

SECTION 10

**TECHNICAL
SPECIFICATIONS**

Project Manual

for

Bee Ridge Water Reclamation Facility Headworks Odor Control Piping

Improvements

CIP # 88006

Bid # 191763JLS

**Board of County Commissioners
Sarasota County, Florida**

Technical Specifications Only

**Issued for Bidding
January 30, 2019**



A Stanley Group Company
Engineering, Environmental and Construction Services - Worldwide

**SARASOTA COUNTY, FLORIDA
BEE RIDGE WATER RECLAMATION FACILITY
HEADWORKS ODOR CONTROL PIPING IMPROVEMENTS**

TECHNICAL SPECIFICATIONS

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SUMMARY OF WORK
SECTION 01 11 00 - Page 1**PART 1 GENERAL**

1.01 WORK COVERED BY CONTRACT DOCUMENTS

- A. Work of this Agreement comprises of demolition of the existing headworks structure air duct piping and supports and the general construction of new headworks structure air duct piping and supports.

1.02 AGREEMENT

- A. Construct Work under single lump sum Agreement.

1.03 WORK BY OTHERS

- A. There is no other work being completed by others associated with this Work.

1.04 WORK SEQUENCE

- A. Construct Work in stages to accommodate Owner's use of premises during construction period.
 1. Coordinate construction schedule and operations with Owner.
 2. Maintain safe access for operational personnel to all portions of the headworks structure during the course of the Work.
 3. Relocate materials and equipment as directed by the Owner to allow access to headworks equipment.
 4. Do not interfere with the operation of the treatment facilities. Water reclamation facility must remain fully operational during construction.

1.05 CONTRACTOR USE OF PREMISES

- A. Contractor shall have access to the site and the headworks, but only as needed to complete the Work.
- B. Coordinate use of premises under direction of Owner. Contractor shall confine construction equipment, storage of materials and equipment and operations of workers to areas permitted by law, ordinances, permits, or requirements of Contract Documents, and shall not unreasonably encumber premises with construction equipment or other material or equipment. Owner will assign Contractor area for the laydown of materials and equipment at the pre-construction meeting. Contractor will restore the laydown area to its original condition at the completion of the Work.
- C. Assume full responsibility for protection and safekeeping of items under this Agreement, stored on Site.
- D. Move any stored items, under Contractor's control, which interfere with operations of Owner.
- E. Obtain and pay for use of additional storage or Work areas needed for operations.

1.06 OWNER OCCUPANCY

- A. Owner will occupy premises during entire period of construction for conduct of its normal operations. Cooperate with Owner's Representative in all construction operations to minimize conflict, and to facilitate Owner usage.

SUMMARY OF WORK

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PART 2 PRODUCTS
NOT USED

PART 3 EXECUTION
NOT USED

END OF SECTION

L. Thomas
B. Ahmed

PART 1 GENERAL

1.01 CASH ALLOWANCES

- A. There are no cash allowances associated with this Project.

1.02 CONTINGENCY ALLOWANCES

- A. Provide an allowance of 5% of Subtotal Bid Items 1-1 to 3-1 on the appropriate line of the bid form.

1.03 TESTING AND INSPECTION ALLOWANCES

- A. There are no testing or inspection allowances associated with this Project.

1.04 SCHEDULE OF VALUES

- A. Submit a Contractor's Application for Payment on a form approved by the Owner. Contractor's standard form or electronic media printout will be considered for use by Owner.
- B. Submit Schedule of Values within 10 days after Notice of Award.
- C. Format: Use Table of Contents of this Project Manual. Identify each line item with number and title of major specification Section. Additionally, identify site mobilization, bonds and insurance.
- D. Include within each line item, a direct proportional amount of Contractor's overhead and profit.
- E. Revise schedule to list approved Change Orders, with each Application for Payment.

1.05 APPLICATIONS FOR PAYMENT

- A. Submit 3 copies of each Application for Payment.
- B. Content and format: Use Schedule of Values for listing items in Application for Payment.
- C. Submit an updated construction schedule with each Application for Payment.
- D. Payment period: Submit at intervals stipulated in Agreement.
- E. Submit with transmittal letter as specified for Submittals in Section 01 33 00.
- F. Submit partial waivers of lien and partial release of liens from major subcontractors and vendors for prior payments with any subsequent Application for Payment.
- G. Substantiating data: When Owner requires substantiating information, submit data justifying dollar amounts in question. Include affidavits attesting to off-site stored products, if applicable.

1.06 CHANGE PROCEDURES

- A. Submittals: Submit name of individual authorized to receive change documents, and be responsible for informing others in Contractor's employ or Subcontractors of changes to Work.
- B. Owner will notify Contractor in writing of minor changes in Work not involving an adjustment to Contract Price or Contract Time.
- C. Owner may issue a proposal request which includes detailed description of proposed change with supplementary or revised Drawings and Specifications, change in Contract Time for executing change Contractor will prepare and submit an estimate within 10 days.

PRICE AND PAYMENT PROCEDURES28706.01.00

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- D. Contractor may propose changes by submitting a request for change to owner, describing proposed change and its full effect on Work. Include a statement describing reason for change, and effect on Contract Price and Contract Time with full documentation. Document any requested substitutions in accordance with Section 01 60 00.
- E. Stipulated price Change Order: Based on proposal request and Contractor's maximum price quotation or Contractor's request for a Change Order as approved by Owner.
- F. Construction Change Directive: Owner may issue a directive instructing Contractor to proceed with a change in Work, for subsequent inclusion in a Change Order. Document will describe changes in Work, and designate method of determining any change in Contract Price or Contract Time. Promptly execute change.
- G. Time and material Change Order: Submit itemized account and supporting data after completion of change, within time limits indicated in Conditions of Contract. Owner will determine change allowable in Contract Price and Contract Time as provided in Contract Documents.
- H. Maintain detailed records of work done on time and material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in Work.
- I. Document each quotation for a change in cost or time with sufficient data to allow evaluation of quotation.
- J. Correlation of Contractor submittals:
 - 1. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust Contract Price.
 - 2. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by change, and resubmit.
 - 3. Promptly enter changes in Project Record Documents.

1.07 REQUEST FOR INFORMATION

- A. Questions regarding conflicts or intent of the Contract Documents shall be submitted by Contractor on attached Request for Information (RFI) form.

1.08 DEFECT ASSESSMENT

- A. Replace Work, or portions of Work, not conforming to specified requirements.
- B. If, in opinion of Owner and Engineer, it is not practical to remove and replace Work, Owner and Engineer will direct an appropriate remedy or adjust payment.
 - 1. At the Owner's option, defective Work may remain, but the Project price will be adjusted to a new price at discretion of Owner.
 - 2. At the Owner's option, defective Work may be partially repaired to instructions of Owner and Engineer and the Project price adjusted at the discretion of Owner.
 - 3. Individual specification sections may modify these options or may identify a specific formula or percentage price reduction.
- C. Authority of Owner to assess defect and identify payment adjustment, is final.
- D. Nonpayment for rejected products: Payment will not be made for rejected products for any of following:
 - 1. Products wasted or disposed of in a manner that is not acceptable.
 - 2. Products determined as unacceptable before or after placement.
 - 3. Products not completely unloaded from transporting vehicle.
 - 4. Products placed beyond lines and levels of required Work.
 - 5. Products remaining on hand after completion of Work.
 - 6. Loading, hauling, and disposing of rejected products.

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PRICE AND PAYMENT PROCEDURES
SECTION 01 20 00 - Page 3

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

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B. Ahmed



Stanley Consultants INC.

REQUEST FOR INFORMATION

RFI No.:

Contract No. and Name:		Date:	
Contractor:		Owner:	
Engineer:			

Subject:	
Drawing Reference:	Spec Section:
Information Required (Be Specific):	
_____	_____
Contractor Representative	Date
Reply:	
_____	_____
Engineer Representative	Date

THIS IS NOT A CHANGE IN SCOPE AUTHORIZATION. IF, IN YOUR OPINION, THIS RESPONSE INVOLVES WORK WHICH CHANGES THE CONTRACT PRICE OR TIME, YOU MUST SUBMIT A PROPOSAL OR A NOTICE AS REQUIRED IN THE CONTRACT DOCUMENTS.

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MEASUREMENT AND PAYMENT
SECTION 01 22 00 - Page 1**PART 1 GENERAL**

1.01 MEASUREMENT AND PAYMENT

- A. This Work is being completed as a lump sum contract, but Contractor is required to provide individual costs for the items identified on the Bid Form.
- B. Payment will be a lump sum amount based on the drawings, specifications and the Bid Form, with modification of the final payment amount based on the actual use of contingency funds, the actual permit and fee costs, plus any approved change orders.
- C. Partial payments will be based on the percentage of construction completed as determined by the Owner.

