be based on the requirements of a well-graded high density plastic workable mix within the slump range and strengths required. The mix shall contain no less than 1,850 pounds of coarse aggregate per cubic yard of concrete, shall be based on conventional conveying and shall not be altered for use in pumping. Pumping equipment, if used, shall be of sufficient size and design to pump the mix designed for conventional conveyance.

B. Coarse Aggregate

1. Coarse aggregate for all concrete in liquid containment structures shall be Size No. 467.

2. Coarse aggregate for all other concrete work shall be Size No. 57.

3. Size No. 467 may be used in lieu of Size No. 57 in concrete members whose minimum size dimension is 8-inches or larger.

C. Submit samples, in adequate quantities for each mix design and verification, of all concrete materials to be used on the project to the designated testing laboratory. Do not use any concrete in this work without acceptance and verification of design mix by the testing laboratory and the approval of the Engineer.

D. If trial batches are used, the testing laboratory shall make strength tests from trial batches in the laboratory using materials and mix designs proposed for use by the Contractor. The testing laboratory shall prepare trial batches in accordance with ACI 211.1.

E. If field experience method is selected, the proposed mix design shall be accompanied by complete standard deviation analysis and at least 30 consecutive strength tests that represent the proposed mix.

F. The proposed mix design and supporting data shall be submitted, in triplicate, to the testing laboratory for their review and comments at least 21 days prior to the expected start of concreting operations. The testing laboratory will forward two copies of the submittal to the Engineer with their comments. The Engineer will review the submittal and return one copy to the Contractor with the Engineer's comments.

G. Compression test specimens made to verify the mixes shall be made in accordance with ASTM C 192. All compression test specimens shall be tested in accordance with ASTM C 39.

3.03 Plant Mixing

A. Proportioning Concrete

1. Proportions shall be in compliance with approved design mix for each class of concrete.

2. The mixing plant shall be provided with adequate equipment and facilities for accurate measurement and control of the quantities of material and water used in the concrete.

3. Concrete materials shall be measured by weight except that admixtures shall be measured by volume.

B. Batching

1. Provide all necessary equipment to accurately determine and control actual amount of materials entering into the concrete mix. Individual ingredients shall be weighted separately for each batch. Accumulative weighing will be allowed if equipment is in acceptable working order as determined by the testing laboratory and approved by the Engineer. Accuracy of all weighing devices shall be such that successive quantities can be measured to within one percent of the desired amount.

2. Completely discharge contents of the mixer before each new batch is loaded. Use of retempered concrete is not permitted.

3. Ready-mixed concrete shall be mixed and delivered in accordance with requirements of ASTM C 94 and the following:

   a. A separate water metering device (not truck tank) shall be used for measuring water added to the original batch.

   b. Use of wash water as a portion of the mixing water is not permitted. Wash water added to empty drums after discharging shall be dumped before a new batch is received.

   c. Centrally mixed concrete shall be mixed for the length of time specified herein, not “shrink-mixed”.

   d. Mixing drums shall be watertight.

   e. Concrete shall be discharged within one hour from the time concrete was mixed, if centrally mixed, or from time the original water was added, if transit-mixed.

   f. Furnish delivery ticket with each load of concrete delivered under these Specifications. Delivery ticket shall show clearly the class and strength of concrete, size of coarse aggregate, water per cubic yard, its slump, quantities of all admixtures, the date and time of departure from the batching plant, and the time of placement.

3.04 Conveying Equipment

A. If concrete is to be transported in carts or buggies, the carts or buggies shall be equipped with pneumatic tires.

B. Equipment for chuting or other methods of conveying concrete shall be of such size and design as to insure a practically continuous flow of concrete at delivery without segregation of concrete.

3.05 Conveying

A. Concrete shall be conveyed from mixer to place of final placement by methods which will prevent separation or loss of the material.

B. Runway supports shall not bear upon reinforcing steel or fresh concrete.

C. All conveying equipment shall be thoroughly cleaned before each run of concrete is begun.

3.06 Delivery and Protection of Materials

A. Deliver ready-mixed concrete in compliance with requirements of ASTM C 94.

B. The following tests shall be made at the work site prior to placement of concrete:

1. Slump Tests: ASTM C 143.

2. Air Content: ASTM C 173 or C 231

3. Test Cylinders: ASTM C 31

3.07 Severe-Weather Provisions

A. Hot Weather Concreting: Protect in accordance with ACI 305R except as modified herein.

1. Provide adequate methods of lowering temperature of concrete ingredients so that the temperature of concrete when placed does not exceed 90 degrees F.

2. Concrete shall not be placed when the air temperature is expected to exceed 100 degrees F within 12 hours after casting.

3. When the air temperature is 75 degrees F and above, forms and reinforcing shall be thoroughly wetted with water so that the concrete will be placed against wet and cooled surfaces. All excess water shall be removed before casting the concrete.

4. Protection and Curing - Slabs (On Grade and Formed)

a. Protect slabs from damage due to dry winds and high temperatures.

b. Protect slabs from direct sun at temperatures of 85 degrees F and above.

c. Moist curing of all slabs shall start as soon as the surface of the fresh concrete is hard enough to permit curing without damage to the surface of the concrete.

5. Protection and Curing - Formed Surfaces: As soon as the concrete has set, wet the forms and keep the forms wet during the curing period. Provide for keeping the top of the walls, and other top surfaces, moist during the curing period.

B. Cold-Weather Concreting: Protect in accordance with ACI 306R except as modified herein.

1. Provide adequate equipment for heating concrete materials and protecting concrete from damage during freezing or near-freezing weather. No frozen materials, or materials containing ice, shall be used.

2. All concrete materials and all reinforcement, forms, fillers and ground with which concrete is to come into contact shall be free from frost.

3. Whenever the temperature of the surrounding air is below 40 degrees F and falling, all concrete placed in the forms shall have a temperature of between 70 and 80 degrees F, and adequate means shall be provided for maintaining a temperature of not less than 70 degrees F for three days, or 50 degrees F for five days, or for as much more time as is necessary to insure proper curing of the concrete. If high early strength concrete is used, the requirement for maintenance of 50 degrees F may be reduced to three days.

4. Use only the specified non-chloride accelerator. Calcium chloride or admixtures containing more than 0.1 percent chloride ions are not permitted.

5. Housing, covering or other protection used in connection with curing shall remain in place and intact at least 24 hours after the artificial heat is discontinued.

3.08 Construction Joints and Expansion Joints

A. Formed Construction Joints in Containment Structures and Where Otherwise Shown: Prior to placing concrete next to the joint, the joint surface shall be thoroughly cleaned and dampened with water. Remove all free water so that the surface of the joint shows signs of drying before placing the adjacent concrete.

B. Construction joints in Beams, Girders and Slabs Where Waterstops are not Specified or Shown to be Installed: These joints shall be located at points of minimum shear and their locations shall be approved by the Engineer before they are bulkheaded. These joints shall be roughened and thoroughly cleaned of all foreign matter and laitance and dampened with water. Remove all free water and slush with a coat of neat cement grout before placing the adjacent concrete. Place the adjacent concrete before the neat cement grout takes its initial set.

C. Construction Joints in Beams, Girders and Slabs: Where waterstops are specified or shown to be installed. These joints shall be treated as specified in paragraph A. above.

D. Construction Joints in Columns: These joints, unless otherwise shown on the Drawings, shall be located at the bottom of the girder, beam or slab it receives, and at the top of slabs when the column continues through a slab level. These joints shall be treated as specified in paragraph B. above.

E. Expansion Joints: Expansion joints shall be installed where shown on the Drawings.

3.09 Waterstops

Waterstops shall be provided where specified and as indicated and noted on Drawings and shall be made continuous throughout their length.

3.10 Inspection of Work Before Placing Concrete

A. Inspect the area to receive concrete for any deficiencies which would prevent proper placing of concrete. Do not proceed with placing concrete until such deficiencies are corrected.

B. Do not place in the concrete any item that is not required to be in the concrete by the Drawings and Specifications. Insert all the items shown on the Drawings or specified properly positioned and secured. Openings other than those which are facilitated by sleeves shall be properly formed and positioned.

C. Remove hardened, or partially hardened, concrete on forms or reinforcement before placing concrete.

D. Do not place concrete on earth until the fill or excavation has been prepared as set forth under applicable sections of the Specifications for that work.

E. Give the Engineer at least 48 hours notice before any concrete is to be placed. Concrete shall not be placed until the Resident Inspector has signed a Concrete Preplacement Sign-Off Card completed by the Contractor. The Concrete Preplacement Sign-Off Card certifies that the formwork, reinforcing, and all inserts required for mechanical and electrical work, instrumentation, plumbing, process piping, metal embeds, and any other inserts or miscellaneous specialties required for the work are supported in their proper position; that the formed enclosure is clean, and the surfaces to receive concrete are prepared as specified. A sample of the Concrete Pre-Placement Sign-Off Card is attached to this Section.

3.11 Placing

A. Place concrete as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. Do not place concrete on work that has partially hardened or been contaminated by foreign material, and do not use retempered concrete. In no case shall Group II concrete be placed when the elapsed time after addition of water and cement to batch exceeds one hour. For Group I concretes, this elapsed time may be extended if sufficient data from this construction indicates a time extension is permissible and if approved by the Engineer.

B. Concrete shall be placed in a manner to avoid the displacement of reinforcing, and coating or spattering the reinforcing steel. The placing of concrete within form work shall be regulated so that the pressure within form work does not exceed the design pressure. In placing concrete each layer shall be placed following the preceding layer to prevent lines of separation or “cold joints” in the work. After the concrete reaches it initial set, jarring the formwork or placing strain or vibration on the ends of projecting reinforcing bars shall be avoided.

C. Group I concrete shall not be dropped more than 10 feet. Group II concrete shall not be dropped more than four feet. All concrete placed over PVC waterstops shall drop no more than 6-inches until there is at least one foot of concrete above the PVC waterstop, at which point the drop distances may be increased to those noted above.

D. Once concrete placing has started, it shall be carried on as a continuous operation until placing of the concrete between construction joints is completed.

E. Concrete shall be placed in layers not over 12-inches deep and each layer shall be compacted with the aid of mechanical internal-vibrating equipment supplemented by hand spading. Vibrators shall in no case be used to transport concrete. Use of form vibrators are not permitted. Internal vibrators shall maintain a speed of not less than 5,000 impulses per minute when submerged in the concrete. At least one spare working vibrator shall be on the job site as a back-up. Duration of vibrator use shall be limited to that necessary to produce satisfactory consolidation without causing objectionable segregation. Vibrator shall not be lowered into courses that have begun to set. Apply vibrator at uniformly spaced points not further apart than the visible effectiveness of the machine. Type and use of vibrators shall be in accordance with ACI 301.

F. Provide vapor barrier under all slabs on soil, sand or stone. Use largest sheets practicable to reduce number of joints. Lap joints a minimum of 24-inches. Remove torn and punctured sheets and replace with new sheets prior to placing concrete. Placing of concrete shall be done in a manner that will not damage the vapor barrier material. The sub-base material shall be as shown and/or noted on the Drawings.

3.12 Protection

Protect freshly placed concrete from damage or injury due to water, falling objects, persons or anything that may mar or injure finish surface on concrete. Only light use of slabs will be permitted for the first 14 days after placing of the concrete.

3.13 Curing

A. Curing shall conform to ACI 308 except as modified herein.

B. All Slabs on Grade: After placement and finishing, concrete shall be maintained in a moist condition for at least seven successive days during which the temperature of the concrete is 50 degrees F or above. For temperatures of 50 degrees F and below, curing period shall be 14 successive days. Concrete shall be kept moist by any one, or combination, of the following methods:

1. Ponding or Immersion: Continually immerse the concrete in water throughout the curing period. Water shall not be more than 20 degrees F less than the temperature of the concrete.

2. Fog Spraying or Sprinkling: Provide uniform and continuous application of water throughout the curing period.

3. Pervious Sheeting: Completely cover surface and edges of the concrete with two thicknesses of wet sheeting. Overlap sheeting 6-inches over adjacent sheeting. Sheeting shall be at least as long as the width of the surface to be cured. During application, do not drag the sheeting over the finished concrete nor over sheeting already placed. Wet sheeting thoroughly and keep continuously wet throughout the curing period.

4. Impervious Sheeting: Wet the entire exposed surface of the concrete thoroughly with a fine spray of water and cover with impervious sheeting throughout the curing period. Lay sheeting directly on the concrete surface and overlap edges 12-inches minimum. Provide sheeting not less than 18-inches wider than the concrete surface to be cured. Secure edges and transverse laps to form closed joints. Repair torn or damaged sheeting or provide new sheeting. Inspect surface of concrete daily for wetness. The surface shall be kept continuously wet during the curing period.

C. All Other Concrete: After placement, concrete shall be maintained in a moist condition for the same periods as specified above for slabs on grade.

1. Concrete in Formed Surfaces - Slabs, Beams, Columns and Building Walls: Keep forms and exposed surfaces wet with water during the curing period. If forms are removed before the end of the curing period, apply a curing compound within one hour after form removal.

2. Concrete in Formed Surfaces - Containment Vessel Walls: Keep forms wet with water during the curing period. If forms are removed before the end of the curing period, continue the moist curing in accordance with Paragraph A. of this article of these Specifications.

3.14 Patching

A. As determined by the Engineer, any concrete which is out of alignment or level, has a defective surface or has defects which reduce its structural adequacy, shall be considered as not conforming with the Drawings and Specifications and shall be rejected.

B. Do not take any remedial action on concrete with any defect without the permission of the Engineer.

C. Unless the Engineer grants permission to patch the rejected concrete, remove the rejected concrete and replace it with concrete that conforms to the Drawings and Specifications. The location of cut lines and the extent of removal will be determined by the Engineer.

D. If the Engineer grants permission to patch the rejected concrete, it shall be done in accordance with the following:

1. Permission to patch rejected concrete will not be a waiver of the Engineer's right to require complete removal of the rejected concrete if the patching does not, in the Engineer's judgment, restore the concrete to the requirements of the Specifications and Drawings.

2. Patching shall be accomplished after the curing is completed.

3. Defective areas shall be chipped away to a depth of not less than 1-inch, in all cases to sound concrete, with edges perpendicular to the surface. Feather edges will not be permitted. Remove all loose material and thoroughly clean the chipped surfaces with a high pressure air hose delivering air at 100 psi. The area to be patched and an area at least 6-inches wide surrounding it shall be dampened. A bonding grout shall be prepared using a mix of approximately one part cement to one part fine sand passing a No. 30 mesh sieve, mixed to the consistency of thick cream, and then well brushed into the surfaces as noted below in paragraph 5.

4. The patching mixture shall be made of the same materials and of approximately the same portions as used for the original concrete, except that the coarse aggregate shall be omitted and the mortar shall consist of not more than one part cement to two and one-half parts sand by damp, loose volume. White Portland cement shall be substituted for a part of the gray Portland cement to produce a color matching the color of the surrounding concrete, as determined by a trial patch. The quantity of mixing water shall be no more than necessary for handling and placing. The patching mortar shall be mixed in advance and allowed to stand with frequent manipulation with a trowel, without addition of water, until it has reached the stiffest consistency that will permit placing.

5. After surface water has evaporated from the area to be patched, the bond coat shall be well brushed into the surface. When the bond coat begins to lose the water sheen, the premixed patching mortar shall be applied. The mortar shall be thoroughly consolidated into place and struck off so as to leave the patch slightly higher than the surrounding surface. To permit initial shrinkage, it shall be left undisturbed for at least one hour before being finally finished. The patched area shall be kept damp for seven days. Finishing tools that produce a finish matching the surrounding shall be used.

E. Tie holes left by withdrawal of rods or the holes left by removal of ends of wall ties shall be filled solid with mortar after first being wetted. For holes passing through the wall, a plunger-type grout gun shall be used to force the mortar through the wall starting at the back face. A piece of burlap or canvas shall be held over the hole on the outside and when the hole is filled, the excess mortar shall be struck off with the cloth flush with the surface. Holes not passing through the walls shall be filled with a small tool that will permit packing the hole solid with mortar. Any excess mortar at the surface of the wall shall be struck off flush with a cloth. Mortar shall consist of one part cement, two and one-half parts sand and no more water than necessary for handling and packing.

3.15 Steel Troweled Finish - Floor Slabs

A. Steel troweled finish shall be applied to the surface of all building and liquid containment structure floor slabs and interior equipment pads.

B. Concrete shall be placed, consolidated, struck-off and leveled to the proper elevation. After the surface has stiffened sufficiently to permit the operation and the water sheen has disappeared, the surface shall be wood floated, by hand or power floated, at least twice, to a uniform sandy texture. Floors shall be leveled such that depressions between high spots do not exceed 1/4-inch under a 10 foot straightedge except where drains occur, in which case the floors shall be pitched to the drains as indicated on the Drawings.

C. After the concrete has received a wood float finish, it shall be troweled at least twice to a smooth dense finish. The drying of the surface moisture before floating or troweling shall not be hastened by the dusting on of dry sand or cement. The first troweling shall be done by a power trowel and shall produce a smooth surface relatively free of defects. Additional troweling shall be done by hand after the surface has hardened sufficiently. The final troweling shall be done when a ringing sound is produced as the trowel is moved over the surface. The surface shall be thoroughly consolidated by the hand troweling operations. The finished surface shall be free of any trowel marks or other imperfections; shall be uniform in texture and appearance, and shall be in true plane within the tolerance specified. Any deviation from this condition which remains after the troweling is completed shall be corrected by grinding.

3.16 Broom Finish

A. Broom finish shall be applied to:

1. All exterior side walks, walkways and platforms.

2. All steps and landings, both interior or exterior.

B. The surface shall be given a floated finish as specified above, then finished with a flexible bristle broom or burlap belt drawn across the surface. Surface must be hardened sufficiently to retain the scoring or ridges. Scores or ridges shall be transverse to traffic or at right angles to the slope of the slab.

3.17 Surface Preparation for Finish Grout

The surface shall be given a wood float finish and moist cured. After the curing period, the finish grout shall be applied where indicated and noted on the Drawings.

3.18 Testing Laboratory

A. The testing laboratory shall have access to all places where concrete materials and concretes are manufactured, stored, proportioned, mixed, placed and tested. Duties shall include, but not necessarily be limited to the following:

1. Make, store, transport, cure and test compression specimens made during placing of concrete. Compression test specimens shall be tested in accordance with ASTM C 39. Test reports shall show all pertinent data, such as class of concrete, exact location of pour, air temperature, date of pour, time of pour, truck number for ready-mixed concrete, date on which specimen was broken, age of specimen, compressive strength of specimen, concrete slump test results and air content of concrete from which the specimen was made. One copy each of all tests shall be sent to the Contractor and two copies each to the Engineer.

2. Each strength test requires four standard test cylinders.

3. Samples for strength tests of each class of concrete placed each day shall be taken not less than once a day, nor less than once for each 100 cubic yards of concrete, nor less than once for each 5,000 square feet of surface area for slabs or walls.

4. Each class of concrete shall be tested with at least five strength tests.

5. From each set of four cylinders, two shall be tested at 28 days and shall comprise a strength test under the definition of these Specifications. One cylinder shall be broken at seven days and will be used as an aid in determining the early strength of the concrete and the 28 day strength, and one cylinder retained in reserve for later testing if required.

6. Test for unit weight of concrete when the first load of each class of concrete is delivered and thereafter at the discretion of the testing laboratory.

B. Periodically inspect the batching plant and file a report with the Engineer stating whether the supplier's equipment and methods meet the requirements of these Specifications.

C. Temperature and Placing Record: Temperature record shall be made each day during the concreting operations. Records shall also include location, quantity and starting and finishing time of placement for all concrete work. Copy distribution shall be as specified above for test reports.

3.19 Evaluation of Compression Tests

A. Evaluation of compression test results shall be as follows: For each class of concrete, compression-strength tests for laboratory-cured cylinders shall be considered satisfactory if the averages of the results of all sets of three consecutive compression-strength tests equal or exceed the 28 day design compression-strength specified; and, no individual cylinder strength test falls below the required compression strength by more than 500 psi. Strength tests of specimens cured under field conditions may be required by the Engineer to check the adequacy of curing and protecting of the concrete placed. Specimens shall be molded by the field testing laboratory at the same time and from the same samples as the laboratory-cured specimens.

B. Faulty Concrete: Failure to comply with any of the specified conditions shall constitute faulty concrete. Unless otherwise directed by the Engineer, faulty concrete shall be removed and replaced with concrete as specified, at no expense to the Owner.

C. Additional Test: If permitted by the Engineer, additional tests shall be subject to the approval of the Engineer and at no expense to the Owner. Load tests, if permitted by the Engineer, shall be conducted in accordance with the loading criteria as required by the design of the structure, as determined by the Engineer.

D. Neither the results of laboratory verification tests nor any provision in the Contract Documents shall relieve the Contractor of the obligation to furnish concrete of the class and strength specified.

END OF SECTION

CONCRETE PREPLACEMENT SIGN-OFF CARD

Project:_____

Inspection Date:_____ Concrete Placement Date: _____

Expected Time of Concrete Placement:_____

Estimated Quantity:_____

Mix Design Strength:_____

Location of Structure:_____

Member (walls, beams, etc.):_____

Weather Conditions:_____

Method of Pour: Chute _____ Bucket_____ Pump_____

Conveyor _____ Other _____

	Status			
Work	Ready	N/A	Signature	Date
Formwork				
Reinforcing				
Mechanical				
Electrical				
Instrumentation				
Plumbing				
Process				
Metal Embeds				
Miscellaneous Specialties				
Clean-Up/OK to Place				

The Contractor certifies that the above work to be cast is prepared in accordance with the Contract Documents.

Contractor (Superintendent):_____ Date:_____

Resident Inspector:_____ Date:_____

Part 1 General

1.01 Scope

A. Adhesive anchor bolts shall be provided for mechanical equipment where indicated on the Drawings or as required by equipment manufacturer's anchor bolt setting plan.

B. Expansion bolts shall be provided where indicated on the Drawings and as required to attach anchor ladders, handrails, stairs, ship's ladders and structural steel shapes to hardened concrete or masonry.

C. Embedded anchor bolts shall be provided where indicated on the Drawings or in the Specifications or where recommended by equipment manufacturers.

1.02 Material Storage

All material shall be stored in manner which will protect it from deterioration and damage.

Part 2 Products

2.01 Adhesive Anchor Bolts

A. Adhesive anchor bolts shall consist of a stainless steel threaded rod meeting the requirements of ASTM F 593 (AISI 304). Installation shall be in conformance with the manufacturer's instructions and under the supervision of a manufacturer's field representative to ensure for maximum pullout and shear strength will be attained.

B. All nuts shall be of stainless steel meeting requirements of ASTM F 594 Alloy Group I, Condition CW.

C. All washers shall meet dimensional requirements of ASTM F 436. Material for washers shall be stainless steel, Type 304, 305, 384 or MX7.

D. Adhesive anchor bolts shall be Epcon System Ceramic 6 Epoxy Adhesive by ITW Ramset/Red Head or HIT HY 150 Injection Adhesive by Hilti Fastening Systems.

2.02 Expansion Anchor Bolts

A. Expansion anchor bolts shall be stainless steel, AISI Type 304 or 316 and shall be of the wedge or self-drilling type. Expansion anchors shall conform to the applicable requirements of Federal Specifications FF-S-325. Installation methods shall be in conformance with the manufacturer's recommendations. For maximum pullout and shear strength, but in no case shall the depth of the hole be less than five bolt diameters. The minimum distance between the center of the expansion anchor and an edge or exterior corner shall not be less than 6 times the diameter of the hole in which it is installed.

B. All nuts shall be of stainless steel meeting requirements of ASTM F 594 Alloy Group I, Condition CW.

C. All washers shall meet dimensional requirements of ASTM F 436. Material for washers shall be stainless steel, Type 304, 305, 384 or MX7.

D. Expansion anchors shall be "Trubolt " by ITW Ramset/Red Head, or "KWIKBOLT II" by Hilti Fastening Systems.

2.03 Embedded Anchor Bolts

A. Embedded anchor bolts, except those used for equipment anchoring, shall be carbon steel unless stainless steel is required on the Drawings or Specifications. Embedded anchor bolts used for anchoring equipment shall be stainless steel.

B. Carbon steel anchor bolts shall meet the requirements of ASTM A 307 or ASTM A 193, Grade B8. Bolts shall be threaded per ANSI B1.1.

C. Stainless steel anchor bolts shall meet the requirements of ASTM A 276, Type 304.

D. All nuts shall be heavy hex nuts, ANSI B18.2, semi-finished pattern. Nuts for carbon steel bolts shall meet the requirements of ASTM A 194, Grade 8. Nuts for stainless steel bolts shall meet the requirements of ASTM A 276, Type 304.

E. All washers shall conform to ANSI B27.2 and shall be 18-8 stainless steel.

Part 3 Execution

3.01 Adhesive Anchor Bolt Installation

A. Drilled Holes: Holes for adhesive anchors shall be drilled with a rotary percussion hammer drill with a carbide tipped masonry drill bit conforming to ANSI B94.12-77. Hole diameter and depth shall be as specified by the manufacturer.

B. Hole Cleaning and Preparation: After drilling, dust and fragments shall be cleared out using a water jet, circular wire brush and oil-free compressed air. The hole may be damp but all water must be blown out.

C. Curing: Anchor shall be unloaded and allowed to cure for manufacturer's recommended curing time.

3.02 Expansion Bolt Installation

A. Drill expansion bolt holes into concrete through item being supported or locate by a template. Drill all holes by a tool designed by or approved by manufacturer of expansion anchors.

B. Installation of expansion anchors shall be in compliance with manufacturer's recommendations for maximum holding power, but in no case shall depth of hole be less than four bolt diameters. Minimum distance between center of any expansion anchor and an edge or exterior corner of concrete shall not be less than 4-1/2 times diameter of hole in which it is installed.

3.03 Embedded Anchor Bolt Installation

Anchor bolts shall be properly located and built into connecting work. Bolts shall be preset by the use of templates or such other methods as may be required to locate the anchor bolts accurately. All base plate anchor bolt nuts shall be turned down tight.

END OF SECTION

Part 1 General

1.01 Scope

A. Provide crystalline waterproofing on concrete structures as indicated on plans and specifications.

B. All exterior concrete walls above ground of the Effluent Filters backwash drain box, influent box, and wall between Filter No. 12 and Electrical room shall be waterproofed utilizing a cementitious crystalline type of material.

1.02 Definitions

Cementitious crystalline waterproofing: Mix of Portland cement, fine treated silica sand and active proprietary chemicals which when mixed with water and applied as a cementitious coating, causes a catalytic reaction which generates a non-soluble crystalline formation of dendritic fibers within the pores and capillary tracts of concrete. This process shall cause concrete to become permanently sealed against the penetration of water or liquids from any direction.

1.03 System

Waterproofing by Crystallization System.

1.04 Submittals

Submit manufacturer's product data and installation methods for each type of product required to demonstrate products comply with contract document.

1.05 Quality Assurance

The installer shall be approved by the manufacturer of the waterproofing material.

Part 2 Products

2.01 Manufacturers

Acceptable Manufacturers are ICS Pentron International Ltd., Xypex Chemical Corporation and Kryton International Inc.

Acceptable Products: ICS Pentron International Ltd – Penetron Concrete Waterproofing by Crystallization Coating System Products including, Penetron, Pencrete Mortar and Penplug, Xypex Chemical Corporation - Xypex Concrete Waterproofing by Crystallization Coating System Products include: Xyper Concrete, Modified, and Patch 'n Plug. Kryton International Inc – KrystolT1/T2 Concrete Waterproofing by Crystallization Coating System Products include: KrystolT1/T2, Krystol Bari-Cote and Krystol Plug.

2.02 Mixes

A. General

1. Mix waterproofing material by volume with clean water, which is free from salt and deleterious materials in accordance with manufacturer instructions. As mixture thickens, stir frequently, but do not add additional water.

2. Do not mix bonding agents or admixtures, with crystalline waterproofing materials.

B. Brush Application Mix

1. Measure dry powder and place in mixing container. Measure water and mix into powder with a paddle on a slow speed electric drill (250 RPM) or other type mixer which will ensure mixing and is acceptable to manufacturer.

2. Mixing proportions shall be as follows:

Coverage	Proportions (by Volume)
1.5 pounds per square yard	5 powder to 2 water
2.0 pounds per square yard	3 powder to 1 water

C. Spray Application Mix

1. Mixing shall be same as specified for brush application, except that mix shall be thinner. Use the following proportions only as a guide. Adjust proportions in order to match type of equipment and pressures used.

2. Mixing proportions shall be as follows:

Coverage	Proportions (by Volume)
1.5 pounds per square yard	5 powder to 3 water

D. Dry-Pac Mix for Seal Strips: Using a trowel, mix one part clean water with six parts waterproofing powder for 10 to 15 seconds. Lumps may be present in mixture and will be acceptable. Mix only as much as can be applied in 15 minutes.

Part 3 Execution

3.01 Examination

A. Prior to start of waterproofing installation arrange a visit to project site by waterproofing material manufacturer's representative. Representative shall inspect and certify that surfaces to which waterproofing is to be applied are in acceptable condition.

B. Verify that surfaces are sound and clean.

C. Verify that form release agents, methods, and materials used to cure concrete surfaces are compatible with waterproofing materials.

3.02 Preparation

A. General: Examine surfaces to be waterproofed for form tie holes and structural defects such as honeycombing, rock pockets, faulty construction joints, and cracks. Repair these defects in accordance with manufacturer's product data and as follows:

1. Form tie holes, faulty construction joints and cracks: Chip defective areas in a "U" shaped slot 3/4-inch to 1-inch wide and a minimum of 1-inch deep. Clean slot of debris and dust. Soak with water and remove surface water. Apply a slurry coat of waterproofing materials at the rate of 1.5 pounds per square yard to the slot. Allow slurry to reach an initial set, then fill cavity with Dry-Pac/Penecrete Mortar/Krystol Bari-cote. Compress into cavity using pneumatic packer or block and hammer.

2. Rock pockets, honeycombing or other defective concrete: Rout out defective areas to sound concrete. Remove loose materials and saturate with water. Remove surface water and apply one slurry coat of waterproofing material. After slurry has set, but while it is still "green", fill cavity to surface with non-shrink grout/Penecrete Mortar /Krystol Bari-cote.

B. Sealing Strips

1. Prepare concrete surfaces which come into contact with sealing strips by applying one coat of waterproofing material in a slurry form at rate of 1.5 lb. per square yard. Apply dry-pack or mortar while slurry coat is still "green" but after it has reached an initial set. Install flexible sealant in expansion joints as specified in Sealant Section.

2. Sealing Strips: Where indicated on the Drawings, preformed grooves 3/4-inch wide by a minimum of 1-inch deep, located at construction joints, shall be filled with waterproofing dry-pack and compacted using a pneumatic packer of hammer and block. Forming of sealing strip grooves shall be responsibility of General Contractor.

C. Concrete Finish

1. Concrete surfaces shall have an open capillary system to provide tooth and suction and shall be clean; free from scale, excess form oil, laitance, curing compounds and foreign matter. Smooth surfaces caused by steel forms and surfaces covered with excess form oil or other contaminants shall be washed, lightly sandblasted or waterblasted (minimum 4,000 psi) as necessary to provide a clean absorbent surface. Saturate surfaces to be acid-etched with water prior to application of acid.