1.02 DESCRIPTION OF INDIVIDUAL PRICE ITEMS

- 1-1. Mobilization; lump sum (LS): Price includes mobilization costs. A maximum payment of 8% of the total extended prices will be made for this item. Payment shall be made along with the first monthly payment after commencement of major construction. Includes field facilities, insurance, bonds, and other front-end costs directly associated with the Project.
- 1-2. Demobilization: lump sum (LS): Price includes costs associated with Project closure. A maximum payment of 3% of the total extended prices will be made for this item. Payment shall be made with the final payment. Includes removal of field facilities and other closure costs directly associated with the Project.
- 2-1. Demolition and Disposal: Demolition; lump sum (LS): Price includes furnishing material and labor for removal and disposal of air duct piping, supports and other miscellaneous items directly related to the Project.
- 3-1. Headworks Odor Control Piping Improvements; lump sum(LS): Unit price includes all costs for joints, fittings, specials, dampers, pipe, supports, electrical grounding, concrete work and repairs, facilities protection, testing, connections to existing headworks and blower, and miscellaneous associated work required to furnish and install the odor control piping of sizes listed.
- 4-1. Contingencies: units are dependent on approved change order: An allowance equal to 5% of the subtotal amount (Bid Items 1-1 to 3-1) is to be included in the final bid amount. These funds will be paid to the Contractor only on the basis of approved change orders.
- 4-2. Permit and Fee Allowance: Include an allowance of \$5,000 in the total base bid price for the payment of possible permits and fees. These funds will be paid to the Contractor only on the basis of approved change orders.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

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B. Ahmed

PART 1 GENERAL

1.01 SUBSTITUTIONS

- A. For period of 30 days after effective date of Agreement, Owner will consider formal requests from Contractor for substitution of products in place of those specified. After end of that period, requests will be considered only in case of product unavailability or other conditions beyond control of Contractor.
- B. Submit one digital copy of request for substitution for consideration using attached Product Substitution Request Form. Limit each request to one proposed Substitution. Support each request with:
1. Complete data substantiating compliance of proposed substitutions with requirements stated in Contract Documents. Burden of proof is on proposer.
 - a. Product identification, including manufacturer's name and address.
 - b. Manufacturer's literature; identify:
 - 1) Product description.
 - 2) Reference standards.
 - 3) Performance and test data.
 - c. Samples, as applicable.
 - d. Name and address of similar projects on which product has been used, and date of each installation.
 2. Itemized comparison of proposed substitution with product specified; list significant variations.
 3. Data relating to changes in construction schedule.
 4. Any effect of substitution on separate contracts.
 5. List of changes required in other work or products.
 6. Accurate cost data comparing proposed substitution with product specified. Amount of any net change to Contract Price.
 7. Designation of required license fees or royalties.
 8. Designation of availability of maintenance services, sources, or replacement materials.
- C. Substitutions will not be considered for acceptance when:
1. They are indicated or implied on Shop Drawings.
 2. They are requested directly by Subcontractor or supplier.
 3. Acceptance will require substantial revision of Contract Documents.
- D. Substitute products shall not be ordered or installed without written notification of Owner's acceptance.
- E. Owner and Engineer will determine acceptability of proposed substitutions.

1.02 CONTRACTOR'S REPRESENTATION

- A. In making formal request for substitution Contractor represents that:
1. It has investigated proposed product and has determined that it is equal to or superior in all respects to that specified.
 2. It will provide same warranties or Bonds for substitution as for product specified or as required by Owner.
 3. It will coordinate installation of accepted substitution into Work, and will make such changes as may be required for Work to be complete in all respects.
 4. It waives claims for additional costs caused by substitution which may subsequently become apparent.
 5. Cost data is complete and includes related costs under its Agreement, but not:
 - a. Costs under separate contracts.
 - b. Engineer's costs for redesign or revision of Contract Documents.
 6. It will reimburse Owner for charges of Engineer or Engineer's consultants for evaluating any proposed substitute, whether proposed substitute is accepted or rejected.

PRODUCT SUBSTITUTION PROCEDURES

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PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

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PRODUCT SUBSTITUTION REQUEST FORM

To: _____

Project: _____

Specified Item: _____
Section Page Paragraph Description

The undersigned request consideration of the following:

PROPOSED SUBSTITUTION _____

Attached data includes product description, specifications, drawings, photographs, performance, and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The undersigned certifies that the following paragraphs, unless modified by attachments are correct:

1. The proposed substitution does not affect dimensions shown on Drawings.
2. The undersigned will pay for changes to the building design, including engineering design, detailing, and construction costs caused by the requested substitution.
3. The proposed substitution will have no adverse affect on other trades, the construction schedule, or specified warranty requirements.
4. Maintenance and service parts will be locally available for the proposed substitution.

The undersigned further states that the function, appearance, and quality of the proposed substitution are equivalent or superior to the specified item.

Submitted by:

Signature _____

Firm _____

Address _____

Date _____

Telephone _____

Attachments

For use by Engineer/Architect

Approved Approved as noted

Not Approved Received too late

By _____

Date _____

Remarks _____

PART 1 GENERAL

1.01 RELATED SECTIONS

- A. Construction Contract Between Owner and Contractor.
- B. General Conditions of the Contract: Progress payments and final payment.
- C. Section 01 20 00 - Price and Payment Procedures.
- D. Section 01 33 00 - Submittal Procedures.
- E. Section 01 70 00 - Execution and Closeout Requirements.

1.02 FORMAT

- A. Contractor's Application for Payment in electronic media driven form, as approved by Owner.
- B. For each item, provide a column for listing each of the following:
 - 1. Item Number.
 - 2. Description of work.
 - 3. Scheduled Values.
 - 4. Previous Applications.
 - 5. Work in Place and stored materials under this Application.
 - 6. Authorized Change Orders.
 - 7. Total Completed and Stored to Date of Application.
 - 8. Percentage of Completion.
 - 9. Balance to Finish.
 - 10. Retainage.

1.03 PREPARATION OF APPLICATIONS

- A. Present required information on electronic media printout.
- B. Execute certification by signature of authorized officer.
- C. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored Products.
- D. List each authorized Change Order listing Change Order number and dollar amount as for an original item of Work.
- E. Prepare Application for Final Payment as specified in Section 01 70 00.

1.04 SUBMITTAL PROCEDURES

- A. Submit one digital copy of each Application for Payment and one hard copy with required waivers, certifications and other required documentation.
- B. Submit an updated construction schedule with each Application for Payment.
- C. Payment Period: Submit at intervals stipulated in the Agreement.
- D. Submit with transmittal letter as specified for submittals in Section 01 33 00.
- E. Submit required partial and final waivers.

APPLICATIONS AND CERTIFICATES FOR PAYMENT28706.01.00

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1.05 SUBSTANTIATING DATA

- A. When Owner requires substantiating information, submit data justifying dollar amounts in question.
- B. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.
- C. Include the following with the application:
 - 1. Partial release of liens from major subcontractors and vendors.
 - 2. Affidavits attesting to off-site stored products.
 - 3. Construction progress schedules.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

L. Thomas
B. Ahmed

PART 1 GENERAL

1.01 REQUIREMENTS

- A. Submit to Engineer schedule of values allocated to various portions of Work, within 10 days after Notice of Award for review and approval.
- B. Upon request of Owner, support values with data which will substantiate their correctness.
- C. Schedule of values, unless objected to by owner, shall be used only as basis for Contractor's partial and final Applications for Payment.

1.02 FORM AND CONTENT

- A. Provide schedule formatted for printing on 8-1/2" x 11" paper; Contractor's standard forms and automated printout will be considered for approval by Owner upon Contractor's request. Identify schedule with:
 - 1. Title of Project and location.
 - 2. Owner and Project number.
 - 3. Name and Address of Contractor.
 - 4. Agreement designation.
 - 5. Date of submission.
- B. Schedule shall list installed value of component parts of Work in sufficient detail to serve as basis for computing values for progress payments during construction.
- C. Follow table of contents of this Project Manual as the format for listing component schedule items. Identify each line item with number and title of respective major section of Specifications.
- D. For various portions of Work:
 - 1. Each item shall include directly proportional amount of Contractor's overhead and profit.
 - 2. For items on which progress payment will be requested for stored materials, break down value into:
 - a. Cost of materials, delivered and unloaded at Site.
 - b. Total installed value.
- E. Sum of all values listed in schedule shall equal total Contract Price.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

L. Thomas
B. Ahmed

PART 1 GENERAL

1.01 COORDINATION AND PROJECT CONDITIONS

- A. Coordinate scheduling, submittals, and Work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.

1.02 COPIES OF DRAWINGS AND PROJECT MANUALS

- A. After Notice of Award, Contractor may obtain, at no charge, digital copies of the Drawings and Project Manual.

1.03 PROJECT SITE ADMINISTRATION

- A. Contractor shall provide competent, suitably qualified personnel to lay out Work and perform construction as required by Contract Documents. Contractor shall at all times maintain good discipline and order at site.
- B. Except in connection with safety or protection of persons or Work or property at site or adjacent thereto, and except as otherwise indicated in Contract Documents, all Work at site shall be performed during regular working hours, and Contractor shall not permit overtime work or performance of Work on Saturday, Sunday, or any legal holiday without Owner's written consent.
- C. Incompetent or incorrigible employees shall be dismissed from Work by Contractor or its representative when requested by Owner, and such persons shall not again be permitted to return to Work without written consent of Owner.
- D. Workmanship shall be of best quality.

1.04 PROJECT MEETINGS

- A. Representatives of Contractor, Subcontractors and suppliers attending meetings shall be qualified and authorized to act on behalf of entity each represents.
- B. Preconstruction meeting:
 - 1. Owner will schedule a meeting approximately 15 days after Notice to proceed.
 - 2. Location: Bee Ridge Wastewater Reclamation Facility.
 - 3. Attendance:
 - a. Owner's representative.
 - b. Engineer.
 - c. Contractor's superintendent.
 - d. Major Subcontractors.
 - e. Others as appropriate.
 - 4. Agenda:
 - a. Submission of executed bonds and insurance certificates.
 - b. Distribution of Contract Documents.
 - c. Submission of list of Subcontractors, list of products, schedule of values, and progress schedule.
 - d. Designation of personnel representing the parties in Contract.
 - e. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 - f. Scheduling.
 - 5. Record minutes and distribute copies within 5 days after meeting to participants, with copies to Engineer, Owner, participants, and those affected by decisions made.
 - 6. Engineer shall facilitate meetings and record/distribute meeting minutes.

ADMINISTRATIVE REQUIREMENTS

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- C. Progress meetings:
1. Schedule and administer meetings throughout progress of the Work at periodic intervals as needed to properly coordinate the project.
 2. Location of meetings: Bee Ridge Water Reclamation Facility.
 3. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
 4. Attendance:
 - a. Owner.
 - b. Engineer.
 - c. Contractor and Subcontractors as appropriate to agenda.
 - d. Others.
 5. Suggested agenda:
 - a. Review, approval of minutes of previous meeting.
 - b. Review of Work progress since previous meeting.
 - c. Field observations, problems, conflicts.
 - d. Problems which impede construction schedule.
 - e. Review of off-site fabrication, delivery schedules.
 - f. Corrective measures and procedures to regain projected schedule.
 - g. Revisions to construction schedule.
 - h. Progress, schedule, during succeeding Work period.
 - i. Coordination of schedules.
 - j. Review submittal schedules; expedite as required.
 - k. Maintenance of quality standards.
 - l. Pending changes and substitutions.
 - m. Review proposed changes for:
 - 1) Effect on construction schedule and on completion date.
 - 2) Effect on other contracts of Project.
 - 3) Other business.
 6. Record minutes and distribute copies within 5 days after meeting to participants, with copies to Engineer, Owner, participants, and those affected by decisions made.
 7. Engineer shall facilitate meetings and record/distribute meeting minutes.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

L. Thomas
B. Ahmed

PART 1 GENERAL

1.01 SUMMARY

- A. Provide color audio-video documentation of headworks and construction area prior to start of demolition, as specified herein.
- B. No construction shall begin prior to review and approval of the pre-construction digital audio-video recording by the Engineer.
- C. Provide documentation on DVD disc, or as directed by Owner.

1.02 REQUIREMENTS

- A. Include comprehensive coverage of the headworks structure and at least 100 feet in each direction of the headworks walls.
- B. All video recordings shall, by electronic means, display continuously and simultaneously generated with the actual taping transparent digital information to include date and time of recording. The date information shall contain the month, day, and year. The time information shall contain the hour, minutes and seconds.
- C. Upon acceptance of the digital files, the files will become the property of the Owner. The Contractor may duplicate the video for his own use at his expense.

1.03 SCHEDULING

- A. Schedule video so that no area is recorded more than 6 weeks prior to the actual beginning of demolition.

PART 2 EQUIPMENT

2.01 GENERAL

- A. Furnish all equipment, accessories, and materials required to perform this service.

2.02 TECHNICAL REQUIREMENTS

- A. Provide the audio-video recording system and procedures as required to produce a high quality video and audio production. Produce the video portion of the recording with bright, sharp, clear pictures with accurate colors and free from distortion, tearing, rolls, or other forms of picture imperfection. Produce the audio portion of the recording with proper volume, clarity, and free from distortion.
- B. Make recordings with a digital video recorder.

PART 3 EXECUTION

3.01 3.1 GENERAL

- A. Audio-video coverage will be required in for all portions of the headworks structure (interior and exterior) and areas within 100 feet of the structure.
- B. Provide an audio-visual presentation for review. The Owner has the authority to reject all or any portion of the video recording not conforming to Specifications. Re-video any coverage not acceptable to the Owner at no cost to the Owner. Reschedule unacceptable coverage as soon as possible after being notified. Submit completed audio-visual file to the Owner before commencement of demolition.

PRECONSTRUCTION VIDEO28706.01.00

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3.02 TIME AND POSITION RECORDS

- A. Audio: Begin each recording with the current date and time, project name, and Owner.

3.03 CONSTRUCTION AREA

- A. Include coverage of all surface features located within the zone of influence of the demolition and construction, supported by appropriate audio description. Make audio description simultaneously with video coverage. Include coverage of the headworks' exterior and interior surfaces as well as pavements and grassed areas that may be impacted by the work.
- B. Control panning rates and zoom-in and zoom-out rates to provide clarity of the viewed object during playback.
- C. Perform all recording during times of good visibility. Perform no documentation during periods of visible precipitation.
- D. The Owner has the authority to designate what areas may be omitted or added for audio-video coverage.

END OF SECTION

L. Thomas
B. Ahmed

PART 1 GENERAL

1.01 SUBMITTAL PROCEDURES

- A. Submit electronically when required by Specification Sections. Contact Engineer as listed below for submittal instructions.

Mr. Larry Thomas, PE
Email: thomaslarry@stanleygroup.com
Office Phone: 773-714-2015
Stanley Consultants, Inc.
Suite 730
8501 West Higgins Road
Chicago, IL 60631-2801

- B. Engineer will make internal distribution to the Owner and other interested parties.
- C. Submittals shall be in English language.
- D. Weights, measures, and units shall be English units.
- E. Symbols and drawings shall conform to ANSI Y32.2/IEEE 315/CSA Z99.

1.02 CONTRACTOR RESPONSIBILITIES

- A. Review submittals prior to submission.
- B. Determine and verify:
1. Field measurements.
 2. Field construction criteria.
 3. Catalog numbers and similar data.
 4. Conformance to Specifications.
- C. Coordinate each submittal with other submittals and with requirements of Work and of Contract Documents.
- D. Notify Engineer in writing, at time of submission, of any deviations in submittals from requirements of Contract Documents. Any such deviations permitted by Engineer will require modifications of Contract Documents.
- E. Provide space on Shop Drawings for Contractor and Engineer stamps.
- F. When Shop Drawings are revised for resubmission, identify all changes made since previous submission.
- G. Submittals containing language imposing duties on others (such as verification of dimensions or supply of related information) inconsistent with contract language shall be null and void.
- H. Submittals shall not be used as media for inquiries for information or for verification of information that must be supplied by others to Contractor. Inquiries or verification of information shall be made by separate Contractor submittal using Request for Information (RFI) process.
- I. Begin no fabrication or Work which requires submittal review until return of submittals by Engineer with stamp, as either "Reviewed", "Reviewed as Noted", or "Reviewed as Noted-Resubmit."
- J. Distribute copies of reviewed submittals that carry Engineer stamp as either "Reviewed" or "Reviewed as Noted" as appropriate. Instruct parties to promptly report any inability to comply with requirements.

SUBMITTAL PROCEDURES28706.01.00

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- K. Submittals not requested will not be recognized or processed.