2. Vertical surfaces may have a sacked finish.

3.02 Curing

A. General

1. Begin curing as soon as waterproofing materials have set up sufficiently so as not to be damaged by a fine spray. Fog-spray treated surfaces three items a day for a two day period, or cover treated surfaces with damp burlap for the prescribed period.

   a. In warm climates, more than three sprayings per day may be necessary to prevent excessive drying of coating.

   b. Do not lay plastic sheeting directly on waterproofing coating as air contact is required for proper curing.

   c. For swimming pools, reservoirs and wet wells, cure waterproofing materials for 3 days and then allow to set for 12 days before filling structure with liquid.

   d. For structures holding hot or corrosive liquids, cure waterproofing for 3 days and allow to set for 18 days.

   e. If there is poor air circulation in treated areas, provide fans or blown air to aid in curing of waterproofing.

2. Horizontal Surfaces: Begin curing as soon as final set has occurred but before surface starts to dry. Conventional moist procedures such as water pray, and wet burlap may be used. Cure for a minimum of 48 hours.

3. In hot dry sunny conditions, consult manufacturer's product data.

B. Protect cured surfaces from damage to wind, sun, rain and temperatures below 36 degrees F for a period of not less than 48 hours after application. If plastic sheeting is used as protection, it shall be raised off waterproofing coating to allow air circulation.

END OF SECTION

Part 1 General

1.01 Scope

This Section includes, but is not necessarily limited to, standards for cleaning and painting structures and equipment described in the Drawings and Specifications. Furnish all materials, equipment and labor necessary to complete the work.

1.02 Substitutions

To the maximum extent possible, all coatings shall be the products of a single manufacturer. Guidelines for determination of acceptability of product substitutions are given in Section 01630 of these Specifications. Contractors intending to furnish substitute materials or equipment are cautioned to read and strictly comply with these guidelines.

1.03 Submittals

A. All submittals shall be made in accordance with the requirements of Section 01340 of these Specifications.

B. The Contractor shall submit to the Engineer, for review, the following information concerning the materials the Contractor proposes to use in work covered by this Section:

1. A list of all components (paints or other materials) to be used in each painting system required herein.

2. A complete descriptive specification, including manufacturer's data sheet, of each component.

3. Prior to completing the purchase and delivery of the coating material selected by the Contractor, the Contractor shall obtain a letter from the material supplier stating that the selected material is suitable and compatible for application and use as directed under these Specifications, and that if properly applied will provide metal protection and a pleasing appearance for five years or longer.

4. A color chart for each product to be applied.

1.04 Project Meeting

Prior to ordering any of the materials covered under this Section, the Contractor, Engineer, painting subcontractor and paint manufacturer’s representative shall attend a progress meeting in accordance with the requirements of Section 01200 of these Specifications, and review the work to be performed under this Section.

1.05 Painting Requirements

A. Finish paint all exposed surfaces except prefinished items, anodized or lacquered aluminum, stainless steel and copper surfaces. Exposures and surfaces are defined in 3.07 of this Section. Items to be left unfinished or to receive other types of finishes, such as tile, are specifically shown on the Drawings or specified.

1. Unpainted Products: Full field cleaning and priming will be performed in accordance with specification requirements for unpainted products. Maintain adequate equipment on the site to assure proper cleaning.

2. Shop Primed Products

   a. Manufactured products may be shop cleaned and primed. Shop cleaning must equal or exceed cleaning specified in the Painting Schedule. Clean as specified and reprime all abrasions, weld splatter, excessive weathering and other defects in the shop prime coating.

   b. Manufacturers furnishing shop primed products shall certify that cleaning was performed in accordance with Specification requirements and that the specified primer was used.

   c. Fully field clean and prime any shop primed products which the Engineer determines that were not cleaned in accordance with the Specifications prior to priming, that the wrong primer was applied, that the primer was applied improperly, or has excessively weathered, or that the product is otherwise unacceptable.

3. Finish Painted Products: Certain products such as electrical control panels and similar items may, with the approval of the Engineer, be furnished finish painted. Properly protect these products throughout the Project to maintain a bright and new appearance. If the finish surfaces are defaced, weathered or not of the selected color, repaint as necessary.

4. Existing Surfaces

   a. Properly protect existing finish painted items and surfaces from damage throughout the Project.

   b. Repair any damage to existing coatings repaired in accordance with the requirements of this Section, at no expense to the Owner.

5. Hardware: Remove all electrical plates, surface hardware, fittings and fastenings prior to painting operations. These items are to be carefully stored, cleaned and replaced upon completion of work in each area. Do not use solvent to clean hardware that may remove permanent lacquer finish.

1.06 Quality Assurance

A. Only those systems and components which are judged acceptable by the Engineer shall be utilized in the work covered by this item. No materials shall be delivered to the job site until the Engineer has evaluated their acceptability.

B. The following information shall be included on the label of all containers of materials supplied under this item:

1. Manufacturer's name.

2. Type of paint or other generic identification.

3. Manufacturer's stock number.

4. Color (if any).

5. Instructions for mixing, thinning, or reducing (as applicable).

6. Manufacturer's application recommendations.

7. Safety and storage information.

C. All coating material used on this Project shall be purchased specifically for this Project and furnished in new, unopened containers.

D. The Contractor shall obtain the Engineer's review of the first finished room, space, area, item or portion of work of each surface type and color specified. The first room, space, area, item or portion of work which is acceptable to the Engineer shall serve as the Project standard for all surfaces of similar type and color. Where spray application is utilized, the area to be reviewed shall not be smaller than 100 square feet.

1.07 Manufacturer’s Representative During Painting Operations

An authorized representative of each coating manufacturer shall be present at the start-up and weekly during painting operations. Such representatives shall instruct and observe the Contractor’s workers on the manufacturer’s application recommendations.

1.08 Testing Equipment

A. The Contractor shall furnish and make available to the Engineer the following items of testing equipment for use in determining if the requirements of this Section are being satisfied. The specified items of equipment shall be available for the Engineer's use at all times when field painting or surface preparation is in progress:

1. Wet film gauge.

2. Surface thermometer.

3. "Surface Profile Comparator" as published by SSPC (with magnifier and three discs).

4. "Visual Standard for Abrasive Blast Cleaned Steel", as published by SSPC (SSPC-VIS 1-89).

5. "Visual Standard for Power- and Hand-Tool Cleaned Steel", as published by SSPC (SSPC-VIS 3).

6. Holiday (pin hole) detector (low voltage).

7. Sling-psychrometer or other on-site device used to calculate relative humidity and ambient air temperature.

8. Magnetic dry film gauge, meeting the requirements of SSPC-PA2, Type I or Type II, including calibration.

9. “Guide and Reference Photographs for Steel Surfaces Prepared by Waterjetting” as published by SSPC (SSPC-VIS 4).

1.09 Product Handling

A. Delivery

1. Deliver materials in original, sealed containers of the manufacturer with labels legible and intact.

2. Each container shall be clearly marked or labeled to show paint identification, date of manufacture, batch number, analysis or contents, and special instructions. At all times a copy of every component’s MSDS shall be available.

B. Storage

1. Store only acceptable Project materials on the Project site.

2. Store material in a suitable location and in such a manner as to comply with all safety requirements including any applicable federal, state and local rules and requirements. Storage shall also be in accordance with the instructions of the paint manufacturer and the requirements of the insurance underwriters.

3. Restrict storage area to paint materials and related equipment.

4. Place any material, which may constitute a fire hazard, in closed metal containers and remove daily from the Project site.

C. Material Safety Data Sheets: A copy of every component's MSDS shall be available at all times on the Project site.

1.10 Material Schedules

Material Schedules at the end of this Section list prime coats, intermediate coats, finish coats and cover coats that comprise a complete and compatible system of surface protection for the particular substrate. Maintain the unity of these systems, making sure all coats applied to any surface are from the same system and same manufacturer. Verify with the manufacturer the compatibility of the materials used.

Part 2 Products

2.01 Abrasive Material

A. The abrasive used in the abrasive cleaning shall be a material acceptable to the regulatory agencies of the State of Georgia for use in the described work. The material shall be of a shape and size to produce a uniform surface of acceptable profile to properly bond the prime coat.

B. The abrasive may be a combination of materials, including additives such as dust inhibitors and Blastox®.

C. If Blastox® is used, it shall be blended with the blasting abrasive by a blending facility authorized by the TDJ Group, Inc.

2.02 Coating Materials

A. Acceptable Manufacturers: The only acceptable manufacturers and products shall be those listed in the Material Schedules at the end of this Section.

B. All applicable data currently published by the paint manufacturer relating to surface preparation, coverages, film thickness, application technique, drying and overcoating times is included by reference as a part of this Section. It is the responsibility of the Contractor to obtain and fully understand the appropriate data sheets for the coatings specified.

C. Products

1. Paints shall be factory mixed and delivered to the site in unbroken original packages bearing the manufacturer's name and brand designation and shall be applied in strict accordance with the manufacturer's printed specifications. Two-component coatings shall be mixed in accordance with manufacturer's instructions. All two-component coatings, once mixed, shall be applied within the pot-life recommended by the manufacturer.

2. Unless otherwise specified, paints shall be of the best grade. All thinners, driers, varnish, etc., shall be of the best grade and shall be furnished by the coating manufacturer for use with the specified paints.

D. Colors: The Owner will select the colors to be used on the various portions of the work. Provide color cards for the coatings proposed. Where more than one coat of paint is required, job tint off-shade the paint for each undercoat to show complete coverage.

2.03 Mixing and Tinting

A. When possible, all paints and other materials shall be mixed and tinted by the paint manufacturer prior to delivery to the job site.

B. When job site mixing and/or tinting is required, the manufacturer's recommendations shall be strictly adhered to. The Contractor shall be solely responsible for the proper conduct of all on-site mixing and/or tinting.

2.04 Pipe and Equipment Identification

Different colors will be used on pumps, motors, valves, piping systems and other surfaces as shown in Table 1.

2.05 OSHA Safety Color Usage Guide

A. OSHA Safety colors, in accordance with ANSI Z3.1, shall be used for marking physical hazards and safety equipment and locations. The following OSHA Safety Color Usage Guide will be used in determining the coating color and type of marking required.

Safety Red	Safety Orange	Safety Yellow	Safety Green
		Physical Hazard CAUTION (Generally used with Black in checks or stripes)	Safety Equipment and Locations
Fire protection equipment	Exposed box housings	Unguarded edges of platforms	First aid kits and stretchers
Fire boxes	Exposed edges of pulleys, gears, etc.	Elevator door edges	First aid signs, dispensaries and drinking water stations
Extinguishers	Exposed box housings	Bollards	
Exit signs	Safety starting buttons	Pulley Blocks	
Sprinkler piping		Material handling equipment	

Safety Red	Safety Orange	Safety Yellow	Safety Green
Portable containers of flammable liquids			
Emergency stop bars			

2.06 Pre-Blast Lead Treatment Coating

The pre-blast lead treatment coating shall be Enviro-Prep System product number 33010, as manufactured by Hoffer's, Inc. Coatings Division (800-596-6282), or Pre Tox 2000 as manufactured by NexTec, Inc. (800-338-8296).

Part 3 Execution

3.01 General

A. Protect other surfaces from paint and damage. Furnish sufficient shields and protective equipment to prevent spray or droppings from fouling surfaces not being painted. Repair damage as a result of inadequate or unsuitable protection.

B. The Contractor's on-site representative shall keep a record of work performed each day and shall submit it to the Engineer weekly. The forms for this record will be furnished by the Engineer.

C. No coat of paint shall be applied until the surface has been inspected and accepted by the Engineer. The Contractor shall give at least 24 hours notice to the Engineer when cleaning is to be performed to prevent inspection delays. The Contractor shall provide the necessary access for inspection by the Engineer.

D. Shop applied prime coatings which are damaged during transportation, construction or installation shall be thoroughly cleaned and touched-up in the field as directed by the Engineer. The Contractor shall use repair procedures which insure the complete protection of all adjacent primer. The specified repair method and equipment may include wire brushing, hand or power tool cleaning, or dry air blast cleaning. In order to prevent injury to surrounding painted areas, blast cleaning may require use of lower air pressure, small nozzle and abrasive particle sizes, short blast nozzle, distance from surface, shielding and masking. If damage is too extensive or uneconomical to touch-up, then the item shall be re-cleaned and coated or painted as directed by the Engineer.

3.02 Cleaning Area

Construct a temporary shed no smaller than 40 feet wide and 60 feet long for field cleaning, including blasting and priming operations. Maintain this area for all painting operations until all such work has been completed and approved. Provide all fixtures and appurtenances required to perform the work, including fixtures to support the work off the ground and proper storage facilities.

3.03 Environmental Conditions

A. Environmental conditions which affect coating application include, but are not necessarily limited to, ambient air temperature, surface temperature, humidity, dew point and environmental cleanliness. Comply with the manufacturer's recommendations regarding environmental conditions under which coatings may be applied.

B. Surface preparation and cleaning of the exterior surfaces must be performed during periods of still air or only a slight breeze so that fallout of the dust produced does not drift onto adjacent property. The Owner reserves the right to temporarily stop the Contractor from exterior blasting (or painting) when by observation it is apparent that the wind direction or velocity prevents compliance with this requirement. Any clean-up of fall-out on adjacent property shall be the responsibility of the Contractor.

C. All blast residue from the tank shall be properly disposed of off-site by the Contractor.

D. No paint shall be applied upon damp or frosty surfaces, or in wet or foggy weather. No paint shall be applied in temperatures below 40 degrees F, when freezing (32 degrees F) is predicted within 24 hours of application, or under temperature or humidity conditions not recommended by the manufacturer. However, in no case shall coatings be applied when the surface temperature is within 5 degrees F of dew point, and in no cases shall coating be applied over a damp surface.

3.04 Safety

A. General

1. The Contractor is responsible for the safety of all workers and subcontractors and suppliers performing work on this Project.

2. The Contractor shall protect the Owner, their agents, and the General Public from harm attributable to the Contractor's performance, or non-performance, of the work on this Project. The protection shall include, but not be limited to, providing the necessary safety equipment and instructions for its use by the Owner, and their agents.

3. The Contractor shall protect the existing structures and environment from damage attributable to the Contractor's performance, or non-performance, of the work on this Project.

4. The Contractor shall comply with the applicable standards of 29 CFR Part 1910 and 29 CFR Part 1926.

5. The listing of the following potential hazards shall in no way relieve the Contractor's responsibility for safety on this Project.

B. The interior of tanks may be considered a confined space hazard. The Contractor shall confirm to the Owner, in writing, prior to the start of the Project that the Contractor has training programs, trained personnel, and is otherwise in compliance with CFR 1910.146.

3.05 Surface Preparation

A. General: All surfaces shall be thoroughly cleaned, dried, and free from oil, grease or dust. All concrete shall have cured a minimum of 21 days before painting. All fabricated metal products shall have all weld flux and weld spatter removed and sharp peaks in welds ground smooth. The Engineer will inspect the surface preparation prior to the application of coatings. If the preparation is found to be satisfactory, a written order will be given to proceed with coatings.

B. Ferrous Metals: Standards for the surface preparation of ferrous metals required in the Material Schedules are the standards of the SSPC – The Society for Protective Coatings (SSPC, SP-1 through SP-10). Inspection of these surfaces will be evaluated by field comparison with visual comparator panels. These panels shall be securely wrapped in clear plastic and sealed to protect them from deterioration and marring.

C. Concrete Surfaces: For all concrete surfaces, the following surface preparation shall be employed:

1. CC-1 - Wash: Wash and scrub all surfaces with a solution of 1-1/2 ounces of soap chips and 1-1/2 ounces of trisodium phosphate in each gallon of water used. Flush away all soap and dirt with clean water. After this washing the surface will be re-checked and any rough areas not suitable for painting shall be sandblasted smooth.

2. CC-2 - Acid Etch: Surface preparation for painting shall not commence until 7 days after the concrete has been pronounced cured. Wash and scrub all surfaces with a solution of 1-1/2 ounces of soap chips and 1-1/2 ounces of trisodium phosphate in each gallon of water used. Flush away all soap and dirt with clean water and then etch the surface with a 15 percent or stronger solution of muriatic acid until an openfaced granular texture, similar to fine sandpaper, is obtained. Any areas that remain smooth are to be re-etched until the desired texture is achieved. Flush and scrub away with clear water all acid and loosened particles.

3. CC-3 - Blast Cleaning: Remove all form oil and dirt by washing the surface with a solution of 1-1/2 ounces of soap chips and 1-1/2 ounces of trisodium phosphate in each gallon of water used. Blast clean all laitance and other foreign material from the surface of the concrete until an openfaced granular texture similar to fine sandpaper is achieved. These results should be accomplished with blast cleaning similar to "brush blasting" steel surfaces.

D. Wood Surfaces: All wood surfaces shall be clean, dry and adequately protected from dampness. Sandpaper to a smooth, even surface, then dust off. After priming coat has dried, apply shellac to all knots, pitch and resinous sapwood. Putty all nail holes, cracks, open joints and other defects; color putty to match finish paint or stain.

3.06 Application

A. Surface Preparation: After specified surface preparation, all surfaces shall be brushed free of dust or foreign matter. Surfaces shall be completely dry before any paint is applied. All voids, open or hollow places in masonry shall be repaired with an epoxy patching compound.

B. Application: Paint shall be evenly spread in the proper thickness, so that there shall be no drops, runs or saggings of the coating. Where runs and drops do occur, they shall be removed and the surface re-coated to the satisfaction of the Engineer. Sufficient time, as directed by the manufacturer, shall be allowed for the paint to dry before the application of succeeding coats.

C. Protection of Work Area: Use drop cloths or other suitable means to protect other surfaces of the structure or equipment in place. Upon completion of the work, remove all paint spots from surfaces as directed by the Engineer.

D. Inspection: The Engineer will inspect each coat prior to the application of subsequent coats. If the work is found to be satisfactory, a written order will be given to proceed.

E. Defective Work: Remove and replace, at the direction of the Engineer, any painting work found to be defective or applied under adverse conditions.

3.07 Painting Schedule

A. General: The Painting Schedule summarizes the painting systems to be applied to the various surfaces. Items which appear in the Painting Schedule are defined in following paragraphs.

B. Exposure terms refer to the environmental conditions to which different surfaces may be exposed. A surface may exist in more than one exposure, e.g. an exterior wall can be categorized not only as "above grade", but also as "below grade", where the exposure is delimited by the grade line.

1. Interior: All surfaces within the confines of a building or other enclosure not constantly exposed to weather, including concealed surfaces subject to trapped moisture, heat or other deteriorating conditions and all surfaces exposed to view.

2. Exterior

a. Above Grade: All surfaces above finished grade and exposed to weather.

b. Below Grade: All surfaces below the finished grade line. Building surfaces with this exposure shall only be painted when they are structurally common with an interior surface, e.g. exterior walls of a dry pit, not the exterior wall of a below grade tank.

3. Submerged: All surfaces below a water surface or exposed to spray. Surfaces exposed to spray include all areas within 6-inches of maximum water surface in quiescent tanks and within 18-inches of maximum water surface in mixed or agitated tanks. Building surfaces with this exposure shall only be painted when surfaces above water level have an interior exposure.

C. Surfaces

1. Floors: Interior surfaces subject to foot or roller traffic.

2. Building Surfaces: All structural and architectural surfaces except floors. Building surfaces include, but are not limited to, doors and frames, windows and frames, floor doors and walls.

3. Piping: All plumbing and process piping and accessories including valves, fittings, pipe supports, electrical conduit and similar related items.

4. Equipment: All mechanical, electrical, and architectural equipment, items, and accessories installed in the work and not defined above. Equipment includes, but is not limited to: pumps, motors, cabinets, ducts, tanks and process equipment.

3.08 Material Schedules

Material Schedules list pretreatment coats, wash coats, seal coats, prime coats, intermediate coats, finish coats and cover coats that comprise a complete and compatible system of surface protection for the particular substrate. Maintain the unity of these systems, making sure all coats applied to any surface are from the same system and same manufacturer. Verify with the manufacturer the compatibility of the materials used.

3.09 Maintenance Materials

Furnish the Owner at least one gallon of each type and color of paint used for finish coats and one gallon of each type of thinner required. Containers shall be tightly sealed and clearly labeled.

3.10 Coating Repair

Where coatings have been damaged, the surfaces shall be cleaned and repainted. Surface preparation shall conform to SSPC-SP 11, and feathered into undamaged areas. Painting shall be performed as specified for the damaged surface.

Painting Schedule

Exposures	Surfaces	System Schedules				
		Concrete & Concrete Block Substrate	Non-Ferrous Metals Substrate	Ferrous Metals Substrate	Wood Substrate	Drywall Substrate
Interior	Floors	-	-	-	-	-
	Building Surfaces**	134	-	144 147	221	160
	Equipment*	-	157	144 147	-	-
	Piping*	-	157	144 147	-	-
Exterior Above Grade	Building Surfaces**	234	257	247	221	-
	Equipment*	-	257	247	-	-
	Piping*	-	257	247	-	-
Exterior Below Grade	Piping*	-	257	247	-	-
Submerged Water	Piping*	-		344W	-	-
	Equipment*	-		344W	-	-
Submerged Wastewater	Piping*			544		
	Equipment*			544		

* See coating, lining, and/or painting paragraphs in individual piping or equipment Specification Sections.

** See finish schedule for where each type shall be used.

Schedule Numbering Guide

First Number - Exposure		Second Number - Substrate		Third Number - Coating Type		Final Letter	
1	Interior and Weather Protected	1	Non-Ferrous Metals	1	Alkyd	S	Sewage
2	Exterior Weather Exposure	2	Wood	2	Asphaltic	W	Potable Water
3	Submerged in Potable Water but Protected from Sunlight	3	Concrete, Concrete Block, Masonry	4	Epoxy	F	Floors
4	Submerged in Potable Water and Exposed to Sunlight	4	Ferrous Metals	5	Vinyl	C	Severe Chemical Exposure
5	Submerged in Wastewater	5	Galvanized Ferrous Metals	6	Coal Tar		
		6	Drywall	7	Polyurethane		
		7	PVC Pipe	8	Acrylic		
				9	Zinc		
				0	Latex		

Material Schedules

System: 134
Type: Epoxy
Use: Interior Concrete and Masonry

Surface Preparation: CC-1

NTS: This is rarely used for concrete. Other options include:
(1) do nothing
(2) rubbed stone finish (see Section 03300) or
(3) Brushed finish (Thorocoat) (see Section 03300)

Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Ameron	Sherwin Williams
1st		Sanitile 600/600 TG	Epoxy-Masonry Filler 54-660	Polyfill Block Filler	Amerlock 400 BF	Kem Cati-Coat HS Epoxy Filler
2nd	4.0	Sanitile 655	Series 66 Hi-Build Epoxoline	Armorguard Epoxy	Amerlock Series	Macropoxy 646 FC Epoxy
3rd	4.0	Sanitile 655	Series 66 Hi-Build Epoxoline	Armourguard Epoxy	Amerlock Series	Macropoxy 646 FC Epoxy
System	8.0					

System: 144
Type: Epoxy
Use: Interior Ferrous Metal

Surface Preparation: SP-10

Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Ameron	Sherwin Williams
1st	3.0 – 5.0	Carboguard 893 SG	Series 66-1211 Epoxoline Primer	Armorguard P-14 Primer	Amerlock Series	Macropoxy 646 FC Epoxy
2nd	4.0 – 6.0	Carboguard 890	Series N69-Color Hi-Build Epoxoline II	Armorguard Epoxy	Amerlock Series	Macropoxy 646 FC Epoxy
3rd	4.0 – 6.0	Carboguard 890	Series N69-Color Hi-Build Epoxoline II	Armorguard Epoxy	- - -	Macropoxy 646 FC Epoxy
System	12.0					

System: 147
Type: Polyurethane
Use: Interior Ferrous Metal

Surface Preparation: SP-10

Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Ameron	Sherwin Williams
1st	3.0	Carboguard 893 SG	Series 66-1211 Epoxoline Primer	Armorguard P-14 Primer	Amerlock Series	Macropoxy 646 FC Epoxy
2nd	4.0 – 6.0	Carboguard 893 SG	Series 66-Color Hi-Build Epoxoline	Armorguard Epoxy	Amercoat 450 Series	Macropoxy 646 FC Epoxy
3rd	2.0 - 4.0	Carbothane 134 HG	Series 1074-Color Endura-Shield	Indurethane 5500 Enamel	- - -	Sherthane 2K Urethane
System	10.0					

System: 157
Type: Polyurethane
Use: Galvanized Metals

Surface Preparation: SP-1 With Manufacturer's Recommended Pre-Treatment

NTS: Paint galvanized metal only when absolutely necessary.

Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Ameron	Sherwin Williams
1st	5.0	Carboguard 893 SG	Series 66 Hi-Build Epoxoline	Pretreat using Vinyl Wash Primer Armorguard Epoxy	Pretreat using Galvapret 5 Amercoat 370 or 385	Macropoxy 646 FC Epoxy
2nd	2.0	Carbothane 134 HG	Series 1074 Endura-Shield IV	Indurethane 5500 Enamel	Amercoat 450 Series	Sherthane 2K Urethane
System	7.0					

System: 160
Type: Latex
Use: Interior Drywall
Surface Preparation: Clean and Dry

Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Ameron	Sherwin Williams
1st	1.0	Sanitile 120	Self-Priming	AC-210	Self-Priming	Prep Rite 200 Interior Latex Primer
2nd	1.5 – 3.0	Carbocrylic 3359	Series 6 Tneme-Cryl	AC-230	Amercoat 220	Prep Rite 200 Interior Latex Flat
3rd	2.0	Carbocrylic 3359	Series 6 Tneme-Cryl	AC-230	Amercoat 220	Prep Rite 200 Interior Latex Flat
System	5.0					

System: 168
Type: Acrylic Epoxy
Use: Interior Drywall
Surface Preparation: Clean & Dry

Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Ameron	Sherwin Williams
1st	1.0	Sanitile 120	51-792 PVA Sealer	AC-303	PVA Sealer	Prep Rite 200 Interior Latex Primer
2nd	2.0 – 4.0	Carbocrylic 255	Series 113-Color H.B. Tneme-Tufcoat	Ac-303	Amercoat 335	Waterbased Catalyzed Epoxy
3rd	2.0 - 4.0	Carbocrylic 255	Series 113-Color H.B. Tneme-Tufcoat		Amercoat 335	Waterbased Catalyzed Epoxy
System	5.0					

System: 221
Type: Alkyd
Use: Exterior Wood

Surface Preparation: As Specified For Wood

Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Ameron	Sherwin Williams
1st	2.0	Sanitile 120	Series 36-603 Undercoater	AC301	Amercoat 5105	A-100 Alkyd Primer
2nd	1.5 – 2.0	Carbocoat 139	Series 23-Color Enduratone	Amorlux 2500 Enamel	Amercoat 5450	Industrial Enamel B-54
3rd	1.5 – 2.0	Carbocoat 139	Series 23-Color Enduratone	Armorlux 2500 Enamel	Amercoat 5450	Industrial Enamel B-54
System	5.0					

System: 234
Type: Epoxy
Use: Exterior Concrete and Masonry

Surface Preparation: CC-3
Note: Concrete shall be at least 28 days old before any of these coatings are applied.

NTS: This is rarely used for concrete. Other options include:
(1) do nothing
(2) rubbed stone finish (see Section 03300) or
(3) Brushed finish (Thorocoat) (see Section 03300)

Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Ameron	Sherwin Williams
1st	8.0 – 10.0	Sanitile 600/600 TG	Series 156 Enviro-Crete	AC-403	Amerlock 400BF	Loxon Primer
2nd	5.0 – 7.0	Carboguard 890	Series 156 Enviro-Crete	AC-403	Amerlock 2	Loxon Masonry Coating
3rd	As Needed	-			- - -	Loxon Masonry Coating
System	13.0					

System: 245
Type: Vinyl Ester
Use: Ferrous Metal
Surface Preparation: SP-5

Coat	Minimum Dry Film Thickness (Mils)	Tnemec	Sauereisen	Carboline	Ameron	Sherwin Williams
1st	12.0 – 18.0	Series 120-5002 Vinester Beige Primer	Fibercrete	Plasite 4007 Off-White		Magnalux 304 FF Flake Filled Vinyl Ester
2nd	12.0 – 18.0	Series 120-5001 Vinester Gray Finish	Fibercrete	Plasite 4007 Gray		Magnalux 304 FF Flake Filled Vinyl Ester
System	24.0					

System: 247
Type: Polyurethane
Use: Exterior Ferrous Metal
Surface Preparation: SP-10

Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Ameron	Sherwin Williams
1st	3.0	Carboguard 893 SG	Series 66-1211 Epoxoline	Armorguard P-14 Primer	Amercoat 370 or 385	Macropoxy 646 FC Epoxy
2nd	4.0 - 6.0	Carboguard 893 SG	Series 66-Color Epoxoline	Armorguard Epoxy	Amercoat 370 or 385	Macropoxy 646 FC Epoxy
3rd	2.0 - 3.0	Carbothane 134 HG	Series 1074 Endura-Shield IV	Indurethane 5500 Enamel	Amercoat 450 Series	Sherthane 2K Urethane
System	11.0					

System: 257
Type: Polyurethane
Use: Exterior Non-Ferrous Metals
Surface Preparation: SP-1

Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Ameron	Sherwin Williams
1st	4.0 - 6.0	Carboguard 893 SG	Series 66-Color Hi-Build Epoxoline	Amorguard Epoxy	Amercoat 370 or 385	Macropoxy 646 FC Epoxy
2nd	2.0 - 3.0	Carbothane 134 HG	Series 1074-Color Endura-Shield IV	Indurethane 5500 Enamel	Amercoat 450 Series	Sherthane 2K Urethane
System	8.0					

System: 333W
Type: Epoxy
Use: Submerged Concrete – Potable Water
Surface Preparation: CC-3

Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Ameron	Sherwin Williams
1st	4.0 - 6.0	Carboguard 561/561 LT Beige	Series 20-1255 Pota-Pox Beige	PE-54 Epoxy	Amerlock Series	Macropoxy 646 NSF Epoxy
2nd	4.0 - 6.0	Carboguard 561/561 LT White	Series 20-AA90 Pota-Pox White	PE-54 Epoxy	Amerlock Series	Macropoxy 646 NSF Epoxy
3rd	2/0 – 3.0	Carboguard 561/561 LT White	Series 20-AA90 Pota-Pox White	PE-54 Epoxy	-	Macropoxy 646 NSF Epoxy
System	10.0					

System: 344W
Type: Epoxy
Use: Submerged Ferrous Metal-Potable Water

Surface Preparation: SP-10
All coatings provided under this system shall be NSF 61 approved

Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Ameron	Sherwin Williams
1st	3.0	Carboguard 561/561 LT Red	Series 20-1211 Pota-Pox Red	PE-54 Epoxy	Amercoat 370	Macropoxy 646 NSF Epoxy
2nd	4.0 - 6.0	Carboguard 561/561 LT Beige	Series 20-1255 Pota-Pox Beige	PE-54 Epoxy	Amercoat 370	Macropoxy 646 NSF Epoxy
3rd	4.0 – 6.0	Carboguard 561/561 LT White	Series 20–WH02 Pota-Pox Tank White	PE-54 Epoxy	Amercoat 370	Macropoxy 646 NSF Epoxy
System	12.0					

System: 444
Type: Epoxy
Use: Submerged Ferrous Metal

Surface Preparation: SP-10

Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Ameron	Sherwin Williams
1st	4.0 - 6.0	Carboguard 561/561 LT	Series 66-Color Hi-Build Epoxoline	PE-54 Epoxy	Amercoat 370	Macropoxy 646 FC Epoxy
2nd	4.0 - 6.0	Carboguard 561/561 LT	Series 69-Color Hi-Build Epoxoline II	PE-54 Epoxy	Amercoat 370	Macropoxy 646 FC Epoxy
3rd	4.0 – 6.0	Carboguard 561/561 LT	Series 69-Color Hi-Build Epoxoline II	PE-54 Epoxy	Amercoat 370	Macropoxy 646 FC Epoxy
System	12.0					

System: 542
Type: Asphaltic
Use: Below Grade Piping
Surface Preparation: SP-2 or SP-3

Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Ameron	Sherwin Williams
1st	8.0 – 12.0	Bitumastic 300 M	46-465 H.B. Tnemecol	Ruff Stuff 2100	78HB	Targuard
2nd	As Needed					
System	10.0					

System: 544
Type: Epoxy
Use: Submerged Ferrous Metal
Surface Preparation: SP-10

Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Ameron	Sherwin Williams
1st	4.0 - 6.0	Carboguard 890	Series 66-Color Hi-Build Epoxoline	Perma-Clean II Epoxy	Amercoat 370	Macropoxy 646 NSF Epoxy
2nd	4.0 - 6.0	Carboguard 890	Series 69-Color Hi-Build Epoxoline II	Perma-Clean II Epoxy	Amercoat 370	Macropoxy 646 NSF Epoxy
3rd	4.0 - 6.0	Carboguard 890	Series 69-Color Hi-Build Epoxoline II	Perma-Clean II Epoxy	Amercoat 370	Macropoxy 646 NSF Epoxy
System	12.0					

Pipe Identification and Color Coding

	Paint Colors		
Pipe System	Pipe	Letters and Arrows	Stencil Text
Air (Compressed)	Light Green	Black	Air
Air (Process)	Light Green w/Black Bands	Black	Air Proce4ss
Air, Instrument	Light Purple	Black	Air Instrument
Alum	Dark Blue/w Light Brown Bands	Light Brown	Alum
Ammonia Gas	Yellow w/Dark Green Bands	Dark Green	Ammonia Gas
Ammonia Solution	Yellow w/Light Blue Bands	Light Blue	Ammoniation Solution
Backwash Water	Light Grey w/Light Green Bands	Light Green	Backwash Water
Chlorine Gas	Yellow w/Red Bands	Red	Chlorine Gas
Chlorine Solution	Yellow	Black	Chlorine Solution
Dewatering	Black w/Orange Bands	Orange	Dewatering
Digested Sludge	Dark Brown w/Red Bands	Red	Digested Sludge
Drains (Plant)	Black w/White Bands	White	Drain
Effluent, Secondary	Light Grey w/Black & White Bands	Black	Secondary Effluent
Filter Effluent	Light Grey w/White Bands	White	Filter Effluent
Filtrate	Black w/Yellow Bands	Yellow	Filtrate
Foam Spray Water	Dark Green	White	Foam Spray Water
Gasoline	Orange	White	Gasoline
Hydraulic Fluid	Purple	White	Hydraulic Fluid
Injector Water	Light Grey w/Purple Bands	Light Purple	-
Lubricating Oil/Grease	Dark Blue w/Red Bands	Red	Lubricant Oil/Grease
Mixed Liquor (Aeration Tank Effluent)	Light Grey w/Pink Bands	Pink	Mixed Liquor
Polymer	Pink w/Dark Green Bands	Dark Green	Polymer
Potable Water	Light Blue	White	Potable Water (Cold) (Hot)
Raw Sewage (Wastewater)	Dark Grey	Orange	Sewage
Return Activated Sludge	Light Brown	White	Return Sludge
Scrubber Water	Light Green w/Dark Brown Bands	Dark Brown	-

	Paint Colors		
Pipe System	Pipe	Letters and Arrows	Stencil Text
Scum	Light Brown w/Pink Bands	Pink	Scum
Scum Decant	Light Brown w/Red Bands	Red	Scum Decant
Sump Drains (Plant)	Light Grey w/Orange Bands	Orange	Sump
Thickener Filtrate (Supematant)	Light Grey w/Dark Brown & Light Brown Bands	Light Brown	Thickener Filtrate (Supermatant)
Thickened Sludge	Light Brown w/Light Green Bands	Light Green	Thickened Sludge
Utility Water	Dark Green w/Yellow Bands	Yellow	Utility Water (Non-Potable)
Vents (Plant)	Black	White	Vent (Plant)
Waste Activated Sludge	Light Brown w/Black Bands	Black	Waste Sludge

Color Coding General Notes

1. All banding to be 2-inches wide and four feet on center.

2. Sample, drain, vent, metering, blowoff, decant, and hot lines shall be painted the same color combination as the piping system from which the line originates unless specified otherwise above. The additional pertinent text shall be applied to the pipe.

3. Insulated pipe, jacketed with canvas, shall be painted with the color combination specified above.

4. Insulated pipe, jacketed with aluminum and/or stainless steel shall have the jacket unpainted. When valves and fittings for such lines are not insulated, the valves and fittings shall be color coded.

5. Building service lines such as plumbing lines, HVAC lines, and electrical conduit, shall not be color coded but shall be painted the same color as the background construction.

6. All sludge lines not otherwise specified above shall be painted dark brown and stenciled as directed by the Engineer.

7. All polymer lines not otherwise specified above shall be painted pink and stenciled as directed by the Engineer.

8. All lettering shall be done in capital letters of approved size and type.

9. Legend symbols shall be applied on piping on every run and spaced not greater than 8 feet apart.

10. Text shall be applied on piping in the middle of pipe runs for runs under 50 feet or in one room, whichever is the least distance. On runs greater than 50 feet, text shall be applied at third points in the run and no more than 35 feet apart.

11. Pumps, chemical tanks and other items of equipment to be painted shall be painted a color corresponding to their service, in accordance with the above schedule.

END OF SECTION

Part 1 General

1.01 Scope

A. Provide all labor, materials, tools, equipment, and related items to furnish and install motorized actuators on valves as specified in these Specifications.

B. All motorized actuators shall be by the same manufacturer. The Contractor shall coordinate this requirement with all valve manufacturers.

C. Actuators listed in Table 1 shall be replaced irrespective of valve status of replace/adjust/none.

1.02 Design Requirements

A. The valve manufacturer shall be responsible for determining maximum torque requirements of the motorized actuators.

B. Motorized actuators shall be of the non-intrusive design housed in a double sealed watertight enclosure rated to IEC Publication 529, IP68 (6 meters, 48 hours). Where indicated in the Tables of this Specification, furnish an explosion proof enclosure in lieu of a watertight enclosure.

C. The motorized actuators shall be suitable for use on a nominal 460 Volt, 3 Phase, 4 wire, 60-Hertz power supply. All controls shall operate on 115 volt AC power and a control power transformer shall be provided within the unit as required. All actuators shall have a control enclosure heater to prevent condensation.

D. The motorized actuators shall be a self contained units consisting of the following:

1. Electric motor.
2. Position encoder.
3. Electronic torque sensor.
4. Integral reversing starter.
5. Electronic control, protection, and monitoring package.
6. Manual override hand wheel.
7. Valve interface bushing.
8. LCD display
9. Local control switches all contained in a sealed enclosure suitable for the enclosure rating specified.

E. All calibration shall be possible without removing any covers.

F. The actuator shall include a device to ensure that the motor runs with the correct rotation for the required direction of valve travel with either phase sequence of the three-phase power supply connected to the actuator.

G. The actuator shall be capable of functioning in an ambient temperature ranging from minus 22°F (-30°C) to + 140°F (+60°C).

1.03 Submittals

A. Submit shop drawings and engineering data in accordance with Section 01340 of these Specifications.

B. Operation and maintenance manuals shall be furnished in accordance with the requirements of Section 01730 of these Specifications.

C. All submittals shall be assembled and made by the valve manufacturer.

D. The manufacturer shall furnish test data from an independent testing agency certifying the enclosure rating.

1.04 Storage and Protection

Motorized actuators shall be stored and protected in accordance with the requirements of Section 01611 of these Specifications.

1.05 Quality Assurance

A. The manufacturer shall provide written certification to the Engineer that all equipment furnished complies with all applicable requirements of these Specifications.

B. The valve manufacturers shall provide unit responsibility for all items specified in this Section. Unit responsibility shall require that all items be products of, or warranted by, the valve manufacturer. The valve manufacturer shall be responsible for all coordination between components and provide all submittals, installation and start-up assistance, and certification on the equipment as a unit.

Part 2 Products

2.01 Motorized Actuators

A. Actuator shall be an electric motor driven gear reducer with integral controls for motorized and manual operation or rising and non-rising stem valves. The actuating unit shall be mounted on and assembled to the valve. The actuator shall provide quarter-turn operation for butterfly and ball valves. Each motor shall be high torque, totally enclosed in a NEMA rated housing.

B. The motor starting torque shall be equal to 2-1/2 times the running torque. The motor shall be 3-phase, 60-Hertz, 460 volt with AIEE Class F insulation, and a thermistor embedded within the motor windings to prevent damage due to overload. The motor shall be easily removed through the use of a plug-in connector and shaft coupling. Motor shall have the capability of removal without the need of draining oil from the actuator gearbox.

C. The power transmission shall be completely bearing – supported, and consist of a hardened alloy steel worm and bronze worm gear, lubricated using oil or grease designed specifically for extreme pressure gear transmission service. Where the actuator operates ball valves, the drive shall incorporate a lost-motion hammer-blow feature.

D. The actuator shall be furnished with a drive bushing or top entry stem nut easily detachable for machining to suit the valve stem or gearbox input shaft. Thrust bearings, when housed in a separate thrust base, should be of the sealed-for-life type.

E. A handwheel and declutch lever shall be provided for manual operation. The handwheel shall not rotate during electric operation nor can a seized motor prevent manual operation. Changing from motor to manual operation shall be accomplished by engaging the declutch lever. Energizing the motor shall return the actuator to motor operation. The declutch lever shall be pad lockable. Lost motion “hammer blow” effect shall be provided with both direct and independently geared hand wheels.

F. The operator shall operate the valve from full open to full close in 60 seconds as shown in Table 1 of this Section.

G. All field terminations shall be located in a termination chamber that is separately sealed from all other actuator components. Site wiring shall not expose actuator components to the environment. The internal sealing within the termination chamber is suitable for the enclosure rating specified. The chamber shall include screw-type terminals, 3 for power, 1 for ground, and 40 for control, for site connections.

H. The actuator shall not require an electrical supply connection while being stored on the plant site prior to being installed.

I. All calibrations shall be possible without removing any covers and without the use of any special tools. The local operation display and calibration of actuator shall be through a local display. The local display shall be a LCD message screen. For actuators requiring an infrared setting tool, one tool shall be provided for every three actuators, with a minimum of two tools provided.

J. The unit shall continuously monitor valve position and torque and shall be able to detect the valve position even during a power failure. The actuator shall include an adjustable electronic torque sensor to interrupt the motor power circuit when an

obstruction is encountered in either direction of travel or when torque seating/unseating of valves is required for tight shut-off. Control of valve position in proportion to a 4-20 mADC signal shall be accomplished by comparing the command signal to an internal position feedback.

K. Remote operation when required shall be accomplished by use of 2, 3 or 4 wire control and shall be internally powered or 4-20 maDC.

L. Analog control: The analog comparator circuit shall provide a 4-20mADC output signal for remote position indication. The system shall allow calibration of Zero, Span, Band and Delay. Both input and output signals shall be optically isolated. The actuator shall be configurable for Remain-In-Last Position or Travel to any preset position on loss of control signal.

M. The controls shall provide for local and remote operation. The pushbutton control shall be provided with open, close and stop pushbuttons, open and close indicator lights, and local/remote selector switch. The controls shall include a transmitter for remote indication of valve position.

N. The actuator and controls shall be rated for Class I, Group D, Division 2 service.

O. Actuators for modulating service shall contain all the design and control features as required for the open/close actuators. In addition, they shall contain the following controls:

1. Actuators shall respond to a 4-20 mA input signal.

2. Actuators shall be capable of a maximum pulse rate of 1000 starts per hour with an accuracy of + two percent.

3. Actuators shall have a system adjustment span of zero - deadband.

4. Actuators shall have a plug in circuit card and capabilities of either "lock in last position" or "fail to close position".

5. Actuators shall be capable of transmitting a 4-20 mA signal for remote indication of valve position.

6. All controls and terminal blocks shall be contained in the same compartment which is integral to the actuator.

P. Actuators to receive position set point, and open close signals via Modbus RS-485 serial communication from PLC or Manufacturers Master station to be located in same control cabinet as PLC, and shall report all valve status, open, close , running, or fault by the same means.

Q. Motorized actuators shall be Model Accutronix MX as manufactured by Flowserve/Limitorque, Model TEC2000 as manufactured by EIM Controls or Model IQ as manufactured by Rotork Controls.

2.02 Painting

The actuator shall be shop painted with a high-solids epoxy primer, and finish painted with a polymer powder coat suitable for field recoating with a paint as specified in Specification Section 09900.

Part 3 Execution

3.01 Installation

Motorized actuators shall be installed as shown on the Drawings, specified herein, and in accordance with the manufacturer's recommendations.

3.02 Inspection and Testing

Following installation, operating tests will be performed to demonstrate to the Engineer that all equipment and accessories will function in a satisfactory manner. The Contractor shall make, at Contractor's own expense, all necessary changes, modifications and/or adjustments required to ensure satisfactory operation.

TABLE 1

MOTORIZED ACTUATOR SCHEDULE
VALVES

Valve No.	Type	Size (in)	End Conn.	Valve Status Replace/Adjust/None	MOD. / O/C	Description	Location	PID
41-BV-01	BV	24	Flg.	Replace	MOD	Backwash Flow Control Valve	Filter Gallery	I0.9
41-BV-11	BV	24	Flg.	Replace	O/C	Influent Valve	Filter No. 1	I0.3
41-BV-12	BV	18	Flg.	Adjust	MOD	Effluent Valve	Filter No. 1	I0.3
41-BV-13	BV	24	Flg.	Adjust	O/C	Backwash Water Valve	Filter No. 1	I0.3
41-BV-14	BV	10	Flg.	Adjust	O/C	Backwash Air Valve	Filter No. 1	I0.3
41-BV-15	BV	30	Flg.	Replace	O/C	Backwash Drain Valve	Filter No. 1	IO.3
41-BLV-16	BLV	3	Flg.	None	O/C	Chlorine Solution Valve	Filter No. 1	I0.3
42-BV-11	BV	24	Flg.	Replace	O/C	Influent Valve	Filter No. 2	I0.4
42-BV-12	BV	18	Flg.	Adjust	MOD	Effluent Valve	Filter No. 2	I0.4
42-BV-13	BV	24	Flg.	Adjust	O/C	Backwash Water Valve	Filter No. 2	I0.4
42-BV-14	BV	10	Flg.	Adjust	O/C	Backwash Air Valve	Filter No. 2	I0.4
42-BV-15	BV	30	Flg.	Replace	O/C	Backwash Drain Valve	Filter No. 2	I0.4
42-BLV-16	BLV	3		None	O/C	Chlorine Solution Valve	Filter No. 2	I0.4
41-BV-21	BV	24	Flg.	Replace	O/C	Influent Valve	Filter No. 3	I0.3
41-BV-22	BV	18	Flg.	Adjust	MOD	Effluent Valve	Filter No. 3	I0.3
41-BV-23	BV	24	Flg.	Adjust	O/C	Backwash Water Valve	Filter No. 3	I0.3
41-BV-24	BV	10	Flg.	Adjust	O/C	Backwash Air Valve	Filter No. 3	I0.3
41-BV-25	BV	30	Flg.	Replace	O/C	Backwash Drain Valve	Filter No. 3	I0.3
41-BLV-26	BLV	3	Flg.	None	O/C	Chlorine Solution Valve	Filter No. 3	I0.3
42-BV-21	BV	24	Flg.	Replace	O/C	Influent Valve	Filter No. 4	I0.4
42-BV-22	BV	18	Flg.	Adjust	MOD	Effluent Valve	Filter No. 4	I0.4
42-BV-23	BV	24	Flg.	Adjust	O/C	Backwash Water Valve	Filter No. 4	I0.4
42-BV-24	BV	10	Flg.	Adjust	O/C	Backwash Air Valve	Filter No. 4	I0.4
42-BV-25	BV	30	Flg.	Replace	O/C	Backwash Drain Valve	Filter No. 4	I0.4
42-BLV-26	BLV	3	Flg.	None	O/C	Chlorine Solution Valve	Filter No. 4	I0.4

Valve No.	Type	Size (in)	End Conn.	Valve Status Replace/Adjust/None	MOD. / O/C	Description	Location	PID
41-BV-31	BV	24	Flg.	Replace	O/C	Influent Valve	Filter No. 5	I0.5
41-BV-32	BV	18	Flg.	Adjust	MOD	Effluent Valve	Filter No. 5	I0.5
41-BV-33	BV	24	Flg.	Adjust	O/C	Backwash Water Valve	Filter No. 5	I0.5
41-BV-34	BV	10	Flg.	Adjust	O/C	Backwash Air Valve	Filter No. 5	I0.5
41-BV-35	BV	30	Flg.	Replace	O/C	Backwash Drain Valve	Filter No. 5	I0.5
41-BLV-26	BLV	3	Flg.	None	O/C	Chlorine Solution Valve	Filter No. 5	I0.5
42-BV-31	BV	24	Flg.	Replace	O/C	Influent Valve	Filter No. 6	I0.6
42-BV-32	BV	18	Flg.	Adjust	MOD	Effluent Valve	Filter No. 6	I0.6
42-BV-33	BV	24	Flg.	Adjust	O/C	Backwash Water Valve	Filter No. 6	I0.6
42-BV-34	BV	10	Flg.	Adjust	O/C	Backwash Air Valve	Filter No. 6	I0.6
42-BV-35	BV	30	Flg.	Replace	O/C	Backwash Drain Valve	Filter No. 6	I0.6
42-BLV-36	BLV	3	Flg.	None	O/C	Chlorine Solution Valve	Filter No. 6	I0.6
41-BV-41	BV	24	Flg.	Replace	O/C	Influent Valve	Filter No. 7	I0.5
41-BV-42	BV	18	Flg.	Adjust	MOD	Effluent Valve	Filter No. 7	I0.5
41-BV-43	BV	24	Flg.	Adjust	O/C	Backwash Water Valve	Filter No. 7	I0.5
41-BV-44	BV	10	Flg.	Adjust	O/C	Backwash Air Valve	Filter No. 7	I0.5
41-BV-45	BV	30	Flg.	Replace	O/C	Backwash Drain Valve	Filter No. 7	I0.5
41-BLV-46	BLV	3	Flg.	None	O/C	Chlorine Solution Valve	Filter No. 7	I0.5
42-BV-41	BV	24	Flg.	Replace	O/C	Influent Valve	Filter No. 8	I0.6
42-BV-42	BV	18	Flg.	Adjust	MOD	Effluent Valve	Filter No. 8	I0.6
42-BV-43	BV	24	Flg.	Adjust	O/C	Backwash Water Valve	Filter No. 8	I0.6
42-BV-44	BV	10	Flg.	Adjust	O/C	Backwash Air Valve	Filter No. 8	I0.6
42-BV-45	BV	30	Flg.	Replace	O/C	Backwash Drain Valve	Filter No. 8	I0.6
42-BLV-46	BLV	3	Flg.	None	O/C	Chlorine Solution Valve	Filter No. 8	I0.6
41-BV-51	BV	24	Flg.	Replace	O/C	Influent Valve	Filter No. 9	I0.7
41-BV-52	BV	18	Flg.	Adjust	MOD	Effluent Valve	Filter No. 9	I0.7
41-BV-53	BV	24	Flg.	Adjust	O/C	Backwash Water Valve	Filter No. 9	I0.7
41-BV-54	BV	10	Flg.	Adjust	O/C	Backwash Air Valve	Filter No. 9	I0.7
41-BV-55	BV	30	Flg.	Replace	O/C	Backwash Drain Valve	Filter No. 9	I0.7

Valve No.	Type	Size (in)	End Conn.	Valve Status Replace/Adjust/None	MOD. / O/C	Description	Location	PID
41-BLV-56	BLV	3	Flg.	None	O/C	Chlorine Solution Valve	Filter No. 9	I0.7
42-BV-51	BV	24	Flg.	Replace	O/C	Influent Valve	Filter No. 10	I0.8
42-BV-52	BV	18	Flg.	Adjust	MOD	Effluent Valve	Filter No. 10	I0.8
42-BV-53	BV	24	Flg.	Adjust	O/C	Backwash Water Valve	Filter No. 10	I0.8
42-BV-54	BV	10	Flg.	Adjust	O/C	Backwash Air Valve	Filter No. 10	I0.8
42-BV-55	BV	30	Flg.	Replace	O/C	Backwash Drain Valve	Filter No. 10	I0.8
42-BLV-56	BLV	3	Flg.	None	O/C	Chlorine Solution Valve	Filter No. 10	I0.8
41-BV-61	BV	24	Flg.	Replace	O/C	Influent Valve	Filter No. 11	I0.7
41-BV-62	BV	18	Flg.	Adjust	MOD	Effluent Valve	Filter No. 11	I0.7
41-BV-63	BV	24	Flg.	Adjust	O/C	Backwash Water Valve	Filter No. 11	I0.7
41-BV-64	BV	10	Flg.	Adjust	O/C	Backwash Air Valve	Filter No. 11	I0.7
41-BV-65	BV	30	Flg.	Replace	O/C	Backwash Drain Valve	Filter No. 11	I0.7
41-BLV-66	BLV	3	Flg.	None	O/C	Chlorine Solution Valve	Filter No. 11	I0.7
42-BV-61	BV	24	Flg.	Replace	O/C	Influent Valve	Filter No. 12	I0.8
42-BV-62	BV	18	Flg.	Adjust	MOD	Effluent Valve	Filter No. 12	I0.8
42-BV-63	BV	24	Flg.	Adjust	O/C	Backwash Water Valve	Filter No. 12	I0.8
42-BV-64	BV	10	Flg.	Adjust	O/C	Backwash Air Valve	Filter No. 12	I0.8
42-BV-65	BV	30	Flg.	Replace	O/C	Backwash Drain Valve	Filter No. 12	I0.8
42-BLV-66	BLV	3	Flg.	None	O/C	Chlorine Solution Valve	Filter No. 12	I0.8

END OF SECTION

Part 1 General

1.01 Scope

A. The work required under this Section consists of, but is not necessarily limited to, furnishing all materials, equipment, accessories, tools, and labor required to install horizontal split case pumps and motors, as shown on the Drawings and as specified herein. All operating tests shall be performed and all adjustments made to guarantee satisfactory system operation.

B. Pumps, motors, couplings, coupling guards and baseplates shall be furnished by the pump manufacturer and sized to accommodate the maximum torque to be transmitted.

C. Three backwash pumps, 43-BWP-01 through -03, shall be horizontal, single stage, double suction, axially split case centrifugal pumps. The suction and discharge nozzles shall be integrally cast in the lower half of the casing.

1.02 Design Requirements

A. Pumps shall be designed to operate under the following conditions:

Rated Capacity at Point on Curve, gpm	3,850
Rated TDH @ Above Capacities, feet	29
Minimum Shut-Off Head, feet	51
Minimum Efficiency at rated capacity , %	76
Speed, RPM (maximum)	1,200
Motor Horsepower	40

B. Each pump shall be designed to have continuously rising characteristic curve from rated point to shut-off. Drive, pump and shafting shall be designed for continuous or intermittent service. Pumps shall be capable of operating continuously at any point on the head capacity curve without exceeding the drive nameplate rating.

1.03 Factory Testing

A. The pump manufacturer shall conduct full scale, full range factory performance tests with respect to capacity, head, NPSH and horsepower.

B. When tested, each pump shall be driven by the specified motor or by a certified calibrated motor equivalent to the motor horsepower and speed specified.

C. Certified test reports shall be submitted for approval prior to shipment of the pumps. Tests shall be conducted in accordance with applicable Hydraulic Institute standards for Level "A" testing for each pump. The test reports shall be certified by a corporate officer of the manufacturer and shall cover the following items:

1. Capacity vs. head curve in U.S. gallons per minute and feet.

2. Efficiency vs. flow curve in percent.

3. Brake horsepower vs. flow curve.

4. Speed of rotation.

5. Impeller size and number.

6. Certified bearing life calculations in accordance with AFBMA standards.

7. A table with a listing of a minimum of 5 test points throughout the pump range including shut off, rated capacity and run out. Show capacity, total head, BHP, efficiency, NPSHR and speed.

D. The Engineer shall have the option to witness the pump tests.

E. Four copies of all test reports shall be submitted.

F. If the results of the factory tests fail to demonstrate compliance with the requirements of this Section, the Contractor shall modify or replace the deficient pump(s) as necessary, at no additional cost to the Owner and shall resubmit certified factory test reports on each modified or replacement pump.

1.04 Submittals

A. Submit shop drawings in accordance with the requirements of Section 01340 of these Specifications.

B. Operation and maintenance manuals shall be furnished in accordance with the requirements of section 01730 of these Specifications.

Part 2 Products

2.01 Acceptable Manufacturers

Pumps shall be as manufactured by Aurora, Patterson, Flowserve or Peerless.

2.02 Materials and Construction

A. Materials of construction shall be as follows:

1. Casing shall be constructed of cast iron, ASTM A 48, Class 40.

2. Impeller shall be bronze, ASTM B 584, Alloy 875.

3. Casing wear rings shall be bronze, ASTM B 584, Alloy 938.

4. Impeller wear rings shall be bronze, ASTM B 584 Alloy, 905.

5. Bearing covers shall be cast iron, ASTM A 48, Class 30.

6. Shaft shall be steel, ASTM A 576, Grade 1045.

7. Shaft sleeves shall be bronze, ASTM B 584, Alloy 905.

8. Glands shall be bronze, ASTM B 584, Alloy 836.

9. Metal Part of seal to be stainless steel

10. Casing gasket shall be BUNA-N Treated cellulose

11. No material in contact with the pumped liquid shall contain lead or have any compositions containing lead.

B. Casing: The casing shall be a horizontally split design, constructed of close-grained cast iron. The bearing bracket shall be integrally cast with the lower half casing. The upper casing shall be fitted with lifting lugs or eyebolts. Necessary vents, drain plugs, suction and discharge connections shall be provided. The lower casing shall have flanged suction and discharge with tapped connections for drains and gauges. Flanges shall conform to ANSI/ASME B16.1, Class 125. Provide renewable wearing rings designed to provide a smooth flow of water into the impeller eye. Provide casing rings with set screws as a positive means to prevent rotation. Upper and lower casing halves shall be bolted and dowelled together. Removal of the upper casing half shall permit inspection, maintenance and removal of the entire rotating element without disturbing suction and discharge piping or motor alignment. The upper casing shall contain connections for water seal piping and priming and vent connections.

C. Impeller: Provide a double suction type impeller. Dynamically balance the impeller and shaft. Mount the impeller on the shaft with a single key that extends beyond the impeller hub to lock the impeller and shaft sleeves. Liquid hone and vibratory finish the impeller. Fit the impeller with removable wear rings held in place with set screws.

D. Shaft: Heat treat the shaft and accurately machine and grind over the entire length. Protect the shaft from wear and erosion in the pump and stuffing box by removable shaft sleeves. Key the shaft sleeves to the shaft with the same key extended from the impeller and secure with separate bronze shaft nuts. Provide sleeves with O-ring seals.

E. Stuffing Box Shaft Seal: Provide split mechanical seals with precision lapped faces. Mechanical seals shall be manufactured by John Crane or Chesterton. Tap and connect the upper casing to supply discharge pressure water to the shaft seal housing and to provide seal water to the seals. Valve the piping from the upper casing to the seal housing to control water flow. Seal water drains shall be provided on each side of the pump housing to allow drainage to be piped away from each shaft seal. Seal water drainage shall be contained and shall not flow onto the base plate of the pump.

F. Bearings: Provide grease lubricated bearings. The outboard bearing shall be double row thrust ball bearings locked on the shaft to take radial and any unbalanced thrust loads, and the inboard bearing shall be a single row, radial type ball bearing. Thrust bearings shall be removable and replaceable without removing the upper casing half. Size the bearings in accordance with AFBMA standards for a B-10 life of 250,000 hours. Bearing housings shall be integrally cast with the pump's lower casing half.

G. Flexible Coupling: Directly connect the pump to its driver by means of a Falk Series T10, all metal, flexible type coupling. Provide coupling guards to shield moving coupling and shaft.

H. Pump Base: The baseplate shall be one-piece, fabricated steel with a continuous drip ring to collect leakage.

2.03 Motors

Motors shall conform to Section 16150 of these Specifications.

2.04 Shop Painting

All materials specified under this Section shall be primed as part of the work under this Section. Surface preparation and paint shall be as specified in Section 09900 of these Specifications.

Part 3 Execution

3.01 Installation

Installation shall be in strict accordance with the manufacturer's recommendations, in the locations shown on the Drawings. Installation shall include furnishing the required oil and grease for initial operation. The grades of oil and grease shall be in accordance with the manufacturer's recommendations. Anchor bolts shall be set in accordance with the manufacturer's recommendations. Pump bases shall be grouted.

3.02 Field Painting

All shop primed surfaces shall be cleaned and painted as specified in Section 09900 of these Specifications.

3.03 Inspection and Testing

After all pumps have been completely installed, the Contractor, under the direction of the manufacturer's representative, shall conduct in the presence of the Engineer, such tests as are necessary to ensure that pump capacity and operation conform to the Specifications. Field tests shall include all pumps included under this Section. The Contractor shall supply all electric power necessary to complete field tests. A factory representative having complete knowledge of proper operation and maintenance shall be provided to instruct Owner's personnel on proper operation and maintenance. This work may be conducted in conjunction with the inspection of the installation and test run. The initial tests, start-up and instruction of the Owner's operation and maintenance personnel shall be scheduled for a minimum of 3, eight hour days. If there are difficulties in operation of the equipment due to the manufacturer's design or fabrication, additional services shall be provided at no cost to the Owner.

3.04 Cleaning

Prior to acceptance of the work of this Section, thoroughly clean all installed equipment, materials and related areas.

END OF SECTION

Part 1 General

1.01 Scope

A. Work described in this Section and in related Section 13226 includes furnishing all labor, materials equipment, tools and incidentals required for removing existing media, repair and replacing existing under drain system, and provide complete and operable installation of twelve dual bay filters. Each unit shall be tested and placed into operation in accordance with these Specifications and the manufacturer's recommendations.