1.03 ENGINEER DUTIES

- A. Review required submittals with reasonable promptness and in accord with schedule, only for general conformance to design concept of Project and compliance with information given in Contract Documents. Review shall not extend to means, methods, sequences, techniques, or procedures of construction or to safety precautions or program incident thereto. Review of a separate item as such will not indicate approval of assembly in which item functions.
- B. Affix stamp and initials or signature, and indicate requirements for resubmittal, or review of submittal. Engineer's action on submittals is classified as follows:
1. Reviewed: Submittal has been reviewed and appears to be in conformance to design concept of Project and Contract Documents. Contractor may proceed with fabrication of work in submittal.
 2. Reviewed As Noted: Submittal has been reviewed and appears to be in conformance to design concept of Project and Contract Documents, except as noted by reviewer. Contractor may proceed with fabrication of work in submittal with modifications and corrections as indicated by reviewer.
 3. Reviewed As Noted-Resubmit: Submittal has been reviewed and appears to be in conformance to design concept of Project and Contract Documents, except as noted by reviewer. Contractor may proceed with fabrication of work in submittal with modifications and corrections as indicated by reviewer. Contractor shall make any corrections indicated by reviewer and resubmit for review.
 4. Resubmit: Submittal has been reviewed and appears not to be in conformance to design concept of Project or with Contract Documents. Contractor shall not proceed with fabrication of work in submittal, but instead shall make any corrections required by reviewer and resubmit for review.
 5. Returned without Review: Submittal is being returned without having been reviewed because: 1) not required by Contract Documents; 2) grossly incomplete; 3) indicates no attempt at conformance to Contract Documents; 4) cannot be reproduced; 5) lacks Contractor's completed approval stamp; or 6) lacks design professional's seal when required by law or Contract Documents. If submittal is required by Contract Documents, Contractor shall not proceed with Work as detailed in submittal, but instead shall correct defects and resubmit for review.
 6. For Information Only: Submittal has not been reviewed but is being retained for informational purposes only.
 7. Void: Submittal is voided because it is no longer required or has been superseded by another submittal.
- C. Return one electronic copy of submittals to Contractor. Contractor shall make additional distribution as required.
- D. Submittals which do not contain markup, or which have minor markup that can be adequately described without referencing submittal, will not be returned. Reviewer will return signed submittal stamp with written description of Review's comments.
- E. Review of submittals shall not relieve Contractor from responsibility for any variation from Contract Documents unless Contractor has, in writing, called Engineer's attention to such variation at time of submission, and Engineer has given written concurrence pursuant to Contract Documents to specific variation, nor shall any concurrence by Engineer or other reviewer relieve Contractor from responsibility for errors or omissions in submittals.

1.04 SHOP DRAWINGS SUBMITTALS

- A. Submit for review for limited purpose of checking for conformance to information given and design concept expressed in Contract Documents. Produce copies and distribute in accordance with article "Submittal Procedures" and for record documents purposes as described in Section 01 70 00.
- B. Designate in construction schedule, or in separate coordinated submittal schedule, dates for submission and dates that reviewed submittals will be needed.

- C. Make submittals promptly in accordance with approved schedule, and in such sequence as to cause no delay in Work or in work of other contractors.
- D. Present in clear and thorough manner, complete with respect to dimensions, design criteria, materials of construction, and like information to enable review of information as required.
- E. Details shall be identified by reference to sheet and detail, schedule or room numbers shown on Drawings.
- F. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- G. Equipment which is identified on Contract Documents with tag number or name shall be identified on Shop Drawing with same tag.
- H. Schedule submittals to expedite Project. Coordinate submission of related items.
- I. For each submittal for review, allow 10 days to complete review process.
- J. Identify variations from Contract Documents and product or system limitations which may be detrimental to successful performance of completed Work.
- K. Shop Drawings shall be submitted in electronic format.
1. Submit electronic copy to Engineer.
 2. Submittal Transmittal form (see pdf attached) shall be provided in Word format for each submittal. MSWord template will be provided after award.
 3. Text documents shall be submitted in .pdf format except for the shop drawing Transmittal Form.
 4. Drawings shall be submitted in .pdf or .tif format.
 5. Electronic submittal shall be suitable for reproduction in black and white.
 6. Samples may be submitted to Engineer at address given above.
- L. Submittals shall contain:
1. Date of submission and dates of any previous submissions.
 2. Project title and number.
 3. Contract identification.
 4. Names of:
 - a. Contractor.
 - b. Supplier.
 - c. Manufacturer.
 5. Identification of product, with Specification section number and article number.
 6. Field dimensions, clearly identified as such.
 7. Relation to adjacent or critical features of Work or materials.
 8. Applicable standards, such as ASTM or Federal Specification numbers.
 9. Identification of deviations from Contract Documents.
 10. Identification of revisions on resubmittals.
 11. An 8" x 3" blank space for Contractor and reviewer stamps.
 12. Indication of Contractor's approval, initialed or signed, with wording substantially as follows:

"Contractor represents to Owner and Engineer that Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data, or assumes full responsibility for doing so and has reviewed or coordinated each submittal with requirements of Work and Contract Documents."
- M. Product Data:
1. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
 2. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances. Design data:

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1. Submit for Engineer's knowledge as contract administrator or for Owner.
2. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

O. Data sheets:

1. Data sheets may require information not known until Contractor's engineering is complete. Furnish estimated values based on good engineering judgment. Estimated values shall be identified by placement of "(est.)" next to value.
2. Data Sheets shall be updated and resubmitted by Contractor once final values are known.
3. Do not leave items blank or labeled "To Be Determined" or "Later."
4. Do not submit manufacturer Product Data instead of completed data sheets.

P. Test reports:

1. Submit for Engineer's knowledge as contract administrator or for Owner.
2. Submit test reports for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

Q. Certificates:

1. When specified in individual specification sections, submit certification by manufacturer, installation/application subcontractor.
2. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
3. Certificates may be recent or previous test results on material or product, but must be acceptable to reviewer.

R. Manufacturer's instructions:

1. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, adjusting, and finishing, to Engineer for delivery to Owner in quantities specified for Product Data.
2. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.05 RESUBMISSION REQUIREMENTS

- A. Make any corrections or changes in submittals required by Engineer and resubmit until stamped as either "Reviewed," "Reviewed as Noted," or "For Information Only."
- B. Text and depictions changed on Submittal shall be back-circled (clouded).
- C. Engineer will assume that portions of Submittal not back-circled have not been changed by Contractor from previous submission.
- D. Indicate revision number and date in document revision block.

1.06 DISTRIBUTION

- A. Distribute reproductions of Shop Drawings which carry Engineer stamp as either "Reviewed" or "Reviewed as Noted" as directed by Engineer to:
 1. Job site file.
 2. Record Documents file.
 3. Other affected contractors.
 4. Subcontractors.
 5. Supplier or fabricator.
- B. Distribute Samples which carry Engineer stamp as either "Reviewed" or "Reviewed as Noted" as directed by Engineer.
- C. Contractor shall be responsible for distribution of Submittals.

1.07 CONSTRUCTION PROGRESS DOCUMENTATION

- A. Construction progress schedules:
1. Submit initial schedules to Engineer within 15 days after date of Notice to Proceed. After review, resubmit required revised data within ten days.
 2. Prepare and provide schedule in either Primavera or Microsoft Project.
 - a. Contractor shall distribute copies of reviewed schedules to Project site file, subcontractors, suppliers, and other concerned parties.
 - b. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.
- B. Form of schedules:
1. Prepare schedules in form of horizontal bar chart.
 - a. Provide separate horizontal bar for each trade or operation.
 - b. Horizontal time scale: Identify first work day of each week.
 - c. Scale and spacing: To allow space for notations and future revisions.
 2. Format of listings: Chronological order of start of each item of Work.
 3. Identification of listings: By major Specification Section numbers.
- C. Construction progress schedule shall show:
1. Complete sequence of construction by activity, with Contract Price breakdown at each stage.
 2. Dates for beginning, and completion of, each major element of construction specifically listing:
 - a. Demolition.
 - b. Foundation Work.
 - c. Structural framing.
 - d. Piping installation.
 3. Projected percentage of completion for each item, as of first day of each month.
- D. Submittal schedule shall show:
1. Dates for Contractor's submittals.
 2. Dates submittals will be required for Owner-furnished products.
- E. Products delivery schedule show delivery dates for:
1. Products specified under Section 01 20 00.
- F. Progress revisions:
1. Indicate progress of each activity to date of submission.
 2. Show changes occurring since previous submission of schedule:
 - a. Major changes in scope.
 - b. Activities modified since previous submission.
 - c. Revised projections of progress and completion.
 - d. Other identifiable changes.
 3. Provide narrative report as needed to define:
 - a. Problem areas, anticipated delays, and impact on schedule.
 - b. Corrective action recommended, and its effect.
 - c. Effect of changes on schedules of other prime contractors.
- G. Distribution copies of reviewed schedules to:
1. Job site file.
 2. Subcontractors.
 3. Other concerned parties.
- H. Instruct recipients to report promptly to Contractor, in writing, any problems anticipated by projects

1.08 SAFETY PROCEDURES MANUAL

- A. Prepare and submit to Owner safety procedures manual defining Contractor's safety program for work on site. Manual shall include:
1. Safety responsibilities of Contractor's personnel.

SUBMITTAL PROCEDURES

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2. Description of Contractor's safety program.
3. Requirements of use of personal protective equipment.
4. General safety-related rules of conduct.
5. Fire prevention measures.
6. Accident reporting procedures.
7. Procedures for hot work (welding, cutting, etc.), overhead work, and work in enclosed, confined spaces (tank, boiler, etc.). Reference 29 CFR Part 1910.

1.09 SUBMITTAL TRANSMITTAL FORM PROCEDURES

- A. Submittals shall be accompanied by completed copies of Submittal Transmittal form, bound herein. An electronic version of transmittal form is available and may be obtained from Engineer. Reproduce additional copies required.
- B. Submit transmittal form for initial submittals and resubmittals. Sequentially number transmittal form. Revise submittals with original number and sequential alphabetic suffix.
- C. Prior to submittal, complete information under heading "Contractor's Transmittal."
- D. Engineer will complete information under "Reviewer's Action."
- E. Do not include submittals for more than one section of Specifications on Submittal Transmittal form.
- F. Identify project title, location, and number and contract title and number.
- G. Identify preparer name and, submittal number, including preparer's submittal revision number.
- H. A brief description under "Title" should clearly identify specific application of equipment or material covered by Submittal, utilizing where possible same title used in Drawings and Specifications.
- I. Identify Specification Section number.
- J. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with requirements of Work and Contract Documents.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

L. Thomas
B. Ahmed

SUBMITTAL TRANSMITTAL

Transmittal No. _____
 Project No. _____
 Contract No. _____

Date Received _____
 Date Distributed _____

Project Location _____
 Contract Title _____
 Project Title _____

CONTRACTOR'S TRANSMITTAL

ENGINEER'S/ARCHITECT'S ACTION

STATUS ABBREVIATIONS
 R - Reviewed
 RN - Reviewed as Noted
 RNR - Reviewed as Noted Resubmit
 RS - Resubmit
 RET - Returned Without Review
 FIO - For Information Only
 V - Void

Preparer	Preparer Submittal No.	Rev No.	Title	Section	Dwg No.	Status

CONTRACTOR'S Remarks

Address _____

By _____ Date _____

Action of any kind on drawings by ENGINEER/ARCHITECT does not relieve CONTRACTOR from responsibility for errors, correctness of details, or conformance to the Contract.

ENGINEER'S/ARCHITECT'S Remarks



Stanley Consultants

By _____ Date _____

PART 1 GENERAL

1.01 QUALITY CONTROL AND CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. If manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform Work by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on Shop Drawings or as instructed by manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.02 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

1.03 BUILDING CODES AND PERMITS

- A. Work shall comply with state building rules and regulations, local municipal ordinances and other Statutory Provisions pertaining to this class of Work; such rules, regulations, and ordinances are to be considered part of Contract Documents.
- B. Owner will reimburse Contractor for construction permits and licenses fees, if any, when appropriate receipts are provided with a pay application. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses.
- C. Owner will reimburse Contractor for any governmental charges and inspection fees necessary for prosecution of Work, which are applicable at time of opening of Bids when appropriate receipts are provided with a pay application.
- D. Give all notices and comply with all laws, ordinances, building and construction codes, rules, and regulations applicable to Work. If Contractor observes that Specifications or Drawings are at variance therewith, give Engineer prompt written notice thereof, and any necessary changes shall be adjusted by appropriate Modification.
- E. If Contractor performs any Work knowing or having reason to know that it is contrary to such laws, ordinances, rules, and regulations, and without such notice to Engineer, Contractor shall bear all costs arising therefrom; however, it shall not be Contractor's primary responsibility to make certain that Specifications and Drawings are in accordance with such laws, ordinances, rules, and regulations.

QUALITY REQUIREMENTS

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Page 2 - SECTION 01 40 00

1.04 TAXES

- A. Contractor shall pay all sales, consumer, use and other similar taxes required to be paid by it in accordance with law of place of Project.

1.05 REFERENCES

- A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current on date for receiving bids, except where a specific date is established by code.
- C. Obtain copies of standards where required by product specification sections.
- D. If specified reference standards conflict with Contract Documents, request clarification from the Engineer before proceeding.
- E. Neither contractual relationships, duties, nor responsibilities of the parties in Contract nor those of the Engineer shall be altered from the Contract Documents by mention or inference otherwise in any reference document.
- F. Abbreviations used in Drawings and Specifications are as specified in ASME Y14.38 and IEEE 260.

1.06 WELDING CERTIFICATES

- A. Promptly after Notice of Award, submit to Engineer one copy, unless specified otherwise, for each person, by name, assigned to do field welding of materials installed under this Agreement.
- B. Show on certificates that each person has passed tests described in Specifications, if any.
- C. Submit certificates prior to execution of any welding. Certificates not required for nonstructural tack welding.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Verify that utility services are available, of the correct characteristics, and in the correct locations.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.

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QUALITY REQUIREMENTS
SECTION 01 40 00 - Page 3

- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

END OF SECTION

L. Thomas
B. Ahmed

28706.01.00

SANITARY FACILITIES
SECTION 01 52 19 - Page 1**PART 1 GENERAL**

1.01 TEMPORARY PORTABLE FACILITIES

A. Provide and maintain necessary facilities and enclosures.

1.02 USE OF EXISTING FACILITIES

A. Do not use existing sanitary facilities.

1.03 COSTS

A. Obtain and pay for permits and inspections.

B. Pay costs for installation, maintenance, and removal of temporary sanitary facilities.

PART 2 PRODUCTS

2.01 MATERIALS

A. May be new or used, adequate to purpose, which will not create unsanitary conditions.

2.02 TOILET FACILITIES

A. Enclosed portable self-contained units or temporary water closets and urinals, secluded from public view.

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide facilities at time of Site mobilization.

3.02 MAINTENANCE, SERVICE

A. Clean facilities at least weekly or more frequently as needed to maintain in sanitary condition.

B. Provide toilet paper, paper towels, and soap in suitable dispensers.

3.03 REMOVAL

A. Remove portable units at end of construction.

END OF SECTION

B. Ahmed
L. Thomas

PART 1 GENERAL

1.01 PRODUCTS

- A. Provide products of qualified manufacturers suitable for intended use. Provide products of each type by a single manufacturer unless specified otherwise.
- B. Do not use materials and equipment removed from existing Owner's premises, except as specifically permitted by the Contract Documents.
- C. Provide interchangeable components of the same manufacturer for components being replaced.

1.02 PRODUCT DELIVERY REQUIREMENTS

- A. Transport and handle products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.03 RECEIVING, UNLOADING AND STORING

- A. Receive and unload shipments to plant site from suppliers under this Contract.
- B. Unload products as soon as possible after arrival.
- C. Pay freight car and truck demurrage, detention, and any other costs which may result from Contractor's failure to unload cars or trucks within time required by freight companies. Provide physical protection for products placed in storage.
 - 1. Store and maintain materials and equipment after receipt until completed installation is accepted by Owner. Such storage and maintenance shall be in accordance with manufacturer's recommendations and requirements of these Specifications. Provide materials, equipment, and labor required for such storage and maintenance. Contractor shall be accountable for any deterioration of materials or equipment occasioned by improper storage or maintenance, and shall recondition, repair, or replace any such materials or equipment without addition cost to Owner.
 - 2. Stored products shall be supported above ground and shall be covered with canvas or other heavy-duty sheeting. Cover shall be securely fastened and shall be replaced if torn or otherwise damaged during storage period.
- E. Take custody of equipment and materials received at Project site and be solely responsible for damage and shortages until acceptance of Contractor's work by Owner.
- F. Use of bare wire rope slings for unloading and handling equipment and materials is prohibited without Owner approval.
- G. Storage areas will be allocated by Owner for Contractor's use. Products shall be stored in assigned lay-down areas.

1.04 GENERAL STORAGE

- A. Store products immediately on delivery in accordance with manufacturer's instructions, with seals and labels intact. Protect until installed.
- B. Arrange storage in manner to provide access for maintenance of stored items and for inspection.

PRODUCT REQUIREMENTS

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- C. For products specified only by reference standard, select product meeting that standard, by any manufacturer subject to review of the shop drawings by the Engineer.
- D. For products specified by naming several products or manufacturers, select any one of products and manufacturers named which complies with Specifications subject to review of the shop drawings by the Engineer.
- E. For products specified by naming one or more products or manufacturers and stating "or equal," submit request as for substitutions for any product or manufacturer which is not specifically named in accordance with Section 01 25 13.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

L Thomas
B Ahmed

PART 1 GENERAL

1.01 CLOSEOUT PROCEDURES

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer's review.
- B. Provide submittals to Owner that are required by governing or other authorities.
- C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- D. Related requirements: Section 01 77 00 and 01 78 00.