B. Each existing filter has a total of 640 square feet, consisting of two filter cells, 8'-0" x 40'-0" feet and a washwater trough. Filters shall be mono media type, utilizing an air and water backwash without washwater troughs and designed to operate at variable, declining rate mode under the following conditions:

1. Downflow of Filtered Water: 2.0 to 7.0 gpm/square foot of filter area, average 5.0 gpm/sf at peak flow.

2. Upflow of Air Only (Air Wash): 5 scfm/square foot.

3. Simultaneous Upflow of Air and Water: 5.0 scfm/square foot (air) and 6 gpm square foot (water).

4. Upflow of Water Only (Backwash): 6 gpm/square foot.

C. Underdrain furnished for each filter shall accommodate existing air/water backwash system without significant modifications, support gravel, mono media, piping, air distribution header, control valves and operators, controls, control panels, instrumentation and any necessary equipment required for a complete installation.

D. The control system (provided by other Divisions) shall control the operation of the backwash air blowers, backwash water pumps and other associated valves. The control system, blowers and pumps are either provided in other Divisions or are existing equipment and thus are not furnished by the filter manufacturer, however, the filter manufacturer must have knowledge of the actual operating ranges of these items in order to provide suitable materials for the filter underdrain system.

1.02 Submittals

A. Submit shop drawings and engineering data in accordance with the requirements of Section 01340 of these Specifications.

B. Operation and maintenance manuals shall be furnished in accordance with the requirements of Section 01730 of these Specifications. Include the following in each manual:

1. Complete installation, operation and maintenance drawings.

2. Trouble shooting guides.

3. Copies of all approved shop drawings and erection drawings.

Part 2 Products

2.01 Acceptable Manufacturers

A. The filter manufacturer/supplier shall be responsible for designing and furnishing a ready-to-install system which meets all flow and structural design requirements specified. The filter manufacturer/supplier shall furnish the Contractor with such installation details and recommendations as are necessary to interface the filter underdrain system within the existing filter box, including requirements for grouting keys and pockets, dowels, support ledges and piers, anchorage and the like.

B. The filter underdrain system shall be as manufactured by Severn Trent Water Purification, Inc. No substitutions will be allowed.

2.02 General Requirements

A. The filter underdrain system shall be designed to ensure long-term stability in its operating characteristics. The filter underdrain system shall be resistant to changes in head loss, flow uniformity, corrosion and any other effects which would in time cause loss of efficiency or effectiveness of its operation.

B. The filter underdrain system shall be a concrete formed washwater channel with steel plate, stainless steel air laterals, concrete block underdrain support system, and graded stone support as manufactured by Severn Trent Water Purification, Inc.

2.03 System Design

A. The filter underdrain system shall be as shown in the Drawings. Each filter cell is of nominal dimensions 40 feet long by 8 feet wide, with two cells per filter, for a total filter area of 640 square feet.

B. The underdrain system shall be arranged for:

1. End entry/exit of water into a distribution gullet that spans the 40 feet length of the filter.

2. Backwash air entrance to the gullet, above and on the same end as the water entrance/exit portal with entry into the filter underdrain plenum from the distribution gullet through horizontally oriented primary metering tubes in the gullet wall, as indicated in the Drawings. Severn Trent Water Purification shall use a gullet weir block.

C. The filter underdrain systems shall be furnished and installed to perform satisfactorily when operated under the specified flow conditions.

D. During backwash with air, air temperature at the backwash air inlet may range up to 240 degrees F. All system components shall be capable of withstanding prolonged exposure to the temperature, without deterioration or adverse effects.

E. Hydraulic Criteria

1. The replaced filter underdrain shall be capable of evenly distributing air, water and a combined flow of air and water in the intended application. When subjected to a combined air/water flow of 5 scfm/per square foot (air) and 6 gpm/square foot (water), the head loss through a primary distribution orifices shall not exceed 8-inches w.c.

2. The filter manufacturer shall provide hydraulic test data to verify that the above headloss conditions can be met.

F. Structural Design Requirements

1. The filter underdrain system shall also be designed to withstand a net downward loading of not less than 1,400 psf, plus its own dead weight.

2. Adequate safety factors shall be included in the design to account for dynamic loadings which may occur during the initiation and termination of air backwash and during seismic events.

3. The design shall adequately provide for all loads incurred during shipment, handling, and installation.

G. Materials

1. Concrete shall conform to the applicable requirements of Section 03300 of these Specifications, but shall have a maximum size of aggregate of 3/8-inch. Plasticizers shall be used of type approved by the underdrain manufacturer and the Engineer. Reinforcement shall be as specified in Section 03200 of these Specifications. Grout shall be a mixture of one part Portland cement and two parts sand, with nonshrink admixture in accordance with written recommendations of the underdrain manufacturer/supplier and reviewed by the Engineer.

2. All exposed metals, including but not limited to anchor bolts and anchorage, fasteners, washers, spring clips, etc., shall be Type 316 stainless steel.

3. Plastics shall be high-strength, completely inert, resistant to erosion and corrosion and suitable for use with backwash air temperature of 240 degrees F at the air inlet.

2.04 Filter Underdrain System

A. Severn Trent Water Purification System, Inc. System

1. General

   a. The underdrain system shall be the nozzle-less type, designed for the simultaneous application of air and water during backwash.

   b. The backwash air distribution shall be separate and independent from the backwash water distribution.

   c. Precast concrete blocks shall cover the air distribution system to prevent intrusion of media or media support materials into the air laterals.

2. Sump Cover Plates

   a. Sumps shall be provided under the filter vessels, as shown on the Drawings. These sumps shall be covered with concrete sump cover plates, at least 4-1/2 inches thick, spaced to provide openings for ingress and egress of backwash water and filtrate and to support the full weight of the filter components placed on them. Two sump coverplates will be provided per filter to replace those taken out to clean plenum.

3. Air and Water Distribution Blocks

   a. The sump cover plates and the air distribution laterals shall be covered completely with precast air and water distribution blocks to distribute backwash air and water uniformly over the entire filter area. The blocks shall be factory cast in an established precast concrete factory which has been casting similar products for at least five years. Casting at the job site will not be permitted.

   b. The concrete used shall be of high quality, having a 28 day compressive strength of not less than 5,000 psi and employing not larger than 1/2-inch diameter coarse aggregate, maximum.

   c. Each block shall be cast without reinforcement, have a dense and smooth surface and shall be hollow and open at the bottom. Air domes shall be cast into the bottom surface of each block to receive air from each air discharge port in the air laterals. Each air dome shall have an unrestricted air and water discharge port, at least 1-inch diameter.

   d. At least 10 air and water discharge ports shall be provided for each square foot of filter bottom area.

   e. Each block shall be 7-inches high, 6-3/16-inches wide and at least 11-7/8-inches long matching the existing blocks and have unrestricted

flow passages laterally and longitudinally to permit water flow in both directions without formation of vortices or creation of head losses. Correct block spacing shall be ensured by means of lugs cast integrally on both sides of each block.

f. The blocks shall be capable of supporting the weight of the filter contents, including the losses of head across the filter.

2.05 Control System

A. General

1. The filter main control panel, six filter consoles, instrumentation devices, valves, controllers, and other appurtenances required for a fully operational system and not specified herein are provided by others under other Divisions. The control system and all components shall be consistent with the main plant instrumentation and control system as specified in Division 17. See Sections 17000 and 17250 for control system details.

2. The filter manufacturer shall be responsible for reviewing and commenting on PLC program to control the filters and to accomplish operator initiated or automatic filter backwash. Although the system integrator is to be advised on the PLC program by the filter manufacturer, the responsibility for proper operation of the filter control system shall rest solely with the system integrator. The filter manufacturer shall include 200 hours of programming and reviewing assistance in their proposal price as a separate line item.

Part 3 Execution

3.01 Installation

A. The Contractor shall install the filter underdrain system in strict accordance with the filter manufacturer's installation drawings and printed recommendations and as herein specified.

B. The Contractor shall obtain from the filter underdrain manufacturer such written installation details and recommendations as are necessary to interface the filter underdrain system with all surrounding structures, including requirements for grouting keys and pockets, dowels, support ledges and piers, anchorage and the like. All costs of such work shall be included in the price named for completion of the work. The Contractor is cautioned that such installation details are not shown on the Drawings, as they will vary according to the individual manufacturer's recommendations.

C. The Contractor shall take all necessary precautions recommended by the filter underdrain manufacturer in writing and as specified herein to ensure that the underdrain system and piping connected thereto is completely clean and free of any debris, dirt, or other foreign materials which could clog the underdrain system or interfere with flow. Backwash air and water piping shall be thoroughly flushed clean. Air piping shall be flushed with air only. All loose debris and dirt within the filter and

gullet shall be removed by brooming down, vacuuming and water flushing. Care shall be taken as necessary to prevent grout from extruding into any flow passages or ports and any grout shall be removed. As installation progresses, underdrain sections partially completed shall be protected with heavy building paper, masking tape, or other means to maintain cleanliness. Cleanliness shall be maintained until final placement of filter media.

3.02 Field Testing

A. The Contractor shall conduct all specified testing and shall furnish all material, instrumentation, suitable portable blower if necessary, personnel, etc., for conducting tests as specified herein and all costs of such testing shall be borne by the Contractor. The costs of all work and materials to correct deficiencies revealed during testing and the cost of re-testing, shall be borne by the Contractor. The Contractor shall give the Engineer sufficient advance notice of the testing to enable the Engineer to witness the tests.

B. The underdrain system in each filter shall be flooded with water to the top of the supporting system for the gravel (or media if gravel not used) to ascertain that the level tolerance is as specified by the manufacturer/supplier. Measurements of level tolerance shall be collected at representative locations within the filter and reported as specified herein.

C. Testing for backwash air and water distribution shall be in accordance with manufacturer instructions.

3.03 Preparation of Filters for Service

After all filter materials have been placed and initially backwashed, each filter shall be backwashed for extended periods of time at the rate of 6 gpm per square foot of filter area until the backwash water clarity is visually acceptable by the filter manufacturer. After each backwashing the filter media shall be allowed to compact by slowly closing the backwash valve.

3.04 Manufacturer Service

A. Furnish the services of a factory technician for 30 8-hour days (10 trips) to instruct the Contractor's personnel on proper installation of filter equipment and inspect the work.

B. Furnish the services of a factory representative, having complete knowledge of proper operation start-up procedure and maintenance requirements, for 12, 8-hour days (4 trips), to inspect the final installation and supervise functional testing of the equipment.

C. Furnish the services of a factory representative having complete knowledge of proper operational and maintenance requirements of the system. The factory representative shall inspect the final installation, observe a functional test, and instruct the Owner's personnel in the proper operation and maintenance of the equipment. The duration and number of instructional sessions shall be as specified in Section 01645.

D. Within the first 12 months of system acceptance, the manufacturer shall provide, at the Owner's request, an individual for supplemental training. The duration and number of supplemental instructional sessions shall be as specified in Section 01645. The individual shall be a qualified service person who is regularly involved in the inspection of installation, start-up, testing, troubleshooting, and programming of programmable controllers to assist in the start-up, testing, and adjustment of the PLC equipment and to provide field instruction of the Owner's personnel in the proper operation and maintenance of the equipment. The individual shall also be fully qualified to troubleshoot, maintain, and service all of the equipment provided by the manufacturer.

3.05 Clean-Up

Prior to acceptance of the work of this Section, Contractor shall thoroughly clean all installed equipment, materials, and related areas in accordance with the requirements of Section 01710 of these Specifications. Contractor shall remove from the job site and move all recovered media as instructed by the Owner and dispose of all rejected filter media.

END OF SECTION

Part 1 General

1.01 Scope

A. All filter media specified herein shall be provided by the filter underdrain manufacturer. The existing filter media and support gravel shall be replaced, utilizing no existing materials for a complete system.

B. The media system shall be capable of filtering treated wastewater without excessive backwash water or undue rate of head loss build-up.

C. All existing sand media shall be carefully removed by the Contractor and stockpiled at an on-site location determined by the Owner.

1.02 Quality Assurance

A. Contractor shall exercise care to recover as much sand media as physically possible without gravel. Refer to filter underdrain manufacturer for removal instructions.

B. Filter media shall be furnished, placed, prepared for service, and tested in accordance with the requirements of AWWA B100.

1.03 Submittals

A. All submittals shall be made in accordance with the requirements of Section 01340 of these Specifications.

B. Submit samples of each material and test results to the Engineer for approval.

Part 2 Products

2.01 Gravel

A. Gravel shall consist of hard, rounded stones with an average specific gravity of not less than 2.5. Not more than one percent by weight of the material shall have a specific gravity of 2.25 or less. The gravel shall contain not more than two percent by weight, of thin, flat, or elongated pieces (pieces in which the largest dimensions exceeds five times the smallest dimension), as determined by hand picking, and shall be free from shale, mica, clay, sand, loam, and organic impurities of any kind.

B. The gravel shall be screened to proper size and placed in the filters in layers as specified below. The gravel within each layer shall be uniformly graded. The porosity of the gravel in any layer shall be not less than 35 percent nor more than 45 percent. Gravel over 1/4-inch in diameter may be screened through wire screens with square openings or plates with round openings. Wire screens shall be used for sizes smaller than 1/4-inch. Not more than eight percent of the weight of any layer shall be finer or coarser than the limit specified for that layer.

C. Filter gravel shall be graded as follows from top to bottom:

Tetra	Gravel Size
4"	1/2" - 1/4"
4"	1/4" - 1/8"
4"	1/2" - 1/4"
2"	3/4" - 1/2"
4"	1-1/2" - 3/4"

2.02 Coarse Sand Media

A. Silica sand media shall be 6 x 9 mesh, clean, hard, well-rounded particles in conformance with AWWA B100. The media shall be placed to a depth of 72-inches and shall consist of specially selected and graded silica sand, greater than 98 percent of silica, specific gravity 2.60 minimum, effective size 2.0 to 3.0 mm, and uniformity coefficient 1.4 maximum. Hardness shall be 6.0 to 7.0 on the MOH scale. Acid solubility shall not exceed 3 percent. Sphericity shall be a minimum of 0.8.

B. The filter manufacturer shall provide results of specific gravity tests, sieve analysis and acid solubility tests conducted by an independent laboratory in accordance with AWWA B100. The sphericity shall be tested as defined in “Elements of Water Supply and Wastewater Disposal”, 2nd Edition, John Wiley & Sons, Inc., NY, 1971, pgs. 404 to 406. Filter media shall not be placed until satisfactory test results meeting the requirements of this Specification have been approved by the Engineer.

Part 3 Execution

3.01 Gravel

A. Clean the filter tanks before any gravel is placed, keeping the filter tanks clean throughout the placing operation.

B. Place the bottom layer carefully by hand to avoid movement to the underdrain system and to assure free passage for water from the orifices.

C. Complete each gravel layer before the next layer above is started. Do not permit workers to walk or stand directly on gravel or other materials at any time, which are less than 1/2-inch in diameter. Use boards which will sustain the weight of workers without displacing the gravel. Remove all gravel that becomes mixed and replace in layers as specified.

D. Obtain the correct thickness of each layer as follows; Before the gravel is placed, mark the top of each layer on the side of the filter. Then level the top of each layer against a water surface held at the appropriate mark. None of the particles shall be less than half submerged, and there shall be no places where additional gravel can be

placed without the particles extending more than 1/2 their volume above the water surface.

3.02 Coarse Sand Media Installation

A. Transport and place media carefully to prevent contamination and to avoid disturbing the top layer of gravel.

B. Place the silica sand and level. Final depth of the media shall be 72-inches.

C. After all filter media is placed, each filter shall be manually backwashed for an extended period of time at the rate of 6.0 gpm/sq. ft. until the backwash water clarity is visually acceptable by the filter manufacturer. After each backwashing, the media shall be allowed to compact by slowly closing the backwash valve.

3.03 Installation Supervision

The filter under drain system manufacturer shall furnish a representative to supervise the work on the Project site throughout the placement and preparation of the filter media for service.

END OF SECTION

Part 1 General

1.01 Scope

A. Provide all labor, materials, equipment and incidentals necessary to construct all ductile iron pipe and appurtenances located inside buildings and structures, and test as shown on the Drawings and as specified herein.

B. Ductile iron pipe and appurtenances covered under this Section shall include all interior pipe and accessories.

1.02 Submittals

A. Complete shop drawings and product data on all piping and fittings shall be submitted to the Engineer in accordance with the requirements of Section 01340 of these Specifications.

B. Shop drawings shall indicate piping layout in plan and/or elevations and shall include a complete schedule of all pipe, fittings, specials, hangers and supports. Special castings shall be detailed showing all pertinent dimensions. Special coatings shall be clearly identified.

C. The Contractor shall furnish the Inspector with lists of all pieces of pipe and fittings in each shipment received. These lists shall give the serial or mark number, weight, class, size and description of each item received.

D. The Contractor shall submit written evidence to the Engineer that the products furnished under this Section will conform to the material and mechanical requirements specified herein. Certified copies of independent laboratory test results or mill test results from the pipe supplier may be considered evidence of compliance provided such tests are performed in accordance with the appropriate testing standards by experienced, competent personnel. In case of doubt as to the accuracy or adequacy of mill tests, the Engineer may require that the Contractor furnish test reports from an independent testing laboratory on samples of pipe materials.

Part 2 Products

2.01 Ductile Iron Pipe (DIP)

A. Ductile iron pipe shall be utilized for all piping where shown on the Drawings.

B. Ductile iron pipe shall be manufactured in accordance with AWWA C151. All pipe, except specials, shall be furnished in nominal lengths of 18 to 20 feet. Sizes will be as shown on the Drawings. All pipe shall have a minimum pressure rating as indicated in the following table, and corresponding minimum wall thickness, unless otherwise specified or shown on the Drawings:

Pipe Sizes (inches)	Pressure Class (psi)
4 - 12	350
14 - 18	350
20	300
24	250
30 - 54	200
60 - 64	200

C. Flanged pipe minimum wall thickness shall be equal to Special Thickness Class 53. Flanges shall be furnished by the pipe manufacturer.

2.02 Fittings and Accessories

A. Fittings shall be ductile iron and shall conform to AWWA C110/ANSI A21.10 or AWWA C153/ANSIA21.53 with a minimum rated working pressure of 250 psi.

B. Flanged elbow fittings shall be ANSI pattern using short radius elbows except where noted differently on the Drawings. Special fittings, ductile iron wall pipes and sleeves shall conform to the dimensions and details as shown on the Drawings.

C. Welded-on Outlets: Welded-on outlets shall be ductile iron body type and shall be faced and tapped for AWWA C110/ANSI A21.10 flange or mechanical joint connection. All welding, fabrication and outlet hole drilling shall be performed by the manufacturer. Outlets shall be free of burrs. Sizes shall be as indicated on the Drawings. The outlets shall be welded on minimum Special Thickness Class 51 ductile iron pipe greater than 12-inches and Special Thickness Class 52 for smaller pipe.

D. Thrust Collars: Thrust collars shall be welded-on ductile iron body type capable of withstanding a thrust due to 250 psi internal pressure on a dead end from either direction on that pipe size. The welded-on collars shall be continuously welded to the pipe by the pipe manufacturer.

E. Solid sleeves shall permit the connection of plain end ductile iron pipe. Solid sleeves shall meet the requirements of ANSI/AWWA C110 for long pattern and have a minimum pressure rating of 250 psi. Solid sleeves shall have mechanical or restrained joints as specified in this Section and as shown on the Drawings. Solid sleeves shall be used only in locations shown on the Drawings or at the direction of the Engineer.

F. Tapping Saddles: Tapping saddles shall be ductile iron body type with O-ring gasket and alloy steel straps. Connection shall be flanged or mechanical joint as detailed on the Drawings. Tapping saddles shall be equal to ACIPCO A-10920 (mechanical joint) and ACIPCO A-30920 (flange joint).

G. Flange Adapter: The flange adapter shall permit the connection of unthreaded, ungrooved, open-ended ductile iron pipe to ANSI/ASME B16.1, Class 125 flanges. The flange adapter shall meet the test requirements of ANSI/ASME B16.1 for Class 125 flanges. The adapter shall be a ductile iron casting incorporating gripping wedges and gasket. The gasket shall provide a compression seal between the adapter, the pipe and the adjacent flange. Flange adapters are to be used only in locations specifically shown on the Drawings and shall be installed in accordance with the manufacturer's recommendations. The flange adapter shall be EBAA Iron Megaflange-Flange Adapter Series 2100.

H. Service Clamps: Service clamps shall be ductile iron, double strap clamps equal to Mueller.

2.03 Joints

A. General

1. Unless shown or specified otherwise, joints for buried service shall be push-on or restrained joint type for pipe and standard mechanical, push-on or restrained joints for fittings. Joints for exposed service shall be flanged for pipe and fittings, unless shown otherwise.

2. Provide the necessary bolts for connections. All bolts and nuts shall be threaded in accordance with ANSI B1.1, Coarse Thread Series, Class 2A external and 2B internal fit. All bolts and nuts shall be made in the U.S.A.

3. In all cases, gaskets shall be made of material that will not be damaged by the fluid being transported or by the environment in which the pipe is installed.

B. Push-On and Mechanical Joints

1. Joints shall conform to AWWA C111/ANSI A21.11.

2. Bolts and nuts shall be Tee Head bolts and nuts of high strength low-alloy steel in accordance with ASTM A 242 to the dimension shown in AWWA C111/ANSI A21.11.

3. Gaskets shall be in accordance with AWWA C111/ANSI A21.11 and shall be constructed of plain rubber unless otherwise shown on the Drawings.

4. Mechanical joint glands shall be ductile iron.

C. Flanged Joints

1. Flanged joints shall conform to AWWA C115/ANSI A21.15. Flanges shall be ductile iron and shall be furnished by the pipe manufacturer.

2. Flanged joints shall be bolted with through stud or tap bolts of required size as directed. Bolt length and diameter shall conform to ANSI/AWWA C115 for Class 125 flanges shown in ANSI/ASME B16.1.

   a. Bolts for exposed service shall be zinc plated, cold pressed, steel machine bolts conforming to ASTM A 307, Grade B. Nuts for exposed service shall be zinc plated, heavy hex conforming to ASTM A 563. Zinc plating shall conform to ASTM B 633, Type II.

   b. Bolts for submerged service shall be stainless steel machine bolts conforming to ASTM A 193, Grade B8. Nuts shall be heavy hex, stainless steel conforming to ASTM A 194, Grade 8.

3. Gaskets shall be made of 1/8-inch thick, Neoprene Gaskets may be ring type or full face type.

4. For 16-inch and larger flanged joints use gaskets equal to American “Toruseal” or US Pipe “Flange Tyte”.

5. Flanged ductile iron pipe shall have flanges cast solidly or threaded to the pipe barrel. Pipe threads shall be of such length that with flanges screwed home, the end of the pipe shall project beyond the face line of the flange. Flange and pipe shall then be machined to give a flush finish to the pipe and the flange and surface shall be normal to the axis of the pipe. Ductile iron flanges shall be of such design that the flange neck completely covers the threaded portion of the pipe to protect same against corrosion. All pipe with threaded type flanges shall be assembled, faced, and drilled at the point of manufacture, unless otherwise approved by the Engineer.

6. Flange filler shall conform to AWWA C110/ANSI A21.10. Joint bolt length shall be increased by the thickness of the flange filler.

D. Restrained Joints

1. Restrained joints: Restrained joints shall be manufactured restrained joint or restraining gasket joint as specified below.

   a. Manufactured restrained joints shall be American, FLEX-RING or LOK-RING, U.S. Pipe TR FLEX or HP LOK, or Clow SUPER-LOCK.

   b. Restraining gasket joints shall be assembled with American Fast-Grip gaskets or US Pipe FIELD LOK gasket.

   c. Retainer glands on a mechanical joint may be used as a restrained joint only where retainer glands are specifically shown on the Drawings or where specifically specified.

d. Where retainer glands are allowed, in lieu of retainer glands specified elsewhere, the joint may be assembled with US Pipe MJ FIELD LOK gasket.

e. No field welding for manufactured restrained joint pipe assembly will be permitted. Where field cutting of restrained joint pipe is required, the joint may be assembled with American Field Flex-Rings or US Pipe TR FLEX GRIPPER Rings.

2.04 Coatings

The exterior of pipe and fittings for buried service shall be factory coated with an asphaltic coating conforming to AWWA C151/ANSI 21.51 for ductile iron pipe, AWWA C115/ANSI 21.15 for flanged pipe and AWWA C110/ANSI 21.10 for fittings. Pipe and fittings which shall be exposed or submerged shall be factory coated with a general purpose rust inhibitive primer compatible with the type of paint which will be field applied in accordance with the requirements of Section 09900 of these Specifications.

2.06 Linings

A. Pipe and fittings shall be cement lined in accordance with AWWA C104/ ANSI A21.4, standard thickness, unless specified otherwise.

B. Special Lining:

1. Where shown on Drawings or where specified, pipe and fittings shall be lined with ceramic epoxy as specified below.

2. Special linings shall cover all exposed surfaces of pipe and fittings subject to contact with sewer liquid or gas. The lining of the pipe barrel shall extend from spigot end through the socket to the edge of the gasket sealing area or recess for pipe using push-on gaskets, and to the edge of the gasket seat for mechanical joints. The lining shall also cover the exterior of the spigot end from the end of the pipe to beyond the gasket sealing area. The lining in fittings shall cover the interior surfaces including the socket areas as defined above. All linings shall be hermetically sealed at the ends.

C. Ceramic Epoxy Lining (all pipe diameters)

1. Lining Material: The lining material shall be Protecto 401 Ceramic Epoxy, an amine cured novalac epoxy containing at least 20 percent by volume of ceramic quartz pigment. The material shall meet the following minimum requirements:

a. A permeability rating of 0.00 when tested according to Method A of ASTM E-96-66, Procedure A with a test duration of 30 days.

b. The following test shall be run on coupons from factory lined ductile iron pipe:

i. ASTM B-117 Salt Spray (scribed panel) – Results to equal 0.0 undercutting after two years.

ii. ASTM G-95 Cathodic Disbondment 1.5 volts @ 77° F. Results to equal no more than 0.5 mm undercutting after 30 days.

iii. Immersion Testing rated using ASTM D-714-87.

a) 20% Sulfuric Acid – No effect after two years.

b) 140° F 25% Sodium Hydroxide – No effect after two years.

c) 160° F Distilled Water – No effect after two years.

d) 120° F Tap Water (scribed panel) – 0.0 undercutting after two years with no effect.

c. An abrasion resistance of no more than 3 mils (.075 mm) loss after one million cycles using European Standard EN 598: 1994 Section 7.8 Abrasion Resistance.

2. Surface Preparation: Surface preparation shall consist of the ductile iron surface to a near-gray blast finish. This degree of cleanliness is comparable to a SSPC-SP10 for steel with the exception that ductile iron attains a gray color when blast cleaned. The blast cleaning operation shall remove 95% of all surface contaminants, including tightly adhered annealing scale. The anchor tooth pattern, resulting from the blasting operation, shall have a minimum height of 3.0 mils.

3. Applicators: The lining shall be applied using a centrifugal lance applicator by applicators certified by the lining manufacturer. The workers shall be experienced and competent in the surface preparation, application and inspection of the lining to be applied.

4. Lining: After the surface preparation and within 8 hours of surface preparation, the interior of the pipe shall receive 40 mils nominal dry film thickness of Protecto 401. Minimum thickness shall be 30 mils. No lining shall take place when the substrate or ambient temperature is below 40 degrees Fahrenheit. The surface shall be dry and dust free. If flange pipe or fittings are lined, the lining shall not be used on the face of the flange.

5. Bell Sockets and Spigot Ends: The gasket area and spigot end up to 6 inches back from the end of the spigot end shall be coated with 6 mils nominal, 10 mils maximum, using Protecto Joint Compound. The Joint Compound shall be applied by brush to ensure coverage. Care should be taken that the Joint Compound is smooth without excess buildup in the gasket seat or on the spigot ends. Coating of the gasket seat and spigot ends shall be performed after the application of the lining.

6. Number of Coats: The number of coats of lining material applied shall be as recommended by the lining manufacturer. However, in no case shall this material be applied above the dry thickness per coat recommended by the lining manufacturer in printed literature. The maximum or minimum time between coats shall be that time recommended by the lining material manufacturer. To prevent delamination between coats, no material shall be used for lining which is not indefinitely recoatable with itself without roughening of the surface.

7. Touch-Up and Repair: Protecto Joint Compound shall be used for touch-up or repair in accordance with manufacturer's recommendations.

8. Lining Holiday Test: At the manufacturer's facility, the lining shall be tested over 100% of the pipe barrel surface with a high-voltage spark tester as recommended by ASTM Designation G-62 Method B. If holidays are found in the lining by the above test at the manufacturing plant, the holiday shall be repaired per the lining manufacturer's recommendation. The holiday detector shall be a commercially available detector available from holiday detection equipment manufacturers such as SPY, TINKER AND RASOR, and ZORELCO.

9. All pipe linings shall be checked for thickness using a magnetic film thickness gauge. Thickness testing shall be performed in accordance with SSPC-PA-2.

10. Each pipe joint and fitting shall be marked with the date of application of the lining system and with the numerical sequence of application of that date.

11. Certification: The pipe or fitting manufacturer shall supply a certificate attesting to the fact that the applicator met the requirements of this Specification, and that the material used was as specified.

12. Handling: Protecto 401 lined pipe and fittings shall be handled only from the outside of the pipe and fittings. No forks, chains, straps, hooks, etc. shall be placed inside the pipe and fittings for lifting, positioning, or laying.

2.07 Retainer Glands

Retainer glands for ductile iron pipe shall be Megalug Series 1100, as manufactured by EBAA Iron, Uni-Flange Series 1400, as manufactured by Ford Meter Box Company, or Star Pipe Products Star-Grip Series 3000.

Part 3 Execution

3.01 Cutting

A. When new or existing pipe is required to be cut, the pipe shall be cut in such a manner as to leave a smooth end normal to the axis of the pipe.

B. All cutting of ductile iron pipe shall be performed with a cutting saw. All burrs shall be removed from the inside and outside edges of all cut pipe. All damaged linings and coatings shall be repaired.

C. Lining Repair: Repair epoxy linings and recoat spigot ends of cut pipe with Protecto 101 or Madewell 1104 coal tar epoxy in accordance with the manufacturer's recommendations and as specified below:

1. Remove all burrs and areas of loose lining materials by sanding or scraping to bare metal.

2. Remove oil and lubricants used during field cutting.

3. Lining shall be stripped back a minimum of 1-inch from the spigot end into well adhered lined areas.

4. Roughen 1 to 2-inches of good lining with a rough grade (40 grit) emery paper, rasp or small chisel, to allow an overlap between new and existing lining.

5. Apply lining repair material in the number of coats required to match the thickness requirements as specified in Part 2 of this Section and in accordance with the manufacturer's recommendations.