1.02 FINAL CLEANING

- A. Provide final cleaning prior to final acceptance in accordance with Section 01 74 23.
- B. Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.03 STARTING OF SYSTEMS

- A. Coordinate schedule for start-up of odor control system upon completion of piping work.
- B. Notify Owner and Engineer in writing 7 days prior to start-up of completed system.

1.04 PROTECTING INSTALLED CONSTRUCTION

- A. Protect installed Work and provide special protection where specified in individual specification sections.
- B. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- D. Protect stairs and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

1.05 PRODUCT WARRANTIES AND PRODUCT BONDS

- A. Obtain warranties and bonds executed by responsible subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work.
- B. Execute and assemble transferable warranty documents and bonds from subcontractors, suppliers, and manufacturers.
- C. Verify that documents are in proper form, contain full information, and are notarized.
- D. Co-execute submittals when required.
- E. Submit prior to final Application for Payment.

PART 2 PRODUCTS

NOT USED

EXECUTION AND CLOSEOUT REQUIREMENTS

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PART 3 EXECUTION**3.01 CUTTING AND PATCHING**

- A. Employ skilled and experienced labor to perform cutting and patching.
- B. Submit written request in advance of cutting or altering elements which affect:
 - 1. Structural integrity of element.
 - 2. Integrity of weather-exposed or moisture-resistant elements.
 - 3. Efficiency, maintenance, or safety of element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Owner or separate Contractor.
- C. Execute work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- D. Cut masonry and concrete materials using masonry saw or core drill.
- E. Restore Work with new products in accordance with requirements of Contract Documents.
- F. Fit Work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- G. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.
- H. Identify hazardous substances or conditions exposed during the Work to the Engineer for decision or remedy.

END OF SECTION

L Thomas
B Ahmed

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-In-Place Concrete.
- B. Section 05 10 00 – Structural Metal Framing.

1.02 SUBMITTALS

- A. Shop drawings for pipe supports.
- B. Quality assurance data:
 - 1. Plan indicating location and extent of proposed field welding, and showing what provisions have been made for type of base metal, present stress conditions, and preheating requirements.
 - 2. Certificates for each welder, showing proof of qualifications as outlined in code, prior to any field welding, either temporary or permanent.

PART 2 PRODUCTS

2.01 PIPE SUPPORTS

- A. Shims shall be stainless steel or aluminum.
- B. Provide bolting required to anchor supports securely to foundation.
- C. Provide expansion or adhesive anchors where required, subject to review by Engineer.
- D. Provide welding rods for field erection of equipment installed under this Contract.

PART 3 EXECUTION

3.01 INSTALLATION PROCEDURES

- A. Materials shall be installed in strict accordance with manufacturer's recommendations.
- B. Provide access space around equipment for service. Provide no less than minimum as recommended by manufacturer.

3.02 ALIGNING

- A. Align vertical piping to be straight and plumb.
- B. Align horizontal piping to be straight and flat (zero bubble).
- C. Use shims of sheet and plate stainless steel or aluminum.

3.03 SUPPORTS

- A. Provide devices as shown on the drawings to support piping.
- B. Fabricate supports of aluminum sections, plates, or rods arranged to provide rigid and sturdy mounting for piping.
- C. Provide Type 304 stainless steel fasteners required between equipment supports and building structure and foundations.

INSTALLATION REQUIREMENTS28706.01.00

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D. Support foundations: As shown on Drawings.

3.04 GROUTING

- A. Place minimum of 1" (25 mm) non-shrink grout under supports being mounted on concrete foundations unless specified otherwise. Refer to Section 03 30 00.
- B. Entire space between top of foundation and bottom of support base plate shall be completely filled with grout, free of any voids.
- C. Place no grout that has been allowed to set, after mixing, beyond time limitations set forth by grout manufacturer.
- D. Remove and replace grout that shows cracking.

END OF SECTION

L Thomas
B Ahmed

PART 1 GENERAL

1.01 CUTTING AND PATCHING REQUIREMENTS

- A. Cut, fit, and patch required to complete Work or to:
 - 1. Make its several parts fit together properly.
 - 2. Uncover portions of Work to provide for installation of ill-timed Work.
 - 3. Remove and replace defective Work.
 - 4. Remove and replace Work not conforming to requirements of Contract Documents.
 - 5. Provide routine penetrations of nonstructural surfaces for installation of piping and electrical conduit.

1.02 SUBMITTALS

- A. Submit written request to Engineer well in advance of executing cutting or alteration which affects:
 - 1. Work of Owner or separate contractor.
 - 2. Structural value or integrity of any element of Project.
 - 3. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
 - 4. Efficiency, operational life, maintenance, or safety of operational elements.
 - 5. Visual qualities of sight-exposed elements.
- B. Request shall include:
 - 1. Identification of Project.
 - 2. Description of affected Work.
 - 3. Necessity for cutting, altering, or excavating.
 - 4. Effect on work of Owner or separate contractor, or structural or weatherproof integrity of Project.
 - 5. Description of proposed Work:
 - a. Scope of cutting, patching, altering, or excavating.
 - b. Trades who will execute Work.
 - c. Products proposed to be used.
 - d. Extent of refinishing to be done.
 - 6. Alternatives to cutting and patching.
 - 7. Cost proposal, when applicable.
 - 8. Written permission of any separate contractor whose work will be affected.
- C. Should conditions of Work or schedule indicate change of products from original installation, Contractor shall submit request for substitution.
- D. No cutting or altering for which written request is submitted shall be performed without written acceptance of Owner and Engineer.
- E. Submit written notice to Owner and Engineer designating date and time Work will be uncovered.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Comply with specifications and standards for each specific product involved.

PART 3 EXECUTION

3.01 INSPECTION

- A. Inspect existing conditions of Project, including elements subject to damage or to movement during cutting and patching.
- B. After uncovering Work, inspect conditions affecting installation of products, or performance of Work.

CUTTING AND PATCHING

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- C. Report unsatisfactory or questionable conditions to Engineer in writing; do not proceed with Work until Engineer has provided further instructions.

3.02 PREPARATION

- A. Provide adequate temporary support as necessary to assure structural value or integrity of affected portion of Work.
- B. Provide devices and methods to protect other portions of Project from damage.
- C. Provide protection from elements for that portion of Project which may be exposed by cutting and patching Work, and maintain excavations free from water.

3.03 PERFORMANCE

- A. Execute cutting and demolition by method which will prevent damage to other Work, and will provide proper surfaces to receive installation of repairs.
- B. Execute excavating and backfilling by methods which will prevent settlement or damage to other Work.
- C. Execute fitting and adjusting of products to provide finished installation to comply with specified products, functions, tolerances, and finishes.
- D. Restore Work which has been cut or removed; install new products to provide completed Work in accordance with requirements of Contract Documents.
- E. Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

END OF SECTION

L Thomas
B Ahmed

PART 1 GENERAL

1.01 DISPOSAL REQUIREMENTS

- A. Conduct cleaning and disposal requirements to comply with codes, ordinances, regulations, and anti-pollution laws.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Use only those cleaning materials which will not create hazards to health or property and which will not damage surfaces.
- B. Use only those cleaning materials and methods recommended by manufacturer of surface material to be cleaned.
- C. Use cleaning materials only on surface recommended by cleaning material manufacturer.

PART 3 EXECUTION

3.01 CLEANING DURING CONSTRUCTION

- A. Execute periodic cleaning to keep Work, site, and adjacent properties free from accumulations of waste materials, rubbish, and windblown debris, resulting from construction operations.
- B. Provide on-site containers at the beginning of the demolition work for the collection waste materials, debris, and rubbish.
- C. Remove waste materials, debris, and rubbish from site periodically and dispose of at legal disposal areas away from site.

3.02 FINAL CLEANING

- A. Employ skilled workers for final cleaning.
- B. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds, so as to leave site ready for occupancy by Owner, and restore those portions of site not designated for alteration by Contract Documents to their condition as of beginning of Work.
- C. Prior to final completion, or Owner occupancy, Contractor shall conduct inspection of sight-exposed interior and exterior surfaces, and all work areas, to verify that entire Work is clean.

END OF SECTION

L Thomas
B Ahmed

PART 1 GENERAL

1.01 SUBSTANTIAL COMPLETION

- A. When the Contractor considers the Work to be substantially complete, submit written notice, with list of items to be completed or corrected.
- B. Within reasonable time, Owner and Engineer will inspect to determine status of completion.
- C. Should Owner and Engineer determine that Work is not substantially complete, it will promptly notify Contractor in writing, giving reasons therefor.
- D. Contractor shall remedy deficiencies, and send second written notice of substantial completion, and Owner will reinspect Work.
- E. When Owner and Engineer determines that Work is substantially complete, the Engineer will prepare a Certificate of Substantial Completion in accordance with General Conditions.