3.02 Joint Assembly

A. General: Ductile iron pipe shall be assembled in accordance with ANSI/AWWA C600.

B. Push-On Joints: The inside of the bell and the outside of the pipe from the plain end to the guide stripe shall be wiped clean immediately before assembling the pipe joint. Then the rubber gasket shall be inserted into a groove or shaped recess in the bell. Both the bell and spigot ends to be joined shall be wiped again to ensure they are thoroughly clean. A liberal coating of special lubricant furnished by the pipe manufacturer shall be applied to the outside of the pipe. The plain end shall be centered in the bell and the spigot pushed home.

C. Mechanical Joints

1. The surfaces with which the rubber gasket comes in contact shall be brushed thoroughly with a wire brush just prior to assembly to remove all loose rust or foreign material which may be present and to provide clean surfaces which shall be brushed with a liberal amount of soapy water or other approved lubricant just prior to slipping the gasket over the spigot end and into the bell. Lubricant shall be brushed over the gasket prior to installation to remove loose dirt and lubricate the gasket as it is forced into its retaining space.

2. Joint bolts shall be tightened by the use of wrenches and to a tension recommended by the pipe manufacturer. When tightening bolts, the gland shall

be brought up toward the pipe bell. If effective sealing is not attained at the maximum torque indicated above, the joint shall be disassembled and reassembled after thorough cleaning. Overstressing of bolts to compensate for poor installation shall not be permitted.

3. After installation, bolts and nuts in buried piping shall be given two heavy coats of a bituminous paint. Bolts and nuts for exposed or submerged service shall be coated in accordance with the requirements of Section 09900 of these Specifications.

D. Flanged Joints

1. All flanges shall be true and perpendicular to the axis of the pipe. Flanges shall be cleaned of all burrs, deformations, or other imperfections before joining. Flanged joints shall be installed so as to ensure uniform gasket compression. All bolting shall be pulled up to the specified torque by crossover sequence. Where screwed flanges are used, the finished pipe edge shall not extend beyond the face of the flange, and the flange neck shall completely cover the threaded portion of the pipe.

2. Connections to equipment shall be made in such a way that no torque is placed on the equipment flanges. Connecting flanges must be in proper position and alignment and no external force may be used to bring them together properly.

3. After installation, bolts and nuts for exposed or submerged service shall be coated in accordance with the requirements of Section 09900 of these Specifications.

4. Flanged filler shall be used only where shown on the Drawings or approved by the Engineer to make up minor differences in pipe length, less than 3-inches. Joint bolts shall be increased in length by the thickness of the flange filler.

E. Grooved-End Joints

1. Pipe ends shall be clean and free from indentations, projections, and roll marks in the area from the pipe end to the groove for proper pipe gasket sealing.

2. The gasket style and elastomeric material shall be verified as suitable for the intended service as specified.

3.03 Drilling and Tapping

A. Wherever required ductile iron pipe and fittings shall be drilled and tapped to receive any other piping. All holes shall be drilled accurately at right angles to the axis of any pipe or fitting. Where plugs are drilled, holes shall be at right angles to the face of the plug.

B. Unless shown otherwise, small diameter pipes, less than 2-inches, shall be connected to ductile iron pipe using one of the following methods:

1. Direct tap.

2. Direct tap with service clamp.

3. Direct tap boss.

4. Tapped plug or flange on tapping saddle.

C. In no case shall the effective number of threads be less than 4.

3.04 Constructing Within Structures

A. Proper and suitable tools and appliances for safe and convenient handling and laying of pipe and fittings shall be used. Care shall be taken to prevent the pipe coating from being damaged, particularly cement linings on the inside of the pipes and fittings. Any damage shall be remedied as directed by the Engineer.

B. All pipe and fittings shall be carefully examined by the Contractor for defects just before installing and no pipe or fitting shall be installed if it is defective. If any defective pipe or fitting is discovered after having been installed, it shall be removed and replaced in a satisfactory manner with a sound pipe or fitting by the Contractor at Contractor's own expense.

C. All pipes and fittings shall be thoroughly cleaned before they are installed and shall be kept clean until they are used in the completed work. Open ends of pipe shall be kept plugged with a bulkhead during construction.

D. All elbows, tees, brackets, crosses, and reducers in pressure piping systems shall be adequately restrained against thrust.

E. Wall pipe and wall sleeves shall be accurately located and securely fastened in place before concrete is poured. All wall pipe and sleeves shall have wall collars properly located to be in the center of the wall where the respective pipes are to be installed. Pipe passing through the sleeve shall extend no more than three feet beyond the structure without a piping joint.

F. Wall pipe and wall sleeves shall be constructed when the wall or slab is constructed. Blocking out or breaking of the wall for later installation shall not be permitted.

G. Cutting or weakening of structural members to facilitate pipe installation shall not be permitted. All piping shall be installed in place without springing or forcing.

H. Exposed ductile iron piping shall be supported as shown on the Drawings and specified in Section 15094 of these Specifications.

3.06 Field Painting

Field painting of exposed and submerged pipe shall be in accordance with the requirements of Section 09900 of these Specifications.

3.07 Inspection and Testing

All testing shall be in accordance with the requirements of Section 02666 of these Specifications.

END OF SECTION

Part 1 General

1.01 Scope

A. Furnish all labor, materials, equipment and incidentals required to complete and make ready for operation, all valves and appurtenances as shown on the Drawings and as specified herein.

B. This Section does not include valves for combustible or flammable liquids or gases.

C. The equipment shall include, but is not limited to, the following:

1. Butterfly Valves
2. Gate Valves
3. Check Valves
4. Valve Operator Accessories

D. All butterfly valves and associated operator accessories shall be included in the preselected equipment allowance package. The Contractor is responsible for all labor associated with valve removal and replacement, for both valves to be replaced and valves to be adjusted. Adjustment of valves shall be performed by the preselected equipment allowance package manufacturer.

E. All gate valves, check valves, and associated operator accessories shall be provided by the Contractor.

1.02 Submittals

A. Submit to the Engineer, within 30 days after execution of the Contract, a list of materials to be furnished, the names of the suppliers, and the date of delivery of materials to the site.

B. Complete shop drawings of all valves and appurtenances shall be submitted to the Engineer for approval in accordance with Section 01340 of these Specifications. Clearly indicate make, model, location, type, size and pressure rating.

C. Operating and maintenance data for all valves shall be furnished in accordance with Section 01730 of these Specifications.

1.03 Storage and Protection

Valves and all associated accessories shall be stored and protected in accordance with the requirements of Section 01640 of these Specifications.

1.04 Quality Assurance

The manufacturer shall provide written certification to the Engineer that all equipment furnished complies with all applicable requirements of these Specifications.

Part 2 Products

2.01 General

A. Provide valves of same manufacturer throughout where possible.

B. Provide valves with manufacturer's name and pressure rating clearly marked on the outside of the valve body.

C. All exposed bolts, nuts, and washers for buried or submerged valves shall be stainless steel. All exposed nuts, bolts, springs, washers, and miscellaneous hardware shall be zinc plated in accordance with ASTM B 633, Type II unless specified otherwise.

2.02 Shop Painting

A. All exterior ferrous metal surfaces of exposed or submerged valves and appurtenances shall receive a coating of rust-inhibitive primer compatible with the finish paint specified in Section 09900 of these Specifications. The exterior of all buried valves shall have a factory applied, two coat coal tar epoxy coating system. The coal tar epoxy shall be Tnemec Tneme-Tar 46-413, Indurall Ruffstuff 2100 Coal Tar Epoxy or KopCoat Bitumastic No. 300-M. Each coating shall have a dry film thickness of 8-10 mils.

B. All interior ferrous metal surfaces of valves, except for finished or bearing surfaces, and appurtenances shall be provided with two coat, interior epoxy coating conforming to the requirements of AWWA C550 and NSF 61. The coating shall be equal to Tnemec Series 20 Pota Pox, Valspar Series 78 Hi-Build Epoxy, or KopCoat Hi-Gard Epoxy. The coating system shall have a dry film thickness of 4 - 6 mils. Valves for air and gas service shall be uncoated.

2.03 Butterfly Valves

A. Butterfly Valves for Liquid Service (BV)

1. Butterfly valves shall be resilient seated, short body design, and shall be designed, manufactured, and tested in accordance with all requirements of AWWA C504 for Class 150B.

2. Valve bodies shall be ductile iron conforming to ASTM A 536, Grade 65-45-12 or ASTM A 126, Grade B cast iron. Shafts shall be ASTM A 276, Type 304 stainless steel, machined and polished. Valve discs shall be ductile iron, ASTM A 536, Grade 65-45-12 or ASTM A 126, Grade B cast iron. The resilient valve

seat shall be located either on the valve disc or in the valve body and shall be fully field adjustable and field replaceable.

3. Actuators

   a. Valves for non-buried service, 3 through 8-inches in diameter, shall be lever operated. Hand levers shall be steel with a non-metallic grip. The lever shall be capable of being locked in any position.

   b. Valves for non-buried service, 10-inches or greater in diameter shall be equipped with geared manual actuators designed, manufactured and tested in accordance with AWWA C504. Actuators shall be capable of holding the disc in any position between full open and full closed without any movement or fluttering of the disc. Actuators shall be furnished with fully adjustable mechanical stop-limiting devices. Actuators that utilize the sides of the actuator housing to limit disc travel are unacceptable. Valve actuators shall be capable of withstanding a minimum of 450 foot pounds of input torque in either the open or closed position without damage.

   c. Valves shall be equipped with motorized actuators where shown on the Drawings and as specified in this Section.

4. Operators

   a. Valves for non-buried service, six feet or more above the operating floor shall be furnished with a chainwheel operator and chain for operation from floor level. All other valves shall be equipped with a handwheel operator.

   b. Valves shall be equipped with pedestal type operators where shown on the Drawings and as specified in this Section.

   c. Valves shall be equipped with motorized actuators where shown on the Drawings and as specified in this Section.

5. Valves shall be installed with disc shaft horizontal except where extended bonnets are used. Valves and actuators shall have seals on all shafts and gaskets on valve actuator covers to prevent the entry of water. Actuator mounting brackets shall be totally enclosed and shall have gasket seals.

6. Valve ends shall be mechanical joint type, except where flanged or restrained joint ends are shown. Flange joints shall meet the requirements of ANSI B16.1, Class 125.

7. All submerged valves shall be provided with 304 stainless steel extension stem (shaft) and carbon steel floor stand assembly. All inner components of the assembly shall be constructed of 304 stainless steel.

8. Butterfly valves shall be manufactured by DeZurik. No substitutions will be allowed.

B. Butterfly Valves for Air Service (BVA)

1. Butterfly valves shall be resilient seated, short body design. Valves shall be designed for a rated working pressure of 25 psi and a minimum service temperature of 300 degrees F.

2. Valve bodies shall be ductile iron conforming to ASTM A 536, Grade 65-45-12 or ASTM A 126, grade B cast iron. Shafts shall be 304 stainless steel, machined and polished. Valve discs shall be ductile iron, ASTM A 536 Grade 65-45-12. The resilient valve seat shall be Viton and shall be located either on the valve disc or in the valve body and shall be fully field adjustable and field replaceable.

3. Actuators

   a. Valves for non-buried service, 3 through 8-inches in diameter, shall be lever operated. Hand levers shall be steel with a non-metallic grip. The lever shall be a universal locking type capable of being locked in any position.

   b. Valves for non-buried service, 10-inches or greater in diameter shall be equipped with geared manual actuators. Actuators shall be capable of holding the disc in any position between full open and full closed without any movement or fluttering of the disc. Actuators shall be furnished with fully adjustable mechanical stop-limiting devices. Actuators that utilize the sides of the actuator housing to limit disc travel are unacceptable. Valve actuators shall be capable of withstanding a minimum of 450 foot pounds of input torque in either the open or closed position without damage.

   c. Valves shall be equipped with motorized actuators where shown on the Drawings and as specified in this Section.

4. Operators

   a. Valves for non-buried service, six feet or more above the operating floor shall be furnished with a chainwheel operator and chain for operation from floor level. All other valves shall be equipped with a handwheel operator.

   b. Valves for buried service shall have a nut type operator and shall be equipped with a valve box and stem extension required to bring the operation nut within 6-inches of finished grade. Valve boxes and extension stems shall be as specified in this Section.

   c. Valves shall be equipped with pedestal type operators where shown on the Drawings and as specified in this Section.

5. Valves shall be installed with disc shaft horizontal. Valves and actuators shall have seals on all shafts and gaskets on valve actuator covers to prevent the entry of water. Actuator mounting brackets shall be totally enclosed and shall have gasket seals.

6. Valve ends shall be mechanical joint type, except where flanged ends are shown. Use Viton gaskets for all joints. Flange joints shall meet the requirements of ANSI B16.1, Class 125.

7. Butterfly valves for air service shall be manufactured by DeZurik. No substitutions will be allowed.

C. Butterfly valves included in the preselected equipment allowance package are listed in Table 1, below.

2.04 Gate Valves (GV)

A. Valves 3-Inches in Diameter and Smaller: Gate valves shall be bronze, heavy duty, rising stem, wedge type with screwed or union bonnet. Valve ends shall be threaded or solder type as appropriate. Valves shall have a minimum 200 psi working pressure for water. Valves shall be made in the U.S.A. Gate valves shall be equal to Crane No. 428 (threaded) or Crane No. 1334 (solder end).

B. Valves 4-Inches through 12-Inches in Diameter: Gate valves 4 through 12-inches shall be resilient wedge type conforming to the requirements of AWWA C509 rated for 200 psi working pressure.

1. Valves shall be provided with two O-ring stem seals with one O-ring located above and one O-ring below the stem collar. The area between the O-rings shall be filled with lubricant to provide lubrication to the thrust collar bearing surfaces each time the valve is operated. At least one anti-friction washer shall be utilized to further minimize operating torque. All seals between valve parts, such as body and bonnet, bonnet and bonnet cover, shall be flat gaskets or O-rings.

2. The valve gate shall be made of cast iron having a vulcanized, synthetic rubber coating, or a seat ring attached to the disc with retaining screws. Sliding of the rubber on the seating surfaces to compress the rubber will not be allowed. The design shall be such that compression-set of the rubber shall not affect the ability of the valve to seal when pressure is applied to either side of the gate. The sealing mechanism shall provide zero leakage at the water working pressure when installed with the line flow in either direction.

3. All internal ferrous surfaces shall be coated with epoxy to a minimum thickness of 4 mils. The epoxy shall be non-toxic, impart no taste to the water and shall conform to AWWA C550, latest revision.

4. Gate valves 4 through 12-inches shall be manufactured by American Flow

Control, Mueller or M & H Valve.

C. Valves 16-Inches in Diameter and Larger: Valves shall be double-disc type conforming to the requirements of AWWA C500. Valves shall be designed for horizontal installation with tracks and rollers, bypass valves, and bevel gear type actuator. Valves shall be rated for 150 psi working pressure.

D. Valve ends shall be mechanical joint type except where flanged or restrained joint ends are shown. Flanged joints shall meet the requirements of ANSI B16.1, Class 125.

E. Operators

1. Manually operated valves, including geared valves, shall be non-rising stem type having O-ring seals.

2. Valves for buried service shall have a nut type operator and shall be equipped with a valve box and extension stem as specified in this Section unless access to the operator is provided by a manhole.

3. Valves for non-buried service shall be equipped with a handwheel operator.

2.05 Check Valves (CV)

A. Swing Disc Type, Cushioned

1. Check valves shall be hinged disc type with cast iron body and bronze or bronze-fitted disc. Valves shall be designed for the operating head indicated and shall not slam shut on pump shutdown. The valve shall be set to close at a differential operating pressure of 2 psi. Valves shall be equipped with a 1/2-inch stop cock at the high point of the valve for bleeding air from the line.

2. Valves shall be outside weight and lever cushioned type. The cushion chamber shall be attached to the side of the valve body externally and constructed with a piston operating in a chamber that will effectively prevent water. The cushioning shall be by air, and the cushion chamber shall be so arranged that the closing speed will be adjustable to meet the service requirements.

3. Valve ends shall be flanged, meeting the requirements of ANSI B16.1, Class 125.

4. Valves shall be manufactured by APCO or GA Industries.

2.06 Valve Operator Accessories

A. Stem Guides (SG): Fully adjustable stem guides with bronze bushings, shall be furnished by the manufacturer of the associated valve and shall be installed as shown on the Drawings and wherever necessary to prevent unsupported stem lengths of 10 feet or more conform to the extension stem guide spacing requirements of AWWA

C501.

B. Extension Stems: Extension stem shall be stainless steel and shall be furnished by the manufacturer of the associated valve to bring the operating nut to within 6-inches of finished grade. Extension stems shall be sized by the valve manufacturer to withstand the maximum valve operator output.

Part 3 Execution

3.01 Installation

A. All valves and appurtenances shall be installed in the locations shown on the Drawings, true to alignment and properly supported. Any damage to the above items shall be repaired to the satisfaction of the Engineer before they are installed.

B. Install all floor boxes, brackets, extension rods, guides, the various types of operators and appurtenances as shown on the Drawings. Before setting these items, the Contractor shall check all plans and figures which have a direct bearing on their location and he shall be responsible for the proper location of these valves and appurtenances during the construction of the structure.

3.02 Field Painting

All exposed, non-buried or submerged valves and appurtenances specified herein shall be painted as part of the work in Section 09900 of these Specifications.

3.03 Inspection and Testing

Following installation, operating tests will be performed to demonstrate to the Engineer that all equipment and accessories will function in a satisfactory manner. The Contractor shall make, at Contractor's own expense, all necessary changes, modifications and/or adjustments required to ensure satisfactory operation.

3.04 Cleaning

Prior to acceptance of the work of this Section, thoroughly clean all installed materials, equipment and related areas in accordance with Section 01710 of these Specifications.

TABLE 1
VALVE SCHEDULE

Valve No.	Type	Size (in)	End Conn.	Valve Status Replace/Adjust	Description	Location
41-BV-01	BV	24	Flg.	Replace	Backwash Flow Control Valve	Filter Gallery
41-BV-11	BV	24	Flg.	Replace	Influent Valve	Filter No. 1
41-BV-12	BV	18	Flg.	Adjust	Effluent Valve	Filter No. 1
41-BV-13	BV	24	Flg.	Adjust	Backwash Water Valve	Filter No. 1
41-BV-14	BV	10	Flg.	Adjust	Backwash Air Valve	Filter No. 1
41-BV-15	BV	30	Flg.	Replace	Backwash Drain Valve	Filter No. 1
42-BV-11	BV	24	Flg.	Replace	Influent Valve	Filter No. 2
42-BV-12	BV	18	Flg.	Adjust	Effluent Valve	Filter No. 2
42-BV-13	BV	24	Flg.	Adjust	Backwash Water Valve	Filter No. 2
42-BV-14	BV	10	Flg.	Adjust	Backwash Air Valve	Filter No. 2
42-BV-15	BV	30	Flg.	Replace	Backwash Drain Valve	Filter No. 2
41-BV-21	BV	24	Flg.	Replace	Influent Valve	Filter No. 3
41-BV-22	BV	18	Flg.	Adjust	Effluent Valve	Filter No. 3
41-BV-23	BV	24	Flg.	Adjust	Backwash Water Valve	Filter No. 3
41-BV-24	BV	10	Flg.	Adjust	Backwash Air Valve	Filter No. 3
41-BV-25	BV	30	Flg.	Replace	Backwash Drain Valve	Filter No. 3
42-BV-21	BV	24	Flg.	Replace	Influent Valve	Filter No. 4
42-BV-22	BV	18	Flg.	Adjust	Effluent Valve	Filter No. 4
42-BV-23	BV	24	Flg.	Adjust	Backwash Water Valve	Filter No. 4
42-BV-24	BV	10	Flg.	Adjust	Backwash Air Valve	Filter No. 4
42-BV-25	BV	30	Flg.	Replace	Backwash Drain Valve	Filter No. 4
41-BV-31	BV	24	Flg.	Replace	Influent Valve	Filter No. 5
41-BV-32	BV	18	Flg.	Adjust	Effluent Valve	Filter No. 5
41-BV-33	BV	24	Flg.	Adjust	Backwash Water Valve	Filter No. 5
41-BV-34	BV	10	Flg.	Adjust	Backwash Air Valve	Filter No. 5
41-BV-35	BV	30	Flg.	Replace	Backwash Drain Valve	Filter No. 5
42-BV-31	BV	24	Flg.	Replace	Influent Valve	Filter No. 6
42-BV-32	BV	18	Flg.	Adjust	Effluent Valve	Filter No. 6
42-BV-33	BV	24	Flg.	Adjust	Backwash Water Valve	Filter No. 6
42-BV-34	BV	10	Flg.	Adjust	Backwash Air Valve	Filter No. 6

Valve No.	Type	Size (in)	End Conn.	Valve Status Replace/Adjust	Description	Location
42-BV-35	BV	30	Flg.	Replace	Backwash Drain Valve	Filter No. 6
41-BV-41	BV	24	Flg.	Replace	Influent Valve	Filter No. 7
41-BV-42	BV	18	Flg.	Adjust	Effluent Valve	Filter No. 7
41-BV-43	BV	24	Flg.	Adjust	Backwash Water Valve	Filter No. 7
41-BV-44	BV	10	Flg.	Adjust	Backwash Air Valve	Filter No. 7
41-BV-45	BV	30	Flg.	Replace	Backwash Drain Valve	Filter No. 7
42-BV-41	BV	24	Flg.	Replace	Influent Valve	Filter No. 8
42-BV-42	BV	18	Flg.	Adjust	Effluent Valve	Filter No. 8
42-BV-43	BV	24	Flg.	Adjust	Backwash Water Valve	Filter No. 8
42-BV-44	BV	10	Flg.	Adjust	Backwash Air Valve	Filter No. 8
42-BV-45	BV	30	Flg.	Replace	Backwash Drain Valve	Filter No. 8
41-BV-51	BV	24	Flg.	Replace	Influent Valve	Filter No. 9
41-BV-52	BV	18	Flg.	Adjust	Effluent Valve	Filter No. 9
41-BV-53	BV	24	Flg.	Adjust	Backwash Water Valve	Filter No. 9
41-BV-54	BV	10	Flg.	Adjust	Backwash Air Valve	Filter No. 9
41-BV-55	BV	30	Flg.	Replace	Backwash Drain Valve	Filter No. 9
42-BV-51	BV	24	Flg.	Replace	Influent Valve	Filter No. 10
42-BV-52	BV	18	Flg.	Adjust	Effluent Valve	Filter No. 10
42-BV-53	BV	24	Flg.	Adjust	Backwash Water Valve	Filter No. 10
42-BV-54	BV	10	Flg.	Adjust	Backwash Air Valve	Filter No. 10
42-BV-55	BV	30	Flg.	Replace	Backwash Drain Valve	Filter No. 10
41-BV-61	BV	24	Flg.	Replace	Influent Valve	Filter No. 11
41-BV-62	BV	18	Flg.	Adjust	Effluent Valve	Filter No. 11
41-BV-63	BV	24	Flg.	Adjust	Backwash Water Valve	Filter No. 11
41-BV-64	BV	10	Flg.	Adjust	Backwash Air Valve	Filter No. 11
41-BV-65	BV	30	Flg.	Replace	Backwash Drain Valve	Filter No. 11
42-BV-61	BV	24	Flg.	Replace	Influent Valve	Filter No. 12
42-BV-62	BV	18	Flg.	Adjust	Effluent Valve	Filter No. 12
42-BV-63	BV	24	Flg.	Adjust	Backwash Water Valve	Filter No. 12
42-BV-64	BV	10	Flg.	Adjust	Backwash Air Valve	Filter No. 12
42-BV-65	BV	30	Flg.	Replace	Backwash Drain Valve	Filter No. 12

END OF SECTION

Part 1 General

1.01 Scope

A. The electrical work commences with the point of electrical service where shown on the Drawings and includes furnishing all material and labor for a complete electrical installation.

B. The requirements of Division 1 apply to all work hereunder. The General and Special Conditions are a part of this Division of the Specifications and all provisions contained therein which affect this work are as binding as though incorporated herein.

1.02 Definitions

A. Provide: Furnish, install, and connect.

B. Product Data: Catalog cuts and descriptive literature.

C. Shop Drawings: Factory prepared specific to the installation.

D. Low Voltage: 0-600 volts.

E. Indicated: Shown on the Drawings.

F. Noted: Indicated or specified elsewhere.

1.03 Material Not Furnished

A. Unless otherwise noted, the following are furnished and installed under other Divisions:

1. Motors
2. Motor starters (except motor control centers)
3. Electric heating and air conditioning equipment
4. Building energy management systems
5. Electrical heat tracing
6. Pilot and control devices for the above equipment

B. All power wiring including associated terminations is provided under this Division. Control and signal wiring shown on the electrical drawings, including associated terminations is also provided under this Division. Control wiring for mechanical equipment not shown on the electrical drawings is provided under Division 15. Where digital communications cables (fiber optic cables, RS-485 cables, etc.) are specified

under Division 17, cable pulling and installation in raceways shall be provided under this Division with any required splices and all terminations provided under Division 17.

1.04 Local Conditions

A. Power will be supplied from the Owner's existing distribution system. Provide connections to existing equipment as indicated on the Drawings. No power interruptions to existing equipment are permitted unless schedule for same has been approved by the Owner.

1.05 Quality Assurance

A. Provide the complete electrical installation in accordance with the National Electrical Code (NFPA 70), Life Safety Code (NFPA 101), and in accordance with applicable local codes. Obtain all necessary permits and have all work inspected by appropriate authorities.

B. All products shall be designed, manufactured, and tested in accordance with industry standards. Where applicable, products shall be labeled or listed by third party certification agencies.

C. Industry Standards: Standards organizations and their abbreviations, as used herein, are as follows. Applicable date for industry standards is that in effect on the date of advertisement of the Project.

1. American National Standards Institute (ANSI)

2. American Society for Testing and Materials (ASTM)

3. Federal Specifications (FS)

4. Institute of Electrical and Electronics Engineers (IEEE)

5. Insulated Cable Engineers Association (ICEA)

6. National Electrical Manufacturers Association (NEMA)

7. National Fire Protection Association (NFPA)

8. Underwriters Laboratories, Inc. (UL)

1.06 Submittals

A. Make all submittals in accordance with the requirements of Section 01340. Approval drawings consist of shop drawings, product data and other information as noted in the individual equipment sections. Except as noted, submittal information is for approval and equipment may not be installed until submittals have been returned with stamped approval.

B. Information required "for reference" such as product samples, similar unit test reports and time current curves is for the purpose of determining the suitability of a product, selecting breaker settings, etc. This information is to be submitted at the same time as approval data; however, this information will not be returned and stamped approval is not required prior to installation.

C. Except as noted, installation instructions are not required to be submitted. However, it is the Contractor's responsibility to obtain installation information from the manufacturer for all equipment prior to installing the equipment.

1.07 Record Drawings

A. Furnish record drawings in accordance with the requirements of Section 01720. Record drawings consist of submittal data as listed above, operation and maintenance data, and as-built drawings. Record drawings are to reflect the final installation, including any changes during approval, manufacturing tests, and installation.

B. In addition to other required sets, furnish one set of operation and maintenance data for all apparatus requiring service. This set is to be bound in hardback, 3-ring binder(s) and shall include:

1. Title page with project name; installing contractor's name, address and telephone number; date of installation and warranty period.

2. Index sheet.

3. Complete manufacturer's operation and maintenance data with tabs (corresponding to the index) separating each item or system. Include the name, address, and phone number of the nearest sales and service organization for each item.

C. As-Built Drawings: Furnish one set of prints maintained at the job site at all times with all changes during construction marked thereon. Include on the as-built drawings sufficient dimensions to permit location of underground conduits.

D. Submit the results of any tests required in the individual equipment sections.

1.08 Delivery, Storage, and Handling

A. Ship products to the job site in their original packaging. Receive and store products in a suitable manner to prevent damage or deterioration. Keep equipment upright at all times.

B. Investigate the spaces through which equipment must pass to reach its final destination. Coordinate with the manufacturer to arrange delivery at the proper stage of construction and to provide shipping splits where necessary.

Part 2 Products

2.01 Materials

Provide only new products of the manufacturer's latest design.

2.02 Substitutions

A. Where the words "equal to" follow or precede the listed acceptable manufacturers, equal products of other manufacturers are acceptable and request for substitution may be made during submittal stage.

Part 3 Execution

3.01 Installation

A. The complete installation is to be accomplished by skilled electrical tradesmen, with certified or suitably qualified individuals performing all special systems installation and testing. All workmanship shall be of the highest quality, sub-standard work will be rejected.

B. Schedule the work and cooperate with all trades to avoid delays, interferences, and unnecessary work. If any conflicts occur necessitating departures from the Drawings and Specifications, details of departures and reasons therefore shall be submitted immediately for the Engineer's consideration.

C. Do not stub up conduits prior to receipt of approved shop drawings showing conduit entry locations.

D. Prior to final inspection, clean all dirt, mud and construction debris from all boxes, cabinets, manholes and equipment enclosures.

3.02 Certification and Tests

A. Prior to request for final review, test all systems and repair or replace all defective work. Submit, with request for final review, written certification that all electrical systems are complete and operational.

B. At the time of final review of electrical work, demonstrate the operation of electrical systems. Furnish labor, apparatus and equipment for systems' demonstration.

C. After final review and acceptance, turn over to the Owner all keys for electrical equipment locks. Present to the Owner or the Owner's designated representative, demonstrations and oral instructions for proper operation and maintenance of the electrical equipment and systems.

END OF SECTION

Part 1 General

1.01 Scope

A. The electrical demolition work commences with the point where indicated on the Drawings and includes furnishing all equipment, materials and labor to accommodate new work.

B. Scheduling: Coordinate all demolition and modification work with the requirements of Division 1 of these Specifications.

C. Methods of demolition work shall provide for a safe conduct of work, and protection of property which is to remain in service and undisturbed.

1.02 Submittals

Submit to the Owner for review, a written detailed procedure and method for each structure to be demolished or modified. The submittal shall include approximate dates and times of deenergization of services.

Part 2 Products (Not Used)

Part 3 Execution

3.01 Demolition

A. Coordinate and schedule all demolition work and outages of existing services prior to starting work.

B. Existing services and facilities damaged or otherwise interrupted by the Contractor through negligence or through use of faulty materials or workmanship shall be promptly repaired, replaced, or otherwise restored by the Contractor without additional cost to the Owner.

C. Interruptions of services necessary for connection to or modification of existing systems or facilities shall occur only at pre-arranged times approved by the Owner. Interruptions shall only occur after the provision of all necessary temporary work and the availability of adequate labor and materials has been assured that the duration of the interruption will not exceed the time agreed upon.

D. Existing materials shall remain the property of the Owner and shall be stored at a location and in a manner as directed, or if classified by the Owner as unsuitable for further use, shall become the property of the Contractor and shall be removed from the site.

E. All underground ductbank and conduits which are not in conflict with the new work shall be abandoned.

F. All exposed conduits in structures or buildings to be removed, shall be cut and plugged flush with structure or floor.

G. All wiring to be removed shall be disconnected at distribution panels or MCC's. All wiring which serves equipment to be removed shall be removed.

H. Schedule: Demolish electrical equipment from structures as indicated or as required to facilitate the installation of new equipment and work.

I. All wiring, conduit or equipment designated on the Demolition Plan shall be disposed of in a safe manner in accordance with all applicable local, state and federal environmental agencies.

END OF SECTION

Part 1 General

1.01 Scope

A. Rigid metal conduit and fittings.

B. Intermediate metal conduit and fittings.

C. Flexible metal conduit and fittings.

D. Liquidtight flexible metal conduit and fittings.

E. Non-metallic conduit and fittings.

1.02 Submittals

Do not submit equipment specified in this Section.

Part 2 Products

2.01 Acceptable Manufacturers

A. Conduit: Allied, Republic, Triangle or Wheatland.

B. PVC Coated Conduit and Fittings: Ocal, Permacote or Robroy.

C. PVC Conduit: Amoco, Carlon or Certainteed.

D. Flexible Conduit: Anaconda, Thomas & Betts, Electric Flex or Triangle.

E. Fittings: Appleton, Crouse-Hinds, Oz or Thomas & Betts.

F. Nonmetallic Flexible Conduit and Fittings: Carlon Carflex.

G. Substitutions: Products equal to those listed.

2.02 Rigid Metal Conduit and Fittings

A. Rigid Steel Conduit: UL 6; ANSI C80.1; hot dip galvanized; minimum size 3/4-inch.

B. Rigid Aluminum Conduit: UL 6; ANSI C80.5; minimum size 3/4-inch.

C. PVC Coated Conduit: NEMA RN-1 or UL-6 rigid steel conduit with factory applied external 40 mil PVC coating and urethane interior coating. Prior to coating, treat conduit with a heat polymerizing adhesive so the bond between metal and coating is greater than the tensile strength of the coating. Minimum size 3/4-inch.

D. Fittings and Conduit Bodies: NEMA FB-1; zinc coated; taper-threaded type, material to match conduit. Where PVC coated conduits are indicated all couplings, fittings, conduit bodies, pipe straps, U bolts, beam clamps, flex connections and other accessories shall be stainless steel or shall have factory applied PVC coating. Use PVC coated hubs for connection of coated conduits - locknuts are not acceptable.

2.03 Intermediate Metal Conduit (IMC) and Fittings

A. IMC: UL 1242; hot dip galvanized; minimum size 3/4-inch.

B. Fittings and Conduit Bodies: Use fittings and conduit bodies specified above for rigid steel conduit.

2.04 Flexible Metal Conduit and Fittings

A. Conduit: UL 1; FS WW-C-566; single steel continuous strip with galvanized coating; minimum size 3/8-inch.

B. Fittings and Conduit Bodies: NEMA FB-1; malleable iron squeeze type.

2.05 Liquidtight Flexible Conduit and Fittings

A. Conduit: UL listed liquidtight consisting of an extruded thermoplastic cover over a galvanized steel core. Minimum size 3/4-inch. Exception: Where connected to devices with manufacturer supplied 1/2 or 3/8-inch hubs, match conduit size to hub size.

B. Fittings and Conduit Bodies: NEMA FB-1; galvanized steel compression type with O-ring. Where PVC coated conduits are indicated, provide PVC coated fittings for flex connections.

2.06 Rigid Nonmetallic Conduit and Fittings

A. Conduit: NEMA TC-2; Schedule 40 PVC.

B. Fittings and Conduit Bodies: NEMA TC-3.

2.07 Liquidtight Flexible Non-Metallic Conduit and Fittings

A. Conduit: UL listed, liquidtight consisting of a hand PVC spiral with flexible PVC covering. Minimum size is 3/4-inch.

B. Fittings: UL listed, molded from high-strength, glass-filled thermoplastic.

Part 3 Execution

3.01 Conduit Schedule

A. Except as noted, use only rigid steel or IMC conduits.

B. Use liquidtight flexible steel conduit for connections to motors, transformers and other vibrating equipment. Maximum length is 3 feet unless approved by the Engineer.

C. EMT may be used where concealed in spaces above hung ceilings and in hollow spaces of interior partitions.

D. Non-jacketed flexible steel conduit may be used for connections to lighting fixtures in suspended ceilings.

E. Use PVC coated conduits where conduits are in direct contact with earth. Provide 24 inches minimum cover.

F. Rigid nonmetallic conduit may be used for underground concrete encased duct banks and in or below slab on grade. Exception: Use rigid steel or IMC conduit for analog signal circuits; 4 to 20 mA and AC or DC signals less than 25 volts.

G. Where PVC conduit is indicated, make a transition to rigid steel below grade or slab and continue above with rigid steel conduit. Exception: PVC may enter switchboards, motor control centers or other floor standing electrical equipment enclosures. Provide bell ends or socket end bell at enclosure entry.

H. Where aluminum conduit is indicated, conduit may not be installed in direct contact with concrete or masonry surfaces.

3.02 Conduit Arrangement and Support

A. Arrange conduit to maintain headroom and present a neat appearance. Run exposed conduits parallel or perpendicular to building surfaces and adjacent piping. Group conduit in parallel runs where practical and provide rack space for 25 percent additional conduits. Use concentric bends for parallel runs.

B. Avoid sources of heat when possible. Where unavoidable, maintain 3-inch clearance when crossing hot pipes and 12-inch clearance between parallel hot pipes, flues, heating appliances and other heat sources.

C. Support conduits to prevent distortion of alignment by wire pulling operations. Fasten single conduits with one hole malleable iron straps. For multiple runs use channel and clamps. Wire, perforated pipe straps and the like are not acceptable support means.

D. Support conduit at a maximum of seven feet on center and within three feet of each box, cabinet, or fitting. Hang trapeze assemblies with threaded rods not less than 3/8-inch diameter. Remove all temporary supports prior to pulling conductors.

E. Do not support conduits from electrical distribution equipment or control panels.

3.03 Conduit Installation

A. Cut conduit square using a saw or pipecutter and de-burr cut ends. Paint threads with zinc compound. Bring conduit to the shoulder of fittings and couplings and fasten securely. All connections are to be wrench tightened and electrically continuous. No running threads are permitted.

B. Use conduit hubs for fastening conduit to cast boxes, and for fastening conduit to sheet metal boxes in damp or wet locations. Use conduit bodies to make sharp changes in direction. For sizes 2-inches and larger, use "LBD" or similar fittings to permit a straight pull from either direction. In no case shall a fitting be used which results in bending radius too small for the cable.

C. The maximum length between pull points is 400 feet. This length shall be reduced by one foot for each degree of bend.

D. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2-inch size. Crushed or deformed conduits may not be installed.

E. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.

F. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture. Install threaded PVC end caps on conduits stubbed up for future use.

G. Provide a 200 pound tensile strength polyolefin line pulled through and tied off at each end of all empty conduits.

H. Install expansion joints equal to Crouse Hinds type XJ where conduit crosses building expansion joints and for straight runs in excess of 100 feet.

I. Where conduit penetrates fire-rated walls and floors, provide mechanical fire-stop fittings with UL listed fire rating equal to wall or floor rating.

J. Provide watertight seals, equal to OZ type WSK, FSK, or CSM, where conduit penetrates exterior walls and where conduit passes between spaces normally at different temperatures. Seal duct bank and underground conduit entry with GE or Dow silicone sealant. Stub duct bank and underground conduits up a minimum of 2-inches above equipment pads and provide bushing.

K. Provide silicone sealant equal to Dow or GE for conduit entry in outlet boxes and equipment enclosures (all conduit ends except pull boxes and fittings) for the following areas:

1. Filter Building - Exterior

2. Filter Building - Bottom Floor

L. Obtain approved shop Drawings showing conduit entry space before stubbing conduits in floor standing electrical gear.

M. In locations where the conduit cannot be turned, provide three piece threaded rigid couplings.

N. Provide clamp backs for conduits on exterior or damp surfaces to prevent the raceway from bearing directly on the damp surface.

O. Route conduits in slabs above grade above the bottom reinforcing and below the top reinforcing. Maximum size for conduits in slabs above grade is 1-inch and minimum cover is 2-inches. Route so conduits in slabs above grade do not cross. For slab on grade route conduits in a trench below slab at sufficient depth to permit vertical exit from slab. Home runs shall not be routed in slabs except where indicated.

P. Protect conduit threads from rust and damage during construction.

Q. PVC Conduit Bends: Do not use methods which will deform or change the physical characteristics of the conduit. Use PVC-coated rigid steel factory elbows for bends in runs longer than 100 feet, and in runs which have more than two bends, regardless of length. Exception: Where concrete encased in slab or ductbank, GRS elbows may be used in lieu of PVC coated.

R. Wipe plastic conduit clean and dry before joining. Apply full even coat of cement to entire area that will be inserted into fitting. Let joint cure for 20 minutes minimum.

S. PVC Coated Conduit: Exercise care not to damage the coating during cutting, threading, bending, and assembly. Follow the manufacturer's installation instructions. Use vise jaws, bending equipment, strap wrenches, and other tools which are specifically designed for coated conduits. Do not use chain vise, pipe wrench, channel locks or the like. Nicks or small damaged areas (1/2-inch maximum) may be repaired with a manufacturer approved compound. Replace items if coating is damaged in excess of 1/2-inch. Fill space between PVC coating and reducing fittings with silicone sealant.

T. Conductor Protection: Provide bushings on metallic and bell ends on PVC conduits unless conduit terminates in a hub or similar fitting.

END OF SECTION

Part 1 General

1.01 Scope

A. Building wire.

B. Cable.

C. Wiring connections and terminations.

1.02 Submittals

A. Submit product data.

B. Submit test results as listed in Part 3.

Part 2 Products

2.01 Acceptable Manufacturers

A. Low Voltage Conductors: Equal to Aetna, American, Cablec, Continental, Okonite, Pirelli, Southwire or Triangle.

B. Signal Circuit Conductors: Equal to Belden, Continental, Dekoron or Penn.

C. Low Voltage Connectors: Equal to Burndy, Thomas & Betts, Ideal or OZ.

D. Pulling Compounds: Water soluble, equal to Polywater J.

E. Wire and Cable Markers: Plastic, split sleeve or tubing type, equal to Brady Type XC or T & B Type SM.

2.02 Building Wire

A. Thermoplastic Insulated Building Wire: NEMA WC-5.

B. Feeder and Branch Circuits: Single conductor; 98 percent conductivity copper; 75/90 degrees C; 600 volt PVC insulated with nylon jacket; Type THWN/THHN for sizes #1 AWG and smaller. Sizes larger than #1 AWG are XLP insulation type XHHW. Minimum size #12 AWG.

C. Control Circuits: Same as specified above for feeder and branch circuits, except minimum size #14 AWG.

2.03 Remote Control and Signal Cable

A. Control Cable for Class 1 Remote Control and Signal Circuits: Copper conductor; 600 volt insulation, rated 60 degrees C; individual conductors twisted together, shielded, and covered with a PVC jacket; UL listed.

B. Control Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper conductor, 300 volt insulation, rated 60 degrees C, individual conductors twisted together, shielded, and covered with a PVC jacket; UL listed.

C. Plenum Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper conductor, 300 volt insulation, individual conductors twisted together, shielded, and covered with a fluoropolymer jacket; UL listed for use in air handling ducts, hollow spaces used as ducts, and plenums.

D. Instrumentation Signal Cables: #16 AWG stranded tinned copper conductors; 600 volt polyethylene insulation; twisted pair or three conductor construction; 100 percent coverage aluminum polyester shield; #18 stranded tinned copper drain wire; vinyl outer jacket; UL listed.

Part 3 Execution

3.01 General Wiring Methods

A. Use only stranded conductors. Exception: Solid conductors size #12 and #10 AWG may be used for receptacle branch circuit wiring.

B. Use 10 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 75 feet, and for 20 ampere, 277 volt branch circuit home runs longer than 200 feet.

C. Place an equal number of conductors for each phase of a circuit in same raceway or cable.

D. Identification: All conductors shall be identified throughout the electrical system. For control and signal conductors use wiremarkers at all terminals and connections. Color code power circuit conductors as follows:

	120/208 Volt System	277/480 Volt System
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Grey
Ground	Green	Green

E. For conductors larger than #6 AWG color coding may be accomplished with 1-inch wide colored tape applied at each end of the conductor or at points where conductor is accessible so as to be visible inside the enclosure.

F. Neatly train and lace wiring inside boxes, equipment and panelboards. Support to prevent conductor movement under fault conditions.

G. Provide separate pull and junction boxes to keep analog signal separate from control and power wiring.

3.02 Wiring Installation in Raceways

A. Unless otherwise indicated, install all conductors in conduit.

B. Pull all conductors into a raceway at the same time. Thoroughly swab raceway system before installing conductors. Use wire pulling lubricant for all pulls. Do not exceed the manufacturer's pulling tension.

C. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.

3.03 Wiring Connections and Terminations

A. Avoid unnecessary splices. Splice only in accessible junction or outlet boxes.

B. Make connections to circuit breakers, disconnect switches, panel mains, etc. with solderless lugs.

C. Use mechanical connectors for splices, taps, fixture and motor connections. Exception: Square thread helical spring plastic cap (wire nut) type connectors are acceptable for solid conductor splices and taps. Provide adapters as required for terminations of multiple conductors.

D. Use insulated throat, spade type crimp on connectors for strap screw device terminals. Exception: Receptacle back wiring provisions may be used for terminating solid conductors.

E. Where possible use connectors with integral, insulating covers. Otherwise tape uninsulated conductors and connectors to 150 percent of the insulation value of conductor.

F. Thoroughly clean wires before installing lugs and connectors.

G. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.

3.06 Field Quality Control

A. Inspect wire and cable for physical damage and proper connection.

B. Torque test conductor connections and terminations to manufacturer's recommended values.

C. Continuity Tests: Ring all conductors for continuity and replace any open conductors.

END OF SECTION

Part 1 General

1.01 Scope

A. Outlet boxes.

B. Pull and junction boxes.

1.02 Submittals

Submit product data.

Part 2 Products

2.01 Acceptable Manufacturers

Boxes shall be equal to Appleton, Crouse Hinds, Hoffman, Raco, or Steel City.

2.02 Outlet Boxes

A. Sheet Metal Outlet Boxes: NEMA OS-1; galvanized steel, with 1/2-inch male fixture studs where required.

B. Nonmetallic Outlet Boxes: NEMA OS-2.

C. Cast Boxes: Cast feralloy with galvanized or cadmium finish, deep type, gasketed cover, threaded hubs.

D. Floor Boxes: Full adjustable, cast iron, water and concrete tight.

2.03 Pull and Junction Boxes

A. Sheet Metal Boxes: NEMA OS-1; galvanized steel.

B. Cast Metal Boxes: NEMA 250; Type 4, galvanized cast iron box and cover, neoprene gasket, stainless steel cover screws, UL listed as raintight. Provide flat-flanged type for surface mounting and outside flange recessed cover type for underground use. Boxes for sidewalk or other traffic areas to have appropriate duty cover with non-skid finish.

C. Corrosion Resistant Boxes: UL 508, NEMA Type 4X Type 316 stainless steel equal to Hoffman Bulletin A-4.

Part 3 Execution

3.01 Coordination of Box Locations

A. Provide boxes as shown on Drawings, and as required for splices, taps, wire pulling, and equipment connections.

B. Box locations shown on the Drawings are approximate unless dimensioned. Verify box locations prior to rough-in. Coordinate mounting heights and locations of outlets mounted above counters, benches, backsplashes, and other furnishings. Locate outlet boxes to permit handicap access per ANSI A117.1. Any outlet may be relocated by up to 10 feet before it is permanently installed without incurring additional cost.

3.02 Installation

A. Do not install boxes back-to-back in walls. Provide minimum 6-inch separation, except provide minimum 24-inch separation in acoustic-rated walls.

B. Locate boxes in masonry walls to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat openings for boxes.

C. Support boxes independently of conduit. Provide knockout closures for unused openings.

D. Use multiple-gang boxes where more than one device is mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.

E. In inaccessible ceiling areas, position outlets and junction boxes within 6-inches of recessed luminaire, to be accessible through luminaire ceiling opening.

F. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes.

G. Align wall-mounted outlet boxes for switches, thermostats, and similar devices. Align adjacent devices at different elevations in one vertical line. Set floor boxes level and flush with finish flooring material.

H. Unless otherwise noted, use only cast boxes. Sheet metal boxes may be used where concealed above ceilings or in dry walls, exposed in electrical closets, and for telephone wiring.

I. Field drill conduit holes in tap, junction and pull boxes so as to afford the maximum bending radius for the conductors.

J. Use PVC coated boxes wherever PVC coated conduit is indicated. Exceptions: stainless steel is permitted for boxes larger than 5 inches square.

K. Label cover of junction boxes with circuit numbers of conductors in the box.

END OF SECTION

Part 1 General

1.01 Scope

A. Squirrel cage induction motors.

1.02 Related Work

All motor driven equipment sections except hermetic refrigerant motor compressors and submersible motors.

1.03 Work Specified Elsewhere

Except as noted, equipment specified in this Section is provided under other Divisions. Include under this Section, receiving, storage, handling and wiring.

1.04 Quality Assurance

A. Equipment Standards: NEMA MG-1.

B. Efficiency: Premium design; guaranteed minimum values determined in accordance with IEEE Standard 112, Test Method B including stray load loss as follows:

HP	Synchronous RPM			
	3,600	1,800	1,200	900 & Less
20 - 49	91%	92.4%	92.4%	90.2%
50 - 99	92.4%	93.6%	93%	93%
100 & Above	94.1%	95%	94.1%	93%

C. For motors rated 1 to 19 HP, provide efficiency in accordance with ASHRAE Standard 90.1 - 1989, Table 5-1.

1.05 Submittals

A. Submit shop drawings showing certified dimensions and nameplate data.

B. Submit expected and guaranteed minimum efficiency values for operation at 100, 75, 50 and 25 percent load.

Part 2 Products

2.01 Acceptable Manufacturers

Motors shall be manufactured by General Electric, Reliance, Toshiba, Siemens or Teco-Westinghouse.

2.02 Ratings

A. Horsepower (HP): As noted. Where no value is noted, match the requirements of the driven equipment.

B. Phase

1. Less than 1/2 HP: Single phase.

2. 1/2 HP and Larger: Three phase.

C. Voltage

1. Single Phase Motors: 115/200/230 volt reconnectable. Exception: Single voltage motors will be permitted if the voltage matches the supply characteristics shown on the Electrical Drawings.

2. Three-Phase Motors: 200/230/460 volt reconnectable. Exception: Single voltage motors will be permitted if the voltage matches the supply characteristics shown on the Electrical Drawings.

D. Speed, Revolutions Per Minute (RPM): As noted. Where no value is noted, match the requirements of the driven equipment.

E. Torque and Starting Current: NEMA design B unless otherwise noted. Exceptions: Provide NEMA design C or D where required by the driven equipment. Unless specifically noted NEMA design A motors are not acceptable.

F. Service Factor: 1.15.

G. Insulation and Temperature Rise: Except as noted, Class B or Class F insulation with temperature rise, measured by resistance, corresponding to the insulation class in accordance with NEMA standards for operation in a 40 degree C ambient.

2.03 Construction

A. Enclosure: Totally enclosed fan cooled (TEFC) unless otherwise noted.

B. Windings: Copper. Exception: Aluminum windings are acceptable where the aluminum to copper transition is done by the manufacturer with copper leads brought out to the motor conduit box.

C. Bearings: Minimum 100,000 hours for direct coupled and 40,000 hours for belted applications B-10 life rating per AFBMA standards.

D. Multispeed Motors: Two-winding type.

E. Starting: Suitable for full voltage starting.

2.04 Accessories

A. Provide lifting eyes for 182 and larger frame size. Provide oversized conduit box for 250 and larger frame size.

B. Where noted provide normally closed thermostat for winding protection.

C. Where noted provide 120 volt, single phase space heater. Size heater to increase motor temperature approximately 10 degrees C above ambient.

D. Nameplate: Permanently affixed and stamped so as to permit recovery of the nameplate data in the event the nameplate is painted over.

2.05 Inverter-Fed Motors

A. Equipment Standards: Inverter duty and in accordance with NEMA MG-1, Part 31, "Definite-Purpose Inverter-Fed Motors". Usual service conditions per MG-1 31.10.2 apply unless otherwise noted.

B. Service Factor: 1.0.

C. Insulation and Temperature Rise: Class F insulation with temperature rise in accordance with Class B limits.

D. Peak Voltage and Rise Time: In accordance with MG-1 31.40.4.2.

E. Provide shaft grounding or insulated bearings for motors larger than 320 frame size. If insulated bearings are used, provide insulated coupling if the driven equipment bearings are susceptible to damage by current flow.

Part 3 Execution

3.01 Installation

A. Verify clearances and alignment prior to operation.

B. Lubricate in accordance with the manufacturer's instructions.

C. Check rotation and correct as necessary. Make correction to preserve conductor color coding.

END OF SECTION

Part 1 General

1.01 Scope

A. Conduit and equipment supports.

B. Fastening hardware.

1.02 Submittals

Do not submit equipment specified in this Section.

Part 2 Products

2.01 Acceptable Manufacturers

Prefabricated structural systems shall be equal to B-Line Systems, Kindorf, Powerstrut or Unistrut.

2.02 Material

A. Support Channel: Galvanized or painted steel.

B. Hardware: Corrosion resistant.

C. Threaded Rods: 3/8-inch diameter, galvanized.

D. Where corrosive or NEMA 4X areas are indicated, use stainless steel channel, straps, hardware and rods.

Part 3 Execution

3.01 Installation

A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using expansion anchors.

B. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; and self-drilling anchors or expansion anchor on concrete surfaces.

C. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.

D. Do not use powder-actuated anchors.

E. Do not use perforated straps or wire.

F. Make all supports from the structure, not the work of other trades. Do not drill structural steel members. Install supports so as not to weaken the structure.

G. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.

H. Install free-standing electrical equipment on concrete pads.

I. Install surface-mounted cabinets and panelboards on channel with minimum of four anchors.

J. Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboards in stud walls.

END OF SECTION

Part 1 General

1.01 Scope

A. Work provided under this Division includes final system design implementation, furnishing all components, system programming and configuration, system installation services, required support services, and complete documentation for the Plant Control System (PCS). This work shall include all materials, labor, and tools required to fabricate, deliver, unload, handle, erect, adjust, field calibrate, and test a complete and operable PCS as indicated on the Drawings and Specifications. Install all panels and designated instrumentation devices and provide all mechanical and pneumatic interconnections between the various components and their local sources of supply.

B. The intent of these Specifications is for the System Manufacturer to provide a complete and operational Filter control system which can be readily integrated into the PCS when it is upgraded in a future project. Additional items of equipment, materials, or labor not specifically called for by these Specifications, which may reasonably be considered to make the system complete and operational, shall be supplied as part of this work.

1.02 Definitions

A. Provide: Furnish, install, and connect.

B. Product Data: Catalog cuts and descriptive literature.

C. Shop Drawings: Factory prepared documentation, specific to the installation.

D. Indicated: Shown on the Drawings.

E. Noted: Indicated or specified elsewhere.

1.03 Work Specified Elsewhere

A. Installation of Inline Instruments: Instruments such as venturi tubes, magmeters, and control valves, which are specified in this Division and mounted in process piping, are installed under other Divisions.

B. Vendor-Supplied Devices: Field instrumentation and panels supplied as part of mechanical equipment or equipment packages shall be furnished, installed, and calibrated under other Divisions.

C. Conductors: Discrete signal conductors, twisted pair analog signal conductors, and RTD conductors are furnished and installed under Division 16. All other instrumentation and signal conductors, including digital data conductors and fiber optic cables are furnished under this Division and installed under Division 16. Special

cables for a particular instrument device which are specified in this Section are installed under Division 16.

D. For RS-485 cable, use Belden 9841 or equal.

E. For ethernet Cable use CAT-6 Ethernet

F. Raceways: All raceways and pulling of conductors (including placement in cable trays) are furnished under Division 16.

G. Terminations: All control and signal conductor terminations in LCPs and on Field Instruments are provided under this Section. This shall include, but not be limited to, terminations for all control panels provided in this Section and termination of the RS-485 data connections to motor protection relays, power monitoring units, and Modbus resident devices. Exceptions: HVAC control terminations are provided under Division 15. Interconnections between equipment and integral equipment control panels (i.e., package air compressors, pumps supplied with Pump Control panels) are provided under the applicable equipment Section. Terminations to motor control centers and all power wiring terminations for new equipment are provided under Division 16.

1.04 Plant Control System Description

A. The PCS consists of programming and configuration, operator interface, Plant Control Network, local control panels, field instruments and control devices, and other appurtenances noted in these Specifications.

B. Major components of the PCS are as follows:

Panel	Location	Area Controlled	New/Existing
HMI	Operator Control Room	All Areas	Existing
40-LCP-01	Filter Control Room, Adjacent to Filter Control Gallery	Filters and Appurtenances	New
41-LCP-1-3	Filter Control Gallery	Filters 1 and 3	New
42-LCP-2-4	Filter Control Gallery	Filters 2and 4	New
41-LCP-5-7	Filter Control Gallery	Filters 5 and 7	New
42-LCP-6-8	Filter Control Gallery	Filters 6 and 8	New
41-LCP-9-11	Filter Control Gallery	Filters 9 and 11	New
42-LCP-10-12	Filter Control Gallery	Filters 10 and 12	New

C. The System Manufacturer shall integrate data from the motor protection relays and the power monitoring modules furnished under Division 16 into the plant control system. The System Manufacturer shall provide a separate monitoring graphic screen to view the data retrieved from the modules as shown on the Drawings.

D. Modifications to Existing Panels

1. This Project will be accomplished without interrupting the operation of the plant beyond those scheduled outages of two filters at a time, or one blower and one backwash pump at a given time interval agreed upon with the Owner, the Engineer and the Contractor. Functional control of the filters shall migrate from the existing 41-LCP-01 to the New 40-LCP-01 by two filters at a time. The control pf a single blower and a single backwash pump shall move at the same time as the first two filters, and the control of the remaining backwash pumps and blower shall migrate at the time of the last set of filters. The migration of control of the last backwash pump and the last blower will not occur until the last pair of filters is functionally moved to the New 40-LCP-01 Local Control Panel.

2. When the Control of a pair of filters is functionally moved from the 41-LCP-01 to the 40-LCP-01, all wiring connections to the old panel shall be lifted, insulated and secured.

3. When all filters and accompanying appurtenances have been changed over from the old panel to the new Panel, the Old panel shall be demolished and removed.

4. Although the ability to perform an Automatic Backwash is the goal once all filters have had their control moved to the 40-LCP-01, automatic backwash control will not be available until some time following completion of the control panel changeover. After the control of all backwash pumps and air scour blowers have been moved along with the control of the backwash flow controller, the automatic backwash control program will be installed and tested. Until that is possible, an operator initiated manual backwash sequence must be in service for all filters in service.

5. When modifying existing panels, the System Manufacturer shall provide the required hardware and labor for installing all terminals, control system hardware, instrumentation devices, etc., including the termination of new signals in the existing panel.

6. The System Manufacturer shall investigate the existing control panel prior to modification. Any installed new components, sub-panels, etc., shall not block access to any existing instrumentation, control system hardware, or terminations. Existing documentation may be of some help to the System Manufacturer, but may not be completely correct. The System Manufacturer shall determine the existing wiring, logic, and functionality via a combination of field investigation and communication with plant operation and maintenance personnel. Existing wiring, logic, and functionality shall be documented by the System Manufacturer prior to any changes being made or wires being disconnected so that re-wiring can be completed accurately.

7. The modifications shall follow the general installation guidelines, where applicable, for new panels listed in paragraph 1.04, B. Provide all nameplates, wire markers, wire duct, surge protection, and any additional components required by this Section for new panels.

E. Filter Control

1. The control system shall provide for the operation of the filters in the "variable declining rate" method of filter control. Flow will be dependent upon the head loss through the units and the resultant level in the filters. Flow will be measured at the effluent of each filter by means of a rectangular weir and a sonic level flow transmitter. A staff gauge calibrated in flow (MGD) and feet shall be mounted on the filter wall at the weir. Minimum flow will be an alarm condition which will initiate backwash. Backwash shall be initiated on the basis of low flow, during certain allowable backwash time intervals, or manually initiated and controlled.

2. Filter Main Control Panel (40-FCP-01) - The filter main control panel shall primarily control automatic backwash sequencing and flow control functions, and indicate the status of all filter operations. The filter main control panel shall be equivalent in construction to the local control panels described in Division 17. Control panel shall be PLC based with PLCs in accordance with Division 17.

3. Backwash sequencing shall provide for placing filters in a queue for initiation of the backwash cycle and controlling the cycle once initiated. Filter backwash sequencing shall normally be initiated from the filter main control panel unless a call to backwash is initiated manually from a filter pedestal. In such a case the call from the filter pedestal shall be given immediate backwash priority upon completion of any ongoing backwash cycle. Multiple calls for priority backwash shall be queued so that the oldest call shall be processed first. Upon completion of a backwash cycle, the filter shall be placed at the end of the sequencing queue. The normal interval of backwash sequence shall continue through any required priority backwashes so that the next regular backwash shall occur at the time as if no priority interruptions had occurred or as soon as possible thereafter.

   a. Backwash sequencing shall also control valve operation at each filter to open or close valves as appropriate. Backwash operation shall provide for sequencing of all filter valves and backwash related valves, and returning them to normal positions following the backwash cycle. Transition from one step to the next shall rely on verification of a set condition or conditions such as filter water levels, Valve positions, and pump and blower status. Timer overrides or operator holds will be provided to allow for failed level indication, or failure of a valve to reach its appointed position. The Failure shall be clearly indicated on the HMI and the appropriate Filter Pedestal

b. Chlorine Feed: The control system shall provide a dry contact to open and close the chlorine vacuum valve (61-BLV-01) when any chlorine solution valve is opened and a master chlorine feed selector switch at the filter main control panel is on.

c. The filter main control panel shall control the backwash air blowers and backwash water pumps and flow controller during the backwash cycle. A choice of automatic or manual backwash control shall be provided. In the automatic mode the backwash blowers, pumps and water flow rate control system shall be controlled from the control system based upon preset values in coordination with filter valve operation. In the manual mode start, stop and rate adjustment shall be manually adjusted from the filter main control panel. Upon initiation of the automatic backwash cycle the filter shall be readied for backwash by closing the influent and effluent valves and opening the drain valve. Blower and flow control shall consist of five separate sequential timed intervals. The system shall provide for the selection of the following for each interval: duration (minutes), backwash air (yes or no), backwash water (one of three rates or zero flow), and chlorine solution (yes or no). The interval shall begin when the selected status is achieved. Upon the end of the last interval the control system shall shut down the blowers and pumps and return the filters to the operating position. Verification of proper valve position will be provided prior to proceeding to the next step in any sequence. Backwash water flow shall be controlled by the backwash water flow control logic which shall determine the flow set point for the backwash rate controller. Backwash flow shall be available at three rates and zero flow. Each rate shall involve a flow set point and a number of pumps on line to achieve that flow. These values shall be adjustable. Knowledge of the pump and system curves along with field trials shall be used for initial settings.

4. During normal operation the filter main control panel shall provide remote set points of required variables.

5. Backwash Water Flow Control: A single rate-of-flow controller shall be provided in the filter main control panel serving all filters. The filter control system shall provide for a signal to control the flow during backwash. Flow rate shall be separately programmable or variable in steps for each filter. Rate of flow shall be adjustable from 4,000 to 8,000 gpm.