1.02 FINAL COMPLETION

- A. When the Contractor considers the Work is complete, it shall submit written certification that:
 - 1. Contract Documents have been reviewed.
 - 2. Work has been inspected for compliance with Contract Documents.
 - 3. Work has been completed in accordance with Contract Documents, and deficiencies listed with Certificate of Substantial Completion have been corrected.
 - 4. Equipment and systems have been tested in presence of Owner's representative and are operational.
 - 5. Work is complete and ready for final inspection.
- B. Owner and Engineer will inspect to verify status of completion with reasonable promptness.
- C. Should Owner and Engineer consider that Work is incomplete or defective, it will promptly notify Contractor in writing, listing incomplete or defective Work.
- D. Contractor shall take immediate steps to remedy deficiencies and send second written certification that Work is complete, and Owner will reinspect Work.
- E. When Owner and Engineer finds Work is acceptable, it will consider closeout submittals.

1.03 REINSPECTION FEES

- A. Should Owner perform reinspections due to failure of Work to comply with claims made by Contractor, Owner will compensate Engineer for such additional services and deduct amount of such compensation from final payment to Contractor.

1.04 CLOSEOUT SUBMITTALS

- A. Evidence of compliance with requirements of governing authorities:
- B. Project record documents: In accordance with Section 01 78 00.
- C. Warranties and Bonds: In accordance with Section 01 78 00.
- D. Evidence of payment and release of liens: In accordance with General and Supplementary Conditions.
- E. Consent of Surety to final payment.

CLOSEOUT PROCEDURES

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F. Certificates of insurance for products and completed operations:

1.05 ADJUSTMENT OF ACCOUNTS

A. Submit final statement of accounting, reflecting adjustments to Contract Price:

B. Original Contract Price.

C. Additions and deductions resulting from:

1. Previous Change Orders.
2. Deductions for uncorrected Work.
3. Deductions for liquidated damages.
4. Deductions for reinspection payments.
5. Other adjustments.

D. Total Contract Price, as adjusted.

E. Previous payments.

F. Sum remaining due.

G. Owner will issue final Change Order, reflecting approved adjustments to Contract Price not previously made by Change Orders, as necessary.

1.06 APPLICATION FOR FINAL PAYMENT

A. Submit Application for Final Payment in accordance with procedures and requirements in the General and Supplemental Conditions of this Project Manual.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

L Thomas
B Ahmed

PART 1 GENERAL

1.01 MAINTENANCE OF DOCUMENTS

- A. Maintain at Site for Owner one record copy of:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other Modifications to Agreement.
 - 5. Engineer Instruction to Contractor or written instructions.
 - 6. Reviewed Shop Drawings and Samples.
 - 7. Field test records.
 - 8. Construction photographs.
- B. Store documents in Contractor's field office apart from documents used for construction.
 - 1. Provide files and racks for storage of documents.
- C. File documents and Samples in accordance with Construction Specifications Institute (CSI) format.
- D. Maintain documents in clean, dry, legible condition and in good order. Do not use record documents for construction purposes.
- E. Make documents available at all times for reference by Engineer.

1.02 RECORDING

- A. Label each document "PROJECT RECORD" in neat large printed letters.
- B. Record information concurrently with construction progress. Do not conceal any Work until required information is recorded.
- C. Drawings shall be legibly marked to record actual construction:
 - 1. Depths of various elements of foundation in relation to finish first floor datum.
 - 2. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 3. Location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure.
 - 4. Field changes of dimension and detail.
 - 5. Changes made by Instruction to Contractor or by Change Order.
 - 6. Details not on original contract Drawings.
- D. Specifications and Addenda shall be legibly marked to record:
 - 1. Manufacturer, trade name, catalog number, and supplier of each product actually installed.
 - 2. Changes made by Instruction to Contractor or by Change Order.

1.03 SUBMITTAL

- A. Upon Contract close-out, deliver record documents to Engineer for 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 its authorized representative.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

L Thomas
B Ahmed

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Removal and disposal of existing headworks odor control piping and piping supports.
- B. Remove and legally dispose of items. Recycle items when possible.

1.02 MEASUREMENT AND PAYMENT

- A. A lump sum payment will be made for demolition work under this contract as specifically described in Bid Item 2-1 within the Bid Form and Section 01 22 00 Measurement and Payment.

1.03 SCHEDULING

- A. Perform Work in manner which will provide least interference to operations and most protection to existing facilities to remain. Contractor's operations subject to approval by Owner prior to commencement of Work.
- B. Carefully coordinate time and manner of demolition work with Engineer to assure continued operation of existing facilities and to maintain construction schedule requirements.

1.04 INFORMATIONAL SUBMITTALS

- A. Quality assurance data:
 - 1. Two weeks prior to any removal, submit demolition plan to Engineer for review. Plans shall include sequence of performing proposed work, requirements for interruptions to operations, if any.

PART 2 PRODUCTS

2.01 MATERIALS OWNERSHIP

- A. Demolished materials shall become Contractor's property and shall be removed, recycled, or disposed from Project Site in appropriate and legal manner.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

- A. Inspect buildings and structures where demolition is required. Inspect existing Drawings of buildings and structures; Drawings are available from Owner. Contractor shall be familiar with items that require demolition and patching.
- B. Determine actual Site conditions, extent to which demolition is required, and method of demolition.
- C. Schedule work with Owner.

3.02 PREPARATION

- A. Conduct demolition operations and remove C&D materials to ensure minimum interference with roads, streets, walks, and other adjacent occupied and utilized facilities.
- B. Conduct demolition operations to prevent injury to people and damage to facilities to remain. Ensure safe passage of people around demolition area.
 - 1. Maintain temporary protection to people at exterior areas of existing structure where removal work is being done.

DEMOLITION

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2. Protect existing Site improvements, appurtenances, and landscaping that are designated to remain in place.

3.03 ENVIRONMENTAL CONTROLS

- A. Comply with federal, state and local regulations pertaining to water, air, solid waste, recycling, chemical waste, sanitary waste, sediment and noise pollution. Disposal practices and waste hauling:
 - a. Legally transport and dispose of materials.
 - b. Use permitted waste hauler or Contractor's trucking services and personnel.
 - c. Deliver to facilities that can legally accept new construction, excavation and demolition materials for purpose of re-use, recycling, composting, or disposal.
 - d. Do not burn, bury or otherwise dispose of rubbish and waste materials on project site. Re-use and donation options: Find re-use, recycling, and/or donation options for demolition material to the extent practical as options to disposal in landfills.
- B. Revenue:
 - a. Revenues or other savings obtained from recycled, re-used, or salvaged materials shall accrue to Contractor.
 - b. Clean adjacent areas of dust, dirt, and C&D materials caused by demolition operations.

3.04 PROTECTION

- A. Protect existing facilities from damage by falling debris, dust, and construction operations.
- B. Provide shoring and bracing where necessary to support existing construction and protect personnel during demolition operation.

3.05 DEMOLITION - GENERAL

- A. Damages: Promptly repair damages to adjacent facilities caused by demolition operations.
- B. Remove existing construction as specified and shown and as required to permit new construction.
- C. Perform removal in manner that will minimize dust, noise, and other nuisances. Maintain haul routes for disposal of material clean and free of debris.
- D. Remove existing construction carefully providing for neat and orderly junctions at construction to remain in place. Final appearance of exposed surfaces shall be similar and equal to that of adjacent existing work. Grind off rough surfaces to remove sharp projections.
- E. Perform demolition operations in manner that in no way endangers personnel, public, existing structures, utilities, roadways, or facilities not to be demolished.
- F. Any portion of existing construction whether structural, or accessory which has become unstable through removal of other parts of construction shall be removed as soon as practicable, and no such unstable part shall be left free-standing or inadequately braced against causes of collapse at end of each day's work.
- G. Wherever cutting torch or other equipment which might cause fire is being used, fire extinguishers shall be kept nearby and ready for instant use. Users of such equipment shall be instructed in proper method of preventing fires and extinguishing fire.
- H. Burning of waste lumber and other building materials or trash on Site will not be permitted.
- I. Use of cranes for demolition work is permitted.
- J. Provide temporary personnel and vehicle protection at openings or ledges made by demolition.

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DEMOLITION
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3.06 PATCHING

- A. Patch holes in walls and concrete surfaces caused by demolition. Use materials comparable to adjacent undisturbed surfaces for patching.
- B. Any new construction work that affects existing building structures shall be patched to match existing surrounding materials.

3.07 REPAIR AND RESTORATION

- A. Contractor shall be responsible for damage to personnel, public, roadways, streets, structures, utilities, facilities, and equipment caused by operations and shall repair any damage at its own expense or replace items damaged beyond repair.
- B. Do not operate vehicles or equipment on existing construction or roadways that could be damaged.