6. Backwash Water Pumps: Three backwash water pumps will be provided. One pump will provide the maximum backwash water flow of 3,850 gpm, the other two pumps will be operated as standby pumps. The lead pump shall be rotated to the standby position upon shutdown, cycling all three pumps for equal run time. Failure of the lead pump to provide the required flow within 10 seconds shall produce an alarm and shall immediately call a standby pump to run. At no time shall more than one backwash pump be permitted to run simultaneously. (A shift supervisor Password override shall be provided for two pump operation; three pumps shall never be allowed to run concurrently). High level alarm from the backwash drain tank (41-LT-02) shall immediately stop a filter backwash

sequence, shut down all backwash pumps, and close all filter drain valves. If any filter drain valve fails to close completely, that condition shall be alarmed.

7. Backwash Air Blowers: Backwash air blowers shall be called to start during the backwash cycle when the backwash air valve is fully opened. Blowers shall alternate operation with each backwash cycle. The lead blower shall shut down and become the lag blower upon completion of each air backwash cycle. At no time shall more than one blower be permitted to run simultaneously. (A hardwired interlock shall be installed per Drawings).

8. Chlorine Feed: The control system shall provide a dry contact to open and close the chlorine vacuum valve (61-BLV-01) when any chlorine solution valve is opened and a master chlorine feed selector switch at the filter main control panel is on.

9. The following shall be indicated at the filter main control panel, via touch screen.

   a. Filter Influent Valve Position: Fully open or fully closed.

   b. Filter Effluent Valve Position: Fully open or fully closed.

   c. Filter Backwash Water Valve Position: Fully open or fully closed.

   d. Filter Backwash Air Valve Position: Fully open or fully closed.

   e. Filter Drain Valve Position: Fully open or fully closed. And all points in between – very important to know that this thing is 100% closed when it is supposed to be

   f. Filter Chlorine Solution Valve Position: Fully open or fully closed.

   g. Filter Chlorine Feed: On/Off.

   h. Filter Backwash Mode: Off/Manual/Automatic.

   i. Backwash Pump Status for each back wash pump: Run/Fault.

   j. Backwash Blower Status for each blower: Run/Fault.

   k. Backwash Water Flow Rate and Unit Flow Rate (per SF).

   l. Backwash Air Flow Rate and Unit Flow Rate.

   m. Filter Effluent Flow Rate and Filter Unit Flow Rate (total 12).

   n. Filter Influent Channel Water Level (41-LIT-01).

   o. Backwash Holding Water Level (41-LIT-02).

   p. Filter Unit Flow (total? Can we do that?) Since Backwash (total 12).

q. Filter Time Since Backwash (total 12).

r. Filter Time to Next Timed Backwash (total 12).

s. Combined Effluent Flow all Filters.

t. 24 hour Trend of combined Filter Effluent Flow.

u. 24 hour Trend of Plant Influent Flow.

v. Filter Building Influent High Level Alarm (see note below).

w. Filter Building Influent Low Level Alarm (see note below).

x. Filter High Flow Alarm (total 12) (see note below).

y. Filter Low Flow Alarm (total 12) (see note below).

Note: High and Low Alarms to be generated from analog signals.

10. The following signals shall be provided for remote control at the filter control panel 40-LCP-01 or any of the Filter Pedestal.

    a. Filter backwash pump start/stop command, dry contact closed to run, 3 total.

    b. Filter backwash air blower start/stop command, dry contact closed to run, 2 total.

    c. Chlorine vacuum valve open/close command, dry contact closed to close valve.

    d. Backwash flow control valve position command, 4-20 mA.

    e. Backwash air flow, 4-20 mA.

    f. Backwash water flow, 4-20 mA.

    g. Filter influent channel water level, 4-20 mA.

    h. Spent Backwash Tank water level, 4-20 mA.

11. The following signals shall be received from the plant instrumentation system or remote equipment for indication

    a. Filter backwash pump run and fault status, dry contacts closed on run and fault, 3 total.

b. Filter backwash air blowers run and fault status, dry contacts closed on run and fault, 2 total.

c. Plant influent flow, 4-20 mA.

d. Backwash air flow, 4-20 mA.

e. Backwash water flow, 4-20 mA.

f. Filter influent channel water level, 4-20 mA.

g. Backwash Drain Tank water level, 4-20 mA.

F. Filter Pedestal: Six filter pedestals shall be provided by the Systems Integrator. Each pedestal shall serve two filters. Pedestals shall be free standing units consisting of touch screen units fully compatible with the main control panel PLCs with controls mounted in an inclined position, for easy operation by a standing individual. Filter pedestals shall provide manual operation of the filters and allow automatic operation from the filter main control panel. Pedestal generated commands shall supersede filter main control panel commands. Pedestals shall be able to generate any commands that can be generated at the main filter control panel 40-LCP-01, which are related to the two filters and related appurtenances controlled by that pedestal.

1. Backwash control shall be selectable from Automatic or Manual modes. In the automatic mode, control of backwash will be handled from the filter main control panel. In the manual mode, backwash control will be handled at the pedestal by operating valves and selecting the backwash flow rate (one of three rates and zero flow). When the backwash water or air valves are fully opened the pumps or blowers shall start as appropriate. In the off mode valves may be opened and closed without affecting pump or blower operation.

2. The following shall be indicated at the filter pedestal:

a. Filter Influent Valve Position: Fully open or fully closed.

b. Filter Effluent Valve Position: Fully open or fully closed.

c. Filter Backwash Water Valve Position: Fully open or fully closed.

d. Filter Backwash Air Valve Position: Fully open or fully closed.

e. Filter Drain Valve Position: Fully open or fully closed.

f. Filter Chlorine Solution Valve Position: Fully open or fully closed.

g. Filter Flow.

h. Filter Level.

i. Backwash Water Flow (41-FE-20).

j. Backwash Air Flow (42-FE-30).

k. Total Flow since last backwash.

l. Time since last backwash.

m. High Level Alarm: Backwash request (see note below).

n. Low Flow Alarm: Backwash request (see note below).

Note: High and Low Alarms to be generated from analog signals.

G. Instrumentation: Instruments shall be provided by the accordance with Division 17, in order to provide a completely functional control system.

H. Provide the following status for remote indication at the plant instrumentation system for each filter.

1. Filter flow, 4-20 mA (2 per pedestal).

2. Backwash status, dry contact close on backwash (2 per pedestal).

1.05 Quality Assurance

A. The Contractor shall ensure that the PCS is an integrated system furnished by the System Manufacturer who shall provide all of the equipment and appurtenances, regardless of manufacturer and be responsible to the Contractor for correct operation of the entire system.

B. The System Manufacturer shall be responsible for the detailed design implementation and the proper functioning of the PCS, programming and/or configuration of all digital hardware, preparation of required submittal data including operations and maintenance manuals, preparation of test procedures, factory and field tests, start-up including field calibration, operational demonstrations, providing technical supervision for installation and connections to equipment, and training of the Owner's operating personnel.

C. The System Manufacturer shall be regularly engaged in the type of work called for under these Specifications and must have capital facilities, personnel, plant, and service capabilities required to successfully perform the work. The System Manufacturer shall employ competent personnel experienced in the design, manufacture, and programming of equipment and systems required. The System Manufacturer shall assign an experienced person who shall act as Project Manager. This person shall have responsible project experience on similar systems of a comparable complexity to that specified herein.

D. The System Manufacturer shall have in employment, a permanent field service organization capable of providing service and maintenance of the system.

E. The System Manufacturer shall have installed similar systems which have been in satisfactory operation to establish the reliability of the equipment proposed to be furnished.

F. The Filter Underdrain System Manufacturer has provided in their pre-selected price/proposal up to 200 hours of programming assistance and review of the filter control system to be provided by the System Manufacturer. The Engineer recommends that the System Manufacturer work closely with the Filter Underdrain System Manufacturer regarding system operation. If more than 200 hours of programming assistance from the Filter Manufacturer is desired by the System Manufacturer, the System Manufacturer shall contract with the Filter Manufacturer for that work for no additional charge to the Owner.

G. Acceptable Manufacturers

1. Control Instruments, Inc., Smyrna, Georgia

2. Revere Control Systems, Birmingham, Alabama

3. M/R Systems, Inc., Norcross, Georgia

1.06 Submittals

A. The System Manufacturer shall make submittals in accordance with the requirements of Section 01340. The submittal shall be divided into separate sections as listed below. Refer to related work Sections for additional requirements.

B. Field Devices: This Section shall include primary elements, transmitters, switches, analytical instruments, etc. List all dimensions, power requirements, enclosure types, ranges, and signal form or value. Provide data, including proposed length, on special cables required between sensing elements and electronics units and data on any special equipment used for calibration or maintenance of a particular device. Field device submittals shall also include specific data sheets for each device which shall contain the following information:

1. Tag number per Specifications and Drawings.

2. Manufacturer's complete model number with complete model number breakdown.

3. Input – output characteristics.

4. Range, size, and graduations.

5. Physical size with dimensions, NEMA enclosure classification and mounting details.

6. Materials of construction of all components.

7. Instrument or control device sizing calculations where applicable.

8. Certified calibration data on all flow metering devices.

9. Environmental requirements during storage and operation.

10. Power requirements.

C. Digital System Hardware: This Section shall include computer hardware complete with printers, magnetic storage devices, cables, UPS systems, and other peripherals. Include PLC hardware, communications hardware, and LAN and data highway conductors.

D. Digital System Software: This Section shall include documentation on system software, standard software packages supplied, and custom software developed for reports, process control, and graphic displays. Include software developed for both the operator interface and PLC system.

E. Control Panels: This Section shall include dimensions, terminal block designations, front panel arrangement, back panel layout, and ladder logic diagrams for both PLC-based and discrete component type control panels, etc. Provide catalog sheets for all panel components, indicate ranges, and provide nameplate schedules. All connections for new instruments terminating in the System Manufacturer's panels shall be clearly shown. All devices installed in each panel or connected to each panel, shall be identified on the panel drawings by the tag number included in the Specifications and Drawings. Any miscellaneous equipment not clearly falling into one of the above volumes, including recommended spare parts list shall be included in the control panel volume.

F. Loop Diagrams: This Section includes no more than 10 typical loop diagrams for approval of format only. The submitted loop diagrams shall represent different types of process measurements. Loop diagram examples are attached to this Section.

G. Factory Test: This Section shall include the witness test and final checkout procedural outline detailed in Article 3.04 – B.

1.07 Construction Documentation

The System Manufacturer shall provide loop diagrams to the Contractor. The Contractor shall provide loop diagrams to the electrical subcontractor. Loop diagrams shall be issued as a group with the delivery of their respective control panel or area instrumentation. Two sets of loop diagrams shall be issued to the electrical contractor and one set to the Engineer.

1.08 Record Documentation

A. General: Record documentation shall be provided in accordance with Section 01720. Additionally, provide all information listed in Article 1.06 above, corrected to reflect the system as installed. Include also any instruction books, operation manuals, and other information pertaining to service and maintenance. Bind record documents in 3-ring, hardback notebooks complete with tabs and index. Include name, address, and telephone number for each manufacturer's service contact. For all major components, provide a recommended spare parts list.

B. Loop Diagrams

1. Provide an individual wiring diagram for each analog and discrete loop showing all terminations, terminal numbers, conductor numbers, cable numbers, the location of the DC power supply, power panel, and circuit numbers for all 120 VAC power to field instruments, MCC and bucket numbers for all 480 VAC power to motor operated valves, signal polarity, the location of any dropping resistors, surge protectors, shielding, grounding, etc. Devices shall be identified by the tag number included in the Specifications and Drawings. Cabling between sensors/elements and associated transmitter shall be included. The loop diagrams shall meet the minimum requirements of ISA S5.4 plus the requirements below.

2. Each loop diagram shall be divided into areas for identification of device locations (e.g. panel face, back-of-panel, field, etc.) Loop diagrams shall be on 11 x 17-inch drawings.

3. The loop number shall be incorporated into the loop diagram drawing number. If the System Manufacturer does not have any specific loop diagram drawing number requirements, the drawing number shall be the loop number (the drawing number for loop F-1004 would be 1004). If a requirement exists (one requirement may be to incorporate the project number XXXXXX), the loop number shall be included as the suffix. The drawing number for loop F-1004 would be XXXXXX-1004.

C. Instrument Hardware: Record documents shall include bills of material, front views, assembly drawings, component layout drawings and schematics, nameplates, schedules, electrical schematics, electrical connection diagrams, and tubing/piping connection diagrams. Electrical and piping connection diagrams shall show all terminations of equipment, complete with instrumentation, wire, equipment, and cable designations. Interconnecting diagrams shall be prepared in a neat and legible manner on 11 x 17-inch or 24 x 36-inch sheets.

D. Software Documentation: In addition to the hard copies of drawings, programming and literature generated specifically for the project, two sets of compact disks shall be provided to the Owner with copies of all custom files specifically created for the project, including all panel drawings, I/O drawings, termination drawings, communication architecture drawings, data sheets, bills of material, operating

procedures, etc. Additional files included in this set shall be PLC programs and copies of the operator interface software application program. Drawing format shall be AutoCAD 2000. All Drawings shall also be furnished as Acrobat *.pdf files. Include copies of all *.shp and *.shx files used in the AutoCAD drawings. Compact discs shall have a complete listing of their contents along with the names and version numbers of the software used to generate each file. Discs shall be clearly identified by the following:

1. Project Name

2. Volume Number

3. Labeled “AS-INSTALLED”

E. Configuration Documentation: Instrument Configuration and Calibration sheets shall be generated for all instruments requiring configuration and/or calibration. The intent of the Instrument Configuration and Calibration sheets is to provide all necessary information required to enable the Owner to calibrate and/or configure a replacement instrument identical to the original instrument. One sheet shall be provided for each instrument. The sheets shall be 8-1/2 x 11 inch size and shall be included in the O&M Manual. Each sheet shall list the instrument tag number (as depicted on the Drawings and Specifications), the date, the System Manufacturer company name and phone number, the name of the individual who filled out the sheet, the instrument manufacturer’s name and phone number, the complete model number, the calibrated range, and all configuration information.

F. SCADA Documentation: Generate a SCADA software document containing the following information for each SCADA related software product purchased.

a. The facility/plant name where the software is installed.

b. The computer name that the software is installed on (master SCADA workstation, historical data computer, etc.)

c. The computer manufacturer and model, processor speed, and installed RAM.

d. The computer operating system (model and version).

e. The product name, version, and serial number.

f. The name and quantity of client licenses (if applicable).

g. The product name and version of all supporting software installed.

h. The date purchased and the company name it was purchased from.

i. The name of the person purchasing the software, and the person’s company name.

j. The date the software was installed.

1.09 Environment

A. Local Control Panels: Local control panels shall be capable of operating between 32 degrees and 120 degrees F and 5 to 95 percent relative humidity without condensation. A 120 VAC single-phase, three-wire grounded power source will be supplied.

B. Field Devices: Field devices shall be housed in NEMA 4X enclosures. Ambient temperature rating shall be suitable for the project locale. All enclosures, including field instruments and control panels, which are located out-of-doors shall be provided with adequate sunscreens.

1.10 Delivery, Storage, and Handling

A. After completion of shop assembly and tests, control panels shall be enclosed in heavy polyethylene envelopes to provide complete protection from dust and moisture. Desiccant materials shall be placed inside the envelope prior to sealing. The equipment shall then be mounted on skids, enclosed in protective boxes, and braced for final transport. Removable lifting rings shall be provided on all sections weighing more than 150 pounds to permit moving without removal of protective covering. Shipping weights shall be shown on shipping tags together with instructions for unloading, transporting, storing, and handling on the job site. If practical, termination cabinets shall be delivered first to permit field wiring to be complete and checked out before receipt of remainder of equipment. None of the control room equipment shall be delivered until the environmental services required by the Specifications and Drawings are available and operating in accordance with manufacturer's specifications.

B. The Contractor shall be fully responsible for moving the equipment through new and existing facilities and setting it in the proper location.

1.11 Warranty

A. Warranty Period: One year following the date of system acceptance.

B. Warranty Requirements: In accordance with Division 1 and the following:

1. Corrective hardware maintenance shall be performed by a trained service technician specifically trained to service the equipment involved. The technician shall be available, on-site, within 24 hours after notification by the Owner.

2. Software maintenance shall be performed by suitably qualified individuals from the System Manufacturer's software service staff. Representatives from third party software sources may additionally be involved, but the System Manufacturer shall be represented at all times during on-site services. Software service representative shall be available for consultation within four hours and, if required, on-site within 16 hours after notification by the Owner.

3. Deliver a copy of all service reports to the Owner on the day the work is performed.

Part 2 Products

2.01 Equipment

A. Quality Standards: It is not the intention of these Specifications to detail every component, accessory, signal conditioning device, etc. that is required to provide a complete system. The System Manufacturer shall provide all required components, using equipment from established manufacturers with a proven history of service and support.

B. Electronic Equipment: All solid state, printed circuit boards and components shall be suitable for the specified environment. Provide complete circuit diagrams for troubleshooting and repair. All parts shall be replaceable with standard commercial components without degrading the performance of the completed assembly.

Field Instruments

2.02 Level Transmitter - Ultrasonic

A. Type: Non-contact, ultrasonic, microprocessor-based with input or output filter capability.

B. Sensor:

1. Mounting: The System Manufacturer shall coordinate mounting to ensure that the sensor is mounted away from vessel walls and other obstructions in accordance with the manufacturer's recommendations. The System Manufacturer shall provide appropriate standoff distance for sensor face from the highest liquid level to accommodate blanking distance.

2. Range: Sufficient range for the application.

3. Cable Length: Sufficient to connect sensor and transmitter.

4. Enclosure: NEMA 4X, rated for mounting in hazardous area as required by schedule.

5. Automatic Temperature Compensation: Required.

6. Face Material: CPVC or PTFE.

7. Process Connection: [8 inch] ANSI flange.

C. Transmitter:

1. Digital Indicator: Required.

2. Output: Isolated 4-20 mADC.

3. Enclosure: NEMA 4X, aluminum, polycarbonate, or fiberglass.

4. Power Supply: 120 VAC.

5. Accuracy: ± 1.0 percent of calibrated range or better for ranges greater than 25-inches.

6. Mounting: Remote, 2” pipe.

D. Schedule:

Tag	Level Range (Feet)	Indicator Scale Units	Location / Area Classification
41-LT-01	8	FT	Intermediate Floor (Filter Gallery)
42-LIT-02	8	FT	Intermediate Floor (Filter Gallery)
41-LT-03	8	FT	Intermediate Floor (Filter Gallery)
42-LIT-04	8	FT	Intermediate Floor (Filter Gallery)
41-LT-05	8	FT	Intermediate Floor (Filter Gallery)
42-LIT-06	8	FT	Intermediate Floor (Filter Gallery)
41-LT-07	8	FT	Intermediate Floor (Filter Gallery)
42-LIT-08	8	FT	Intermediate Floor (Filter Gallery)
41-LT-09	8	FT	Intermediate Floor (Filter Gallery)
42-LIT-10	8	FT	Intermediate Floor (Filter Gallery)

Tag	Level Range (Feet)	Indicator Scale Units	Location / Area Classification
41-LT-11	8	FT	Intermediate Floor (Filter Gallery)
42-LIT-12	8	FT	Intermediate Floor (Filter Gallery)

E. Acceptable Manufacturers: Siemens Milltronics, Endress+Hauser.

2.03 Flow Transmitter - Ultrasonic

A. Type: Microprocessor-based ultrasonic flow transmitter. Unit shall have output or input filter capability.

B. Sensor: Sensor shall have sufficient range for the application and shall be supplied with sufficient cable length for arrangement indicated. Unit shall be supplied with automatic temperature compensation. Sensor shall be rated for mounting in a hazardous area if required in the table below.

C. Accuracy: ± 0.5 percent of full scale.

D. Output: Isolated 4-20 mADC.

E. Enclosure: NEMA 4X, aluminum, polycarbonate or fiberglass. For transmitters located outdoors provide thermostatically controlled space heater.

F. Power Supply: 120 VAC.

G. Schedule:

Tag	Level Range	Flow Rate	Indicator Scale Units	Sensor Area Classification	Transmitter Location
41-FT-01	Note 1	0-3360	GPM	UNCLASSIFIED	PIPE GALLERY
42-FT-02	Note 1	0-3360	GPM	UNCLASSIFIED	PIPE GALLERY
41-FT-03	Note 1	0-3360	GPM	UNCLASSIFIED	PIPE GALLERY
42-FT-04	Note 1	0-3360	GPM	UNCLASSIFIED	PIPE GALLERY
41-FT-05	Note 1	0-3360	GPM	UNCLASSIFIED	PIPE GALLERY
42-FT-06	Note 1	0-3360	GPM	UNCLASSIFIED	PIPE GALLERY
41-FT-07	Note 1	0-3360	GPM	UNCLASSIFIED	PIPE GALLERY
42-FT-08	Note 1	0-3360	GPM	UNCLASSIFIED	PIPE GALLERY
41-FT-09	Note 1	0-3360	GPM	UNCLASSIFIED	PIPE GALLERY
42-FT-10	Note 1	0-3360	GPM	UNCLASSIFIED	PIPE GALLERY
41-FT-11	Note 1	0-3360	GPM	UNCLASSIFIED	PIPE GALLERY

Tag	Level Range	Flow Rate	Indicator Scale Units	Sensor Area Classification	Transmitter Location
42-FT-12	Note 1	0-3360	GPM	UNCLASSIFIED	PIPE GALLERY

H. Acceptable Manufacturers: Milltronics (OCM III), Endress+Hauser (FMU-861 with FDU-80 transducer).

Notes: Calibrated level range vs flow by System Manufacturer based on Primary flow element manufacturer recommendation.

2.04 Enclosure

A. Provide wall mounted, stanchion mounted, free-standing, or walk-in enclosures as scheduled.

B. Provide NEMA 12 enclosures for control panels located indoors and NEMA 4X stainless steel for outdoor locations (except walk-in) unless otherwise noted.

C. In all NEMA 4X enclosures, provide a thermostat controlled space heater and corrosion inhibitor blocks. Provide NEMA 4X rated devices on front of enclosure or mount devices on interior panel and provide door mounted tempered glass or polycarbonate viewing window.

D. Free-standing enclosures shall be a minimum of 20-inches deep.

E. NEMA 12 and general purpose enclosures shall be fabricated from a minimum 14 gauge steel, unless noted otherwise, with all seams ground smooth, all corners rounded, and all flat surfaces smooth with no ripples, dimples, or surface imperfections and no screws, bolts, or nuts visible from outside. Provide panel stiffeners as required to provide a rigid, non-bowing surface. Thoroughly clean and degrease the steel shell before painting. Apply one coat of a rust inhibiting primer and two coats of air dry enamel or acrylic with flattening agent to produce a smooth semi-gloss finish. Colors are to be chosen by the Engineer.

F. Install a continuous hinged front access door. For freestanding enclosures, furnish a three point latch. A single point latch is acceptable for wall-mounted enclosures. Wire door mounted instruments and controls to stationary components with suitable flexible connections and protection where wiring crosses the hinge. Provide double or multiple doors as required for stability and smooth mechanical operation.

G. Terminate all tubing and electrical connections at the bottom of the panel to bulkhead fittings and terminal strips, with all external connections properly identified for field connections. Space shall be provided at the bottom of the panel for excess wiring to be laid out before landing on the associated field terminal strip. Space shall also be provided at the top and sides of the panel for routing cables entering from the top of the panel.

H. For panels with 120 VAC power supply, provide appropriately sized circuit breaker, single pole, 22,000 AIC, mounted in the rear of the panel to disconnect power.

Mount an engraved nameplate (white letters, red background) to read “WARNING – This panel energized by foreign control power sources. Equipment will be live with panel disconnect in either on or off position”.

I. Internal panel sub-feeds of 120 VAC power shall be divided into separate circuits protected by properly sized circuit breakers or fuses. The following separate circuit divisions shall be provided:

1. Panel light(s) and panel fans (where used).

2. Each receptacle.

3. Power to the panel UPS (where supplied).

4. Thermostatically controlled heaters (where supplied).

5. Each power supply (including 24-volt power supplies, power supplies for PLCs, power supplies for fiber optic transceivers, etc.)

6. 120-volt power to field mounted instruments (each instrument shall be provided with a separate circuit).

J. Provide 1/4 x 12-inch copper ground bus bar(s) in the rear of the panel. All bus bars shall be bonded together. Ground bus shall be capable of accepting System Ground Grid connection and Power System Ground connection.

K. Provide 20 percent spare, contiguous panel/sub-panel mounting area to accommodate future panel expansion, unless noted otherwise.

L. The System Manufacturer shall investigate the space allocated for control panels on the accompanying drawings and inform the Engineer of any potential problems.

M. If indicated in the control panel schedule, control panels shall be provided with a drip shield or heat shield.

1. A 304 stainless steel drip shield shall be provided to prevent ice buildup on the panel door, door hinges, and front of panel-mounted devices. Minimum overhang shall be one inch on the front and side of the panel.

2. 304 stainless steel heat shields shall be provided to prevent excess heat inside the panel. Shields shall be provided for the top, front, back, and both sides of the panel. Shields shall be mounted to provide one-inch air space between the shield and the panel. Each shield shall have the same height and width as the panel side being protected. Cutouts shall be provided for access to front of panel-mounted devices.

N. All indicator lights shall be push-to-test. In cases where it is not practical to use push-to-test indicator lights (Engineer's approval required), then a lamp test circuit with a lamp test pushbutton mounted on the front-of-panel shall be provided. Pressing the lamp test pushbutton shall illuminate all indicator lights without interrupting control circuits.

Lamp Colors:	Red	Running, Open
	Green	Stopped, Off, Closed
	Amber	Alarm

O. Provide one 120 VAC duplex receptacle and fluorescent light(s) as scheduled. Incandescent lights may be used where panel size prohibits the use of fluorescent lights. Provide one standard on/off light switch for the lights. Receptacles and lights shall be provided with a separate circuit breaker and shall be fed from the 120 VAC power supply to the panel. Receptacles and lights shall be fed from uninterruptible power supplies.

P. All PLC discrete outputs shall have interposing relays installed in the control panel.

Q. Where Intrinsic Safety (IS) barriers have been supplied as a means of providing electrical hazardous area protection for the associated field device, all IS barriers and associated IS wiring shall be separated by at least two inches of air space from all regular non-hazardous wiring inside the control panel. Per NEC Article 504-30, grounded metal or other insulated partitions with lesser distance requirements shall be permitted. IS wiring entering the control panel shall be located in dedicated conduits, which also shall be separated from any non-hazardous wiring. IS Barriers shall be located in electrical non-hazardous areas.

R. Conduits containing IS wiring where entering enclosures containing regular, non-IS wiring shall be externally sealed to prevent transmission of gases from hazardous areas. Conduit installation and sealing is to be provided under Division 16.

S. All FRP panels located in direct sunlight shall be provided with at least two coats of UV protective coating to prevent discoloration and cracking.

T. All control panels shall be either padlockable or have a lock installed in the door handle. All Contractor provided locks shall be keyed alike – consult with the Owner for preferred keying system.

U. Front of panel devices, such as analog controllers or annunciators, that have rear mounted terminal strips shall be accessible without standing inside the control panel (i.e. mounted on panel door or swing-out panels). Walk-in control panels are excepted.

2.05 Wiring

A. Install a minimum of #16 AWG copper stranded, 600 volt, extra flexible type for all control wiring 50 volts and above, and a minimum of #18 AWG twisted, shielded pair for analog signal conductors. Color code wires as follows:

1. Ground: Green.
2. Neutral: White.
3. Line Conductor (150 volts or less to ground): Black.
4. Control (150 volts AC or less): Red.
5. Control (150 volts DC or less): Blue.
6. Interlock control circuits supplied from external power source: Yellow or pink.
7. Intrinsic Safety Conductors: Light blue.
8. Signal, Shielded and Special Cables: Identify with wire markers.

B. Mark all wires with approved wire markers at all terminations, per Section 16195. Clearly mark all terminal blocks with typewritten or ink markings. Label all devices mounted on the steel sub-panel. All instrument and control devices (current switches, MiniCAS II relay modules, etc.) located inside control panels shall have engraved lamacoid nametag affixed on or near the device and shall bear the tag number and service description. Label all devices mounted on the panel front with engraved lamacoid nameplates, fastened with screws. Nameplates shall be three-layer laminated plastic, black letters on a white background. Letter height to be 1/8-inch for individual devices and 1/4-inch for panel designation.

C. Neatly bundle and secure all wiring with plastic ties. Route back-of-panel wiring in slotted plastic wireways with snap-on covers.

D. Terminal blocks shall be provided for all field wiring connections to the panel. This includes shield terminals for shielded cables. Terminal blocks may be mounted horizontally or vertically and shall be easily accessed from panel door(s). Terminal blocks shall be DIN rail mounted, screw clamp, feed-through type with 600 volt minimum rating. A minimum of 20 percent extra terminals shall be provided on the terminal blocks. Each terminal shall be clearly and permanently marked. Provide fused terminal blocks for all 120 VAC discrete inputs and outputs. All terminal blocks shall be suitably sized for #12 AWG (minimum) stranded wire. All terminal blocks shall be grouped apart, depending upon type of signal per Paragraph E. below.

E. AC or DC power wiring shall not run in any raceway with any type of instrument wiring. Wiring is to be divided into categories and shall be carried in separate raceways. The minimum acceptable groupings are:

1. 120 VAC, 60 Hz AC power wiring and chart drive power wiring.

2. DC power to electronic instruments (does not include loop powered instruments), contact closure input and output wiring.

3. All wiring carrying pulsed information.

4. Standard range analog DC signals, thermocouple and up to 200 mV DC signals.

5. All intrinsic safe wiring.

F. It is the responsibility of the System Manufacturer to provide appropriate protection against transients and surges for all field wiring, interfacing with the control panels. This protection equipment shall reside in the appropriate control panel. All instrument analog signal wiring, data transmission wiring, and 120 VAC power supply wiring shall be protected against lightning strikes, and other transient surges at all control panel termination points. All control power wiring, AC control power wiring, I/O cabinet discrete input wiring and discrete output wiring which is routed outside of buildings shall be protected against lightning strikes, and other transient surges at all control panel termination points. Lightning and surge devices shall protect the system from induced surges in analog, discrete and control circuitry and power supply lines. The protective devices shall not interfere with the normal operation of the panel hardware and shall be designed not to have a maximum clamping voltage in excess of what the protected device is capable of withstanding. Protection devices for all internally mounted power supplies shall be installed on individual 120 VAC supply wiring. Each surge/lighting protector shall be independently grounded to the panel ground bus. Protector mounting rail shall not be used to ground the protector.

G. The System Manufacturer shall provide required hardware and labor for termination of new signals in existing termination cabinets where required. This hardware and workmanship shall match existing work with respect to method, materials, and workmanship.

H. All control panels furnished under this Section shall carry a UL label which certifies the control panel meets the requirements of UL-508A (latest version).

2.06 Control Panel Schedule

Panel No.	Mounting Type	Enclosure Rating	Light/Receptacle	Heat Shield/ Drip Shield
40-LCP-01	Free-Standing	NEMA 12	Yes/Yes	No
41-LCP-1-3	Pedestal	NEMA 12	Yes/No	No
42-LCP-2-4	Pedestal	NEMA 12	Yes/No	No
41-LCP-5-7	Pedestal	NEMA 12	Yes/No	No
42-LCP-6-8	Pedestal	NEMA 12	Yes/No	No
41-LCP-9-11	Pedestal	NEMA 12	Yes/No	No
42-LCP-210-12	Pedestal	NEMA 12	Yes/No	No

2.07 Control Description

A. In general, simple analog and discrete control, logic and indication requirements are depicted on the Process and Instrumentation Diagrams (P&IDs) supplied as part of this package. Where additional information is necessary, it is included in the descriptions that follow.

B. The items described in Paragraph 2.09 are general loop requirements for typical plan unit operations. It is intended that these general requirements shall be followed where applicable.

C. The items described in Paragraph 2.10 are loop descriptions for typical plant unit operations. It is intended that these descriptions, in conjunction with the P&IDs, provide sufficient system configuration information for the majority of simple control systems. Where additional descriptions are necessary or where control logic deviates from the general and typical descriptions, it is described in the paragraph.

D. Software Alarms

1. All analog inputs to the plant control system shall have low and high software alarms. Where low and/or high software alarms are not specified elsewhere in this Specification, they shall initially be turned off or set for 0% (low alarm) and 100% (high alarm) of the signal range. This will help eliminate nuisance alarms during checkout and start-up.

2. All software alarms shall be reviewed with the plant superintendent, or his designee, during programming or panel checkout and again during filed checkout or start-up. The System Manufacturer shall change all software alarm setpoint values as instructed by the plant superintendent. For critical alarms, the System Manufacturer shall configure the associated graphic symbol to flash or change color when in an alarm condition.

2.08 Loop Descriptions - General

A. Equipment protection interlocks and safety interlocks (motor temperature and moisture switches, emergency stops, low-low level shutdowns, etc.) shall be

hardwired and shall not reside in the plant control system. Hardwired equipment protection interlocks and safety interlocks shall be functional at all times, regardless of operating mode (HAND, AUTO, LOCAL, REMOTE, etc.) Equipment protection circuits shall be fail-safe, the circuit shall open to stop equipment.

B. All motor control logic in the plant control system shall include COMMAND DISAGREE logic. The plant control system shall generate a COMMAND DISAGREE alarm to alert the operator that a fault has occurred for any of the following conditions:

1. When a motor is called to run by the control system and no run feedback is received by the plant control system within a preset, adjustable period of time. This shall only be applied to those motors which have run feedback to the plant control system.

2. When a motor is running based on a manual command generated through the plant control system, or based on an automated sequence in the plant control system, and run feedback is lost by the plant control system for a preset, adjustable period of time. This shall only be applied to those motors which have run feedback to the plant control system.

3. When a motor is called to run based on a manual command generated through the plant control system, or based on an automated sequence in the plant control system, and the feedback from a HAND/OFF/AUTO or similar field-mounted switch indicates that the unit is not in the AUTO mode. This shall only be applied to those motors which have UNIT IN AUTO feedback to the plant control system.

C. All control valve logic in the plant control system shall include COMMAND DISAGREE logic. The plant control system shall generate a COMMAND DISAGREE alarm to alert the operator that a fault has occurred for any of the following conditions:

1. When a valve is called to open by the control system and the open feedback is not received by the plant control system within a preset, adjustable period of time.

2. When a valve is called to close by the control system and the closed feedback is not received by the plant control system within a preset, adjustable period of time.

D. All analog inputs shall be monitored by the plant control system to identify out of range signals (less than 4 mADC or more than 20 mADC). When the control system detects an out of range signal which continues for more than five minutes, an alarm shall be generated by the plant control system. The alarm shall identify the particular analog signal which is out of range.

E. In general, all analog input scaling shall be performed in the operator interface software.

2.09 Loop Descriptions - Typical

A. Typical Motor Status Monitoring – Constant Speed Motors

1. Motor run (typically designated XI and annotated RUN) and overload (typically designated XA and annotated OVERLOAD) status will be indicated in the plant control system.

2. Where conditions other than motor overload are sensed in the MCC (e.g., motor temperature or moisture switch activated), the fault condition is combined with motor overload and the resulting fault (typically designated XA and annotated FAULT) status will be indicated in the control system.

3. Total unit run time (typically designated KQI and annotated RUNTIME) will be provided for the motor in the plant control system.

B. Typical Motor Control Loop – Local/MCC HAND-OFF-AUTO Switch

1. When the HAND-OFF-AUTO switch is in the HAND mode, the equipment will run continuously regardless of the automatic control logic. In the HAND mode, personnel protective and equipment protective interlocks shall be enabled to shut down the equipment. In the HAND mode, the equipment will run even in the event of PLC or control system failure.

2. When the HAND-OFF-AUTO switch is in the OFF mode, the equipment will not run under any circumstances.

3. When the HAND-OFF-AUTO switch is in the AUTO mode, the equipment will run in response to a single automatic contact from PLC or hardwired logic functions.

4. Where UNIT IN AUTOC feedback (typically designated XI and annotated UNIT IN AUTO) is required, it will be shown on the P&ID's.

C. Typical Motor Control Loop – Local/MCC LOCAL-OFF-REMOTE Switch

1. When the LOCAL-OFF-REMOTE switch is in the LOCAL mode, the equipment will run continuously regardless of the remote control logic. In the LOCAL mode, personnel protective and equipment protective interlocks shall be enabled to shut down the equipment. In the LOCAL mode, the equipment will run even in the event of PLC or control system failure.

2. When the LOCAL-OFF-REMOTE switch is in the OFF mode, the equipment will not run under any circumstances.

3. When the LOCAL-OFF-REMOTE switch is in the REMOTE mode, the equipment will run in response to a single remote contact from PLC or hardwired logic functions.

4. Where UNIT IN REMOTE feedback (typically designated XI and annotated UNIT IN REMOTE) is required for a control loop, it will be shown on the P&IDs.

D. Typical Motor Control Loop – Local START-STOP Switch

1. The START-STOP switch is typically set up for three- wire momentary control logic.

2. In the event of loss of power, the motor must be manually restarted.

3. Hardwired START-STOP switches shall operate equipment even in the event of PLC or control system failure.

E. Typical Software Control Switches

1. Where an automatic control strategy is implemented in software and it is necessary to disable the automatic operation, a software MANUAL-OFF-AUTO switch (typically designated HS and annotated MANUAL-OFF-AUTO) may be provide on the P&IDs. In the AUTO mode, the automatic control logic operates the control system output. In the OFF mode, the control system output remains open. In the MANUAL mode, the output contact remains closed or is controlled by a software START-STOP switch.

2. Where no automatic control strategy is implemented in software, but it is necessary to disable the automatic operation elsewhere, a software ENABLE-OFF switch (typically designated HS and annotated ENABLE OFF) may be provided on the P&IDs. In the OFF mode, the output contact from the control system remains open. In the ENABLE mode, the output contact remains closed.

3. Where a software START-STOP switch (typically designated HS and annotated START-STOP) is shown on the P&IDs, the control system shall provide one normally open contact which closes for an adjustable time period to start the equipment and one normally closed contact which opens for an adjustable time period to stop the equipment. Where an automatic control sequence interfaces with a hardwired START-STOP momentary logic circuit, the control system shall provide one normally open contact which closes for an adjustable time period to start the equipment and one normally closed contact which opens for an adjustable time period to stop the equipment.

4. When a software RUN-STOP switch (typically designated HS and annotated RUN-STOP) is shown on the P&IDs, the control system shall provide one normally open contact which closes for as long as the control system logic calls for the equipment to run.

5. Where a software OPEN-CLOSE switch (typically designated HS and annotated OPEN-CLOSE) is shown on the P&IDs, the control system shall provide one normally open contact which closes when the control system logic calls for the valve to open and another normally open contact that closes when

the control system logic calls for the valve to close. The outputs remain closed until the valve has reached its new position, as confirmed by the valve limit switches.

a. When the valve is fully closed or is traveling, the valve closed indicator in the plant control system, ZIO shall be on. When the valve is fully open, the valve open indicator in the plant control system, ZIO shall be off.

b. When the valve is fully open or is traveling, the valve open indicator in the plant control system, ZIO shall be on. When the valve is fully closed, the valve open indicator in the plant control system, ZIO shall be off.

F. Typical Analog Loop – Indication and Alarm

1. Analog values (designated LI, PI, etc.) will be indicated in the plant control system. Readouts for pressure, temperature, flow and analytical loops shall be in engineering units based on the field transmitter range specified in Section 17300. Readouts for special analog loops, analog signals from equipment not supplied under Division 17, etc. will be listed in the Initial Software Settings list attached to this Section or described in the project specific loop descriptions.

2. Required software alarm functions (designated LAL, TAH, AAL, etc.) derived from analog variables are shown on the P&IDs. Initial setpoints for software switches will be listed in the Initial Software Settings list attached to this Section or described in the project specific loop descriptions.

G. Typical Analog Loop – Control and alarm

1. All software PID (proportional, integral, derivative) controllers (designated LIC, PIC, FIC, AIC PDIC) must show setpoint, process variable, and manipulated variable and allow access to tuning parameters from the operator interface software package. Any software controller shall have the capability of being placed in MANUAL mode and have the capability of manually adjusting the output in MANUAL mode from the operator interface software package. Indicator readouts for software PID controllers shall conform to the requirements given in the Typical Analog Loop – Indication and Alarm description above.

2. Required software alarm functions (designated LALL, TAH, AAL, etc.) derived from analog variables are shown on the P&ID's. Initial setpoints for software switches will be listed in the Initial Software Settings list attached to this Section or described in the project specific loop descriptions.

H. Manual Analog Control Setting: A software manual analog control (designated HIC) input is shown on the P&IDs. Initial control ranges will be listed in the Initial Software Settings list attached to this Section or described in the project specific loop descriptions.

I. Timer Control

1. A software time control function (designated KIC or KC) is shown on the P&IDs. Initial time settings will be listed in the Initial Software Settings list attached to this Section or described in the project specific loop descriptions.

2. Where times are used for cycle/duration control logic, the controlled unit will remain off for a preset, adjustable cycle time (designated KIC or KC and annotated CYCLE). At the end of the cycle time, the controlled unit will turn on for an adjustable duration time (designated KIC or KC and annotated DURATION). At the end of the duration time, the cycle timer resets and starts again.

2.10 Project Specific Loop Description

A Filter Flow Control - not included in the design. Filters in service will run until the flow drops below 500 gpm. At which time they will be entered in the backwash cue.

B. Backwash will be controlled by the Backwash Master controller and may be either automatic, with Manual or automatic initiation, or operator assisted.

1. Automatic Backwash, if selected will automatically remove the next filter in the Backwash queue from service and begin backwash.

2. Automatic Backwash, with operator initiation will alert the operator when the next filter from the queue is available for backwash, and the operator will initiate the automatic backwash operation.

3. Operator assisted Backwash will await the operators permission at the end of each step during the backwash operation.

4. Manual Backwash will require the operator to set up the valve configuration for each stem of the backwash cycle, and start and stop the backwash pumps and air scour blowers manually.

2.11 Automatic Backwash

A. Take filter out of service

1. Close the influent valve, verify closed. Drain water until Level is 2 feet above filter medial (adjustable). Allow 300 seconds.

2. Close Effluent Valve, verify closed. Open BW Drain Valve, verify open.

3. Open BW Air Valve, verify open. Open BW Water Valve, verify open. Open BW Flow Control Valve to 25%.

B. Air Scour

1. Start BW air blower. Monitor for low pressure, alarm and switch to alternate blow on low pressure alarm.

C. Backwash

1. Start BW water pump. Establish 3,840 backwash flow. When water reaches top of weir, start step 5 timer. Allow 600 seconds to reach top of weir before overriding with timer. Alarm on low flow and switch to standby pump on low water flow.

D. Rinse

1. Stop BW air blower, close BW air valve. Verify closed.

2. Stop BW pump. Close BW valve.

E. Drain-Down

1. Close BW drain valve, open effluent valve to 25% position. Advance to step 9 when level reaches 3 feet (adjustable).

F. Put filter back in service

1. Open influent valve. Verify open. Open effluent valve 100%, verify 100%.

2.12 Spare Parts

A. The System Manufacturer shall supply spare parts for the Plant Control System.

B. The System Manufacturer shall provide a list of all spare parts being provided under this Division. The spare parts list shall be included in the documents to be reviewed by the Engineer during the shop drawing review process. The spare parts shall include, but shall not be limited to, the items included in the list below.

1. Two of each type PLC processor.

2. Two each type of PLC I/O card.

3. Two each type of PLC power supply.

4. One lot of PLC I/O Card Fuses, 10 spare fuses for each type of fuse used in PLC I/O cards.

5. One lot of PLC Fuses, 5 spare fuses for each type of fuse used in PLC hardware (excluding I/O cards).

6. One Plant Control Network backbone Fast Ethernet switch.

7. One spare for each different type of media converter (fiber-to-copper, etc.).

8. Five fiber optic patch cards with connectors.

9. One lot of Terminals, 10 spare terminals for each type of terminal used in local control panels.

10. One lot of Terminal Fuses, 5 spare fuses for each type of miscellaneous fuse used in local control panels.

11. One heavy-duty relay.

12. Two ice-cube relays.

13. One spare for each different type of timing relay.

14. One lot of surge protectors, including 5 spare of each type used.

15. One 24 VDC power supply

16. Two of each type of Intrinsic Safety Barrier provided.

17. One lot of Zener type Intrinsic Safety Barrier Fuses, standard lot cartons equal to 10 percent of the number of furnished IS Barrier fuses provided, two cartons of each type size and type of fuse minimum.

18. Other spares as noted in other Division 17 Sections.

Part 3 Execution

3.01 Installation

A. The System Manufacturer shall assign a full time representative to provide coordination and supervision of on-site PCS construction work. The individual is to be on-site during all times when PCS work is being done.

B. The system, peripherals, and accessory equipment shall be installed in accordance with the manufacturer's instructions and located as shown on the Drawings unless otherwise approved by the Engineer.

C. All work shall be executed in full accordance with all applicable codes and local rulings. Should any work be performed contrary to said rulings, ordinances, or regulations, the System Manufacturer shall bear the full responsibility for such violations and assume all costs arising therefrom.

D. The Contractor shall investigate each space in the building through which equipment must pass to reach its final location. If necessary, the manufacturer shall ship the equipment in sections sized to permit passage through such areas.

3.02 System Noise Rejection

A. Electrical isolation shall be provided between input systems and the processor units. Noise rejection for common mode shall be at least 100 decibels from 0 to 100 Hertz, and up to 175 volts. Normal voltage rejection shall be not less than 35 decibels at 60 Hertz.

B. All instrument signal wiring, control wiring, and AC control power wiring shall be protected against lightning, spikes, and other transient surges at all field and control panel termination points per the requirements of Section 17120.

3.03 Grounding

A. Bond all instrument and control panel enclosures to the power system ground.

B. Ground analog signal conductor shields at the control panel end only.

3.04 Tests and Acceptance

A. The equipment and programs shall be factory-tested prior to shipment for compliance with the conditions of this Section, these Specifications, and for environmental conditions.

B. Factory Testing: Factory-test setup shall demonstrate peripheral performance, including all displays and graphics. All discrete and analog points shall be verified. A 100-hour burn-in test shall be performed on all solid-state devices. The Owner reserves the right to witness the factory tests. At least 20 days written notice shall be given to the Owner and the Engineer by the Contractor prior to the date of starting factory tests. Submit detailed witness test and final checkout procedural outlines for approval to the Engineer not less than 60 days prior to starting factory tests. Testing shall include the complete system with all cabinet doors in place and peripherals attached, for an agreed to period time, with documentation via periodic printouts.

C. After installation of the complete system, the System Manufacturer shall provide the services of a qualified systems engineer to test the complete system under the observation of the Owner or Owner's representative to verify that all functions specified are performed without error or malfunction. As a part of the test procedure, Contractor's personnel, when requested by the system supplier, shall cause each remote process to change state or value three times to verify all functions during the checkout period. This shall be repeated until the system performs correctly to the satisfaction of the Owner or Owner's representative.

3.05 Start-Up Assistance

The System Manufacturer shall provide the on-site services of a project engineer for a minimum of two weeks (10 days at 8-hours per day) for start-up assistance. The individual provided shall be familiar with the Project and with all software packages and supplied hardware. This individual shall be capable of modifying PLC programming or operator interface configuration during the start-up period.

3.06 Training

A. The System Manufacturer shall provide the following training courses for designated Owner's personnel. The courses shall be taught by professional, full-time instructors. All course materials required to adequately support the material presented shall be included. The System Manufacturer shall bear the cost of student transportation, meals, and lodging for any courses taught away from the Owner's facility. The System Manufacturer shall set the schedule for all courses with the Owner at least 20 days prior to the proposed date.

1. Computer Process Control Overview

   a. Length: Four hours

   b. Number of Students: 5

   c. Location: Owner' plant site

   d. This course will familiarize students with the basic structure of a computer process control system and will explain the interrelationships between hardware, software, and the process.

2. System Hardware Maintenance

   a. Length: Eight hours

   b. Number of Students: 5

   c. Location: Owner's plant site

   d. This course will instruct the computer maintenance personnel in maintenance and repair practices used to support the system hardware.

3. Application Software

   a. Length: Eight hours

   b. Number of Students: 5

   c. Location: Owner's plant site

d. This course will provide the student with a working knowledge of all software supplied with the computer system. Topics covered shall include the operating system software, file structures, and application software. Include lab sessions to reinforce classroom lessons.

4. Operator Familiarization

a. Length: Eight hours

b. Number of Students: 5

c. Location: Owner's plant site

d. This course will be taught on-site to ensure that plant operating personnel will be thoroughly familiar with the PCS as delivered. The students will be instructed in PCS start-up and loading procedures, loop tuning via the operator's pedestal, and all computer features.

5. HMI Software Training

a. Length: Three days

b. Number of Students: 8

c. Location: Owner's plant site

d. This course will familiarize students with the HMI software and shall include such topics as generating graphics, database modifications, short and long term historical data, reporting, and scripting. This course will cover the basics of configuring the Industrial SQL package including configuring and printing reports, adding and deleting points, modifying data storage parameters, etc.

6. PLC Software

a. Length: Three days

b. Number of Students: 8

c. Location: Owner's plant site

d. This course will provide the student with a working knowledge of the software used to program the PLCs. Topics shall include ladder logic programming, data transfer between PLCs, program debugging, and program simulation. Include lab sessions to reinforce classroom lessons.

7. Report Generation Software

a. Length: One day.

b. Number of Students: Three.

c. Location: Owner's plant site.

d. This course will provide the student with a working knowledge of the software used to generate custom reports. Topics shall include data storage, data retrieval (including queries), report layout, and automatic report generating and printing for daily, weekly, and monthly reports. Include lab sessions to reinforce classroom lessons.

B. The System Manufacturer shall provide a four-hour training course taught by the fiber optic cable manufacturer for Owner's personnel. Topics of the training course shall include a general overview of fiber optic systems, fiber optic cable testing, connector and termination methods, splicing methods, and general maintenance and troubleshooting. The training course shall be taught on-site. The System Manufacturer shall bear the cost of the instructor's transportation and lodging.

C. In addition to the courses enumerated above, the System Manufacturer shall provide training courses taught by the equipment and software manufacturers, or their certified training provider, for the Owner's personnel as follows. The courses shall be purchased in the names of the individuals designated by the Owner. The Owner will bear the cost of student transportation and boarding.

1. Wonderware

a. Provide two individual Industrial SQL Clients training passes for the Owner's personnel. This course shall provide ActiveFactory training including trending, live and historical data retrieving and displaying, and report generating.

b. Each pass shall serve as tuition for one individual in the specified course taught at InSource Software Solutions in Duluth, Georgia, (770) 935-9364.

c. The passes shall be valid for a minimum of 12 months from the date of purchase.

END OF SECTION

Part 1 General

1.01 Scope

Programmable logic controllers (PLC).

1.02 System Description

A. This Section covers the technical requirements for programmable logic controllers (PLC) that will receive discrete and analog inputs, and through the use of an internal ladder logic program, control output relay operations and perform data handling functions.

B. The capabilities of the individual PLCs shall be as required to perform the control functions associated with the particular control panel or system.

C. The System Manufacturer shall determine the actual amount of memory and I/O requirements necessary for each control panel to function as specified or shown on the Drawings. Each processor shall have 50 percent spare memory capacity (not less than 1K). Where rack type PLCs are used, each rack shall have a minimum of 10 percent spare I/O points per type (but not less than four discrete inputs, four discrete outputs, two analog inputs, and two analog outputs) and a minimum of 25 percent spare slots (not less than two).

1.03 Submittals

A. For each individual PLC, the following record documentation shall be furnished in addition to documentation requirements in other Sections:

1. Complete software documentation, including annotated ladder logic diagram printout. Printout shall include a complete set of comments identifying relays, function of logic blocks, I/O points, etc.

2. Narrative description of the sequence of operation. Description shall reference, as applicable, the ladder diagram.

B. For the PLC system, documentation shall consist of descriptive literature and installation, operation, and instruction manuals, and shall be included in prints for approval and prints for record. In addition, record drawings shall include PLC manufacturer's recommended list of spare parts with prices, and availability/cost of maintenance contracts and similar support services available.

Part 2 Products

2.01 Acceptable Manufacturers

A. Programmable logic controllers shall be manufactured by Allen-Bradley (Control Logix 5555).

B. Program development software shall be as distributed by the PLC manufacturer.

2.02 General Requirements

A. All components in the PLC system shall be the product of a company who regularly manufactures and services this type of equipment. Wherever possible, all assemblies and sub-assemblies performing similar functions in separate controllers purchased under this Section shall be interchangeable.

B. Components: In compliance with normally recognized industry standards and regularly sold to heavy industry installations. All connecting cables shall be constructed so as to withstand, without damage, all normal use and handling.

C. The PLC system shall be of a modular design with a plug-in processing unit, input/output frames or assemblies, and plug-in peripherals. All necessary cables shall be included.

D. Mark all major assemblies, sub-assemblies, circuit cards, and devices with the manufacturer's part or identification number.

E. All components of the PLC system shall be capable of continuous operation at temperatures of 0-60 degrees C, and humidity levels of 5-95 percent.

F. Electrical supply voltage to the individual controllers shall be 115 VAC ± 10 percent 48-63 Hz. Controller system power supplies shall have circuit breakers or fuses for overload protection.

G. Each controller, including output devices, shall orderly shut down and alarm in the event of a disruption of program execution or scan, a loss of logic power, loss of communication between controller essential devices, or a memory error. A failure of one controller shall not disrupt operation of other controllers in the system.

2.03 Central Processing Unit (CPU)

A. The CPU shall contain the program memory in static RAM, PROM, or a combination of both.

1. CMOS or RAM shall have a battery backup system capable of retaining all memory for a minimum of six months and shall require no external cooling or special vents. The backup batter shall be capable of being replaced without interruption of memory integrity with AC power off.

2. Provide visual indication of backup battery status with alarm in the event of low battery voltage before battery failure.

3. Provisions shall be made for connecting an external DC voltage to the system to provide auxiliary protection for CMOS RAM memories.

B. The program memory shall be capable of being expanded in the field by card exchange.

C. At least 1,024 internal storage registers shall be available for data storage. These registers shall be independent of and in addition to program storage memory.

D. Provisions shall be made for the processor to check all logic words for parity when read from memory. A parity error shall cause an immediate shutdown with alarm and visual indication.

E. Nominal memory scan time shall be no longer than 4 milli-seconds per 1K of ladder logic memory. Only the portion of memory being used shall be scanned, and the memory shall be automatically repositioned up or down when contacts and rungs are added or deleted. Service each input on every scan.

F. The system shall have the capability of servicing the I/O at any point in the user program as many times as desired during a scan. Provide the capability of not servicing the I/O during a scan if the user so chooses.

G. Software or key locking arrangement at the CPU shall prevent memory modification by unauthorized personnel.

H. The processor unit shall be expandable to a minimum of 4,000 I/O points. Any number of normally open or normally closed contacts shall then be available from these references for use in the program. Any internal coil shall be capable of assuming a relay, latch relay, one-shot, timer, or counter function.

I. The system software timers and counters shall be capable of the following:

1. Timers shall have a selectable time base of 0.01, 0.1, and 1.0 second, or 0.1 minutes. Each timer shall be capable of the maximum time preset.

2. Both up-counters and down-counters shall be available. Each counter shall be capable of a fixed preset of at least 0-999 and at least a register preset of 0-65535.

3. Presets shall be from internal constants and internal storage registers. Timers and counters shall have the capability of being reprogrammed from the keyboard, as specified below, at anytime without halting system operation.

4. Timers and counters shall be capable of causing an output relay operation, and display of the time or count through programming software.

5. Timers and counters shall be capable of using the same contact for enable and reset functions.

J. The system shall have math capability available.

1. Math functions shall be a minimum of four digit (0-9999) addition, subtraction, multiplication, division, equality, greater than, and less than. In addition,

signed addition and subtraction, and floating point addition and subtraction shall be available.

2. Include capability to handle data in lists or tables. These lists shall be a minimum of 16 bits wide, with capability of a length of 255. Include a sort function with a sort capability of 192 items, and the ability to generate FIFO and LIFO stacks.

3. The system shall have matrix logic capability up to 16 x 255. Matrix logic functions shall include AND, OR, XOR, and Compare.

4. The numerical data for a math function, data list, or matrix shall be input from timers, counters, keyboard entry, and other math functions, data lists, or matrices.

5. The system shall be capable of using the results from math functions, data handling functions, and matrix functions for presets to timers and counters, and for operating system outputs and CRT displays.

K. The status of latch relays and one-shots, and all data from timers, counters, and math functions shall be retained during any power outage as specified above.

L. The system shall have the capability to conditionally skip execution of all or part of the user program.

M. The system shall be capable of performing a minimum of 16 sub-routines. These sub-routines shall be called up by a programmed instruction at any time during the main body user program.

N. The system shall have a minimum of 16 priority interrupt inputs which will cause an immediate jump to the associated sub-routine of the main body user program.

2.04 Input/Output (I/O) Devices

A. Discrete Inputs/Outputs

1. Discrete inputs shall be available in 24 and 115 VAC/DC. Discrete outputs shall be available in 24 VDC and 115 VAC.

2. Discrete inputs shall be guaranteed “on” if at least 78 percent of nominal voltage is present. Discrete inputs shall be guaranteed “off” if 20 percent or less of the nominal voltage is present.

3. Minimum isolation between input/output and logic voltage shall be 1,500 V RMS per NEMA standards via optoisolation.

4. AC discrete outputs shall be rated at 20 amps inrush, 2 amps continuous. DC discrete outputs shall have a 2 amp rating. All outputs shall have 3 amp normal fuse protection.

5. Each discrete input and output shall have an LED or other visible indication of on/off status.

B. Analog Inputs/Outputs

1. Analog inputs shall be available in 4-20 mADC, 1-5 VDC, and 0-10 VDC. Analog outputs shall be available in 4-20 mADC, 0-10 VDC, and –10 to +10 VDC.

2. All of the above inputs and outputs shall have at least 11 bit resolution with an accuracy of ± 1 percent over the rated temperature range.

3. Minimum isolation between input/output and logic voltage shall be 1,500 VDC per NEMA standards via optoisolation.

4. All analog inputs interfacing with 120 VAC or 24 VDC (non-loop) powered devices shall be provided with isolated analog input modules.

5. All analog outputs shall be isolated.

C. Frames or racks for mounting all types of inputs and outputs shall be interchangeable, and inputs and outputs shall be interchangeable within the same frame.

D. All PLC terminal blocks shall be 300 V minimum NEMA rated, and accommodate no fewer than two #14 gauge wires.

E. Marker strips shall be attached adjacent to the field wiring and the status indicating lights to allow easy identification of inputs and outputs by the user. These markers shall not change when devices are replaced during repair or maintenance. Color code marker strips according to voltage.

F. Field wiring shall not have to be removed in order to replace an I/O device during repair or maintenance.

2.05 Data Processing

A. The controller system shall have the ability to perform the following data processing functions without significantly slowing down or interrupting the logic processing:

1. The controller system shall be capable of storing, displaying, and printing messages containing numerical information, including information from timers, counters, math functions, and analog functions. These messages shall contain the full range of alphanumeric characters and shall be capable of assuming user required formats. A minimum storage capacity of 64,000 characters in addition to program memory and storage registers shall be available for these messages.

2. Provide proportional, integral, derivative (PID) fixed point control with ability to solve 32 PID loops with a repetition rate of one second.

3. The controller system shall have data storage capability which will allow the storage of recipes or other information in a structured file system. The file system shall be accessible from the user program.

2.06 Program Development Software

A. Provide current version of Windows-based programming software.

B. Programming capabilities shall include the ability to alert the programmer to errors in order to prevent not closing logic circuits, entering non-allowable addresses, or missing addresses.

C. Programming field for each rung shall be 70 elements minimum. Program changes shall be allowed element by element such as adding, deleting, or reversing (NO to NC) contacts without replacing an entire rung. It shall be possible to delete or insert entire rungs inside the program.

D. A search feature shall allow the operator to call up any contact or coil in the program by reference. The search feature shall be provided by a special pushbutton on the keyboard.

E. The controller system shall allow an operator to override inputs and outputs on or off from the development software. The override function shall be provided by a special pushbutton on the keyboard.

F. The programming software shall have off-line, on-line, and monitor modes of operation, controlled by password to provide an additional tier of security.

1. Normal programming shall be in the off-line mode. The PC shall not need to be connected to the control system for off-line programming.

2. In the on-line mode, the programming device shall be connected to the control system, and the two-way communications shall exist between individual CPUs and the programming device. On-line programming shall include the ability to make program edits, upload data and download data while the CPU is running. The status of contacts and coils in the ladder logic program shall be displayed on the PC. The PC shall be able to display the current values of timers, counters, and internal registers, and the operator shall be able to modify these values through the development software while in the program display mode.

3. In the monitor mode the programming device shall be connected to the control system, and disabled communication shall exist from the CPU to the programming device. The programming device shall be able to read from but not write to the CPU. The status of contacts, coils, timers, counters, and registers shall be displayed on the PC, but an operator shall not be able to modify them.

2.07 Program Development PC

A program development PC is not included in the Project. It shall be the responsibility of the System Manufacturer to supply a PC for its own use for the development of the PLC program.

Part 3 Execution

3.01 Installation

A. PLC equipment is to be mounted on the back panel of the local control panels, unless otherwise noted, and incorporated in the panel design by the System Manufacturer.

B. The Contractor is responsible for furnishing required footage for the data highway to the System Manufacturer. Data highway conductors shall be furnished by the System Manufacturer for installation by the Contractor.

C. Data highway routing shown on the Drawings is based on a loop feed system. Dual radial or other configurations which meet the redundancy requirements specified above will be permitted so long as the Contractor provides any additional raceways or conductors required and coordinates all clearances, at no cost to the Owner.

END OF SECTION