3.08 CLEAN-UP

- A. Maintain public streets, alleys, or other thoroughfares used in carrying out disposal free of litter attributable to this operation. Equip and load trucks or other vehicles to prevent leakage, blowing off, or other escape of any portion of whatsoever is being hauled. Cost incurred by Owner in cleaning up such litter will be charged to Contractor and deducted from monies due or to become due it under this contract.
- B. Upon completion of demolition work in each area, thoroughly clean area of materials not to remain.

END OF SECTION

- 1) B. Ahmed
- 2) L. Thomas

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CAST-IN-PLACE CONCRETE
SECTION 03 30 00 - Page 1**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Cast-in-place concrete and miscellaneous materials.

1.02 MEASUREMENT AND PAYMENT

- A. Concrete work, where required, is incidental to the installation of vertical cantilevered pipe supports.

1.03 INFORMATIONAL SUBMITTALS

- A. Product Data: List of admixtures, sealants, curing agents, surface finish materials, and other manufactured materials furnished. Furnish manufacturer's literature and written recommendations for products furnished as equal to that specified or to meet performance requirements.
- B. Quality assurance data:
 - 1. Proposed concrete design mixes with supporting data and test results, for each concrete class specified:
 - a. Concrete design mix proportions.
 - b. Supporting data and tests results:
 - 1) Compressive strength (individual and average test results, standard deviation, and required average strength).
 - 2) Slump range.
 - 3) Air content range.
 - 4) Water/cement ratio.
 - 5) Density.
 - 6) Fine and coarse aggregates.
 - 2. Testing laboratory reports:
 - a. Submit reports immediately after conducting tests.
 - b. Test reports shall contain following information:
 - 1) Testing agency.
 - 2) Project identification.
 - 3) Material tested and date of test.
 - 4) Material source or placement description, as applicable.
 - 5) Tests performed and referenced standard.
 - 6) Test results and referenced standard or specification criteria.
 - c. Laboratory shall stamp each report or certificate stating whether or not test results indicate materials comply with specifications.
- C. Submit product data and quality assurance data to Owner.
- D. Concrete batch delivery tickets: Provide signed copy of ticket to Owner for each concrete load delivered and placed into Work. Delivery tickets shall include information required by ASTM C94. Submit following supplemental information with first delivery of day for of each class of concrete placed:
 - 1. Type and amount of admixtures (per CY).
 - 2. Maximum permissible amount of water that truck driver can add and comply with specified water/cement requirements (per CY).

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 117 and 301.
- B. Contractor shall retain and pay for the services of qualified independent testing laboratory to perform the following tests:
 - 1. Obtaining, making and transporting field samples of concrete for testing.
 - 2. Conducting tests on following materials as specified.
 - a. Concrete strength tests.

CAST-IN-PLACE CONCRETE

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- b. Concrete slump tests.
- 3. Providing test reports.
- C. Concrete strength tests:
 - 1. Comply with ASTM C39/C39M for testing and ASTM C31 or C192/C192M for preparation of cylinders. Cylinders shall be 6" (150 mm) diameter x 12" (300 mm) length.
 - 2. Field strength tests: Sample in accordance with ASTM C172 on basis of not less than:
 - a. One sample from each day's placement.
 - 3. For each sample taken, make and test 3 laboratory cured cylinders. Test 1 laboratory cured cylinder at 7 days and other 2 at 28 days for average strength.
 - 5. If tests indicate deficient strength as defined by ACI 318, Contractor shall immediately remove the previously poured concrete and pour new support foundations. Additional testing and remedial work shall be at no additional cost to Owner.
- D. Slump tests:
 - 1. Test each batch as delivered; comply with ASTM C172 and C143/C143M.
 - 2. If slump does not meet Specifications, promptly remove batch from Work and dispose of off-site at location selected by Contractor. Do not add water in excess of maximum specified water-cement ratio to batch to achieve desired slump.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Cement: Keep clean, dry, and free from weather damage.
- B. Aggregates: Stockpile each gradation separately on clean, noncontaminating surface.

PART 2 PRODUCTS**2.01 CEMENT**

- A. Portland cement: ASTM C150.
- B. High-early-strength Portland cement: ASTM C150, Type III. May be used instead of Type I cement, at Contractor's option unless specified otherwise, to achieve 28-day strength at 7 days. Use only 1 brand of each type of cement.

2.02 AGGREGATE

- A. Regular aggregate: Strong, durable, well-graded minerals conforming to ASTM C33 requirements for grading, deleterious substances, and soundness.
- B. Aggregates not conforming exactly to above specifications may be used provided:
 - 1. Special tests or actual service establish that such aggregates will produce concrete of quality specified.
 - 2. An Addendum to Specifications is issued prior to receipt of Bids; no deviations will be permitted after receipt of Bids.
- C. Coarse aggregate nominal size:
 - 1. 1-1/2" to No. 4 (38 mm to 4.75 mm): Use for all concrete unless specified otherwise.
 - 2. 3/4" to No. 4 (19 mm to 4.75 mm): Use for slabs and thin sections and areas where clear spacing between reinforcing bars is less than 3" (75 mm).
 - 3. 3/8" to No. 8 (9.5 mm to 4.75 mm): Use for wearing course.
 - 4. 2" to No. 4 (50 mm to 4.75 mm): Use for mass concrete.

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CAST-IN-PLACE CONCRETE
SECTION 03 30 00 - Page 3

2.03 WATER

- A. Clean, fresh, free from injurious amounts of oil, alkali, acid, salts, organic materials, or other substances that may be deleterious to concrete or steel. Mix water shall comply with ASTM C1602.

2.04 ADMIXTURES

- A. Water-reducing and set-controlling admixture, ASTM C494/C494M, type as required. Use for all concrete.
- B. Air entraining agent: ASTM C260. Use in accordance with manufacturer's recommendations. Fly ash:
1. Conform to ASTM C618.
 2. Fly ash for total Project shall be obtained from single source.
 3. At Contractor's option, concrete mixes may be designed to include fly ash in amount of approximately 15% to 20% of cement by weight unless specified otherwise.
- D. Calcium chloride or admixtures containing chloride other than from impurities in admixture ingredients shall not be used.
- E. Admixture products selected by Contractor shall be compatible, and shall result in no adverse effects on concrete.

2.05 CONCRETE DESIGN AND USE

- A. Each concrete design mix shall be established in strict accordance with ACI 318 by proportioning on basis of either field experience (previously used and tested concrete mixture) and/or trial mixtures.
- B. Strength classifications:

Class	Specified Compressive Strength, f'c	Required Average Compressive Strength, f'cr
A	4,000 psi	5,200 psi
B	2,500 psi	3,500 psi
C	3,000 psi	3,900 psi
D	4,500 psi	5,700 psi
E	5,000 psi	6,200 psi
F	6,000 psi	7,400 psi

Class	Specified Compressive Strength, f'c	Required Average Compressive Strength, f'cr
A	28 Mpa	36.4 Mpa
B	17.5 Mpa	24.5 Mpa
C	20.7 MPa	26.9 Mpa
D	31 MPa	39.3 MPa
E	35 MPa	43.4 Mpa
F	42 MPa	51.8 Mpa

- C. Required average compressive strengths:
1. Produce concrete of average strengths conforming to Class A as noted above unless test results substantiate lower permissible average strength based on standard deviation criteria set forth in ACI 318.
 2. Strengths listed above are 7-day strengths for concrete using high-early-strength cement and 28-day strengths for concrete using other type of cements except mass concrete. Use 90 day strength for mass concrete.
- D. Concrete use:
1. Class A: Use for all concrete, unless specified otherwise.

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- E. Minimum cement content: 5.5 sacks of cement per cubic yard (307 kg of cement per cubic meter) of concrete.
- F. Maximum water-cement ratio: 0.45 by weight. Where pozzolan fly ash is used, water-cement plus pozzolan ratio shall not exceed specified ratio.
- G. Air entrainment: Air entrained concrete shall contain entrained air within following limits.

Nominal Maximum Aggregate Size, in.	Total Air Content, Percent By Volume	
	Exposure Class F1	Exposure Classes F2 and F3
3/8	6	7.5
1/2	5.5	7
3/4	5	6
1	4.5	6
1-1/2	4.5	5.5
2	4	5
3	3.5	4.5

Nominal Maximum Aggregate Size, mm	Total Air Content, Percent By Volume	
	Exposure Class F1	Exposure Classes F2 and F3
9.5	6	7.5
13	5.5	7
19	5	6
25	4.5	6
38	4.5	5.5
51	4	5
76	3.5	4.5

- H. Workability:
- Proportions of concrete shall produce a mixture, suited to placement methods, which will work readily into corners and angles of forms and around reinforcement and embedded items. Segregation of materials or presence of free water will not be permitted.
 - Slump of concrete: Use minimum practical; vary within limits given to suit placement conditions; in no case is slump to be increased by addition of water in excess of design mix quantity:

Type of Construction	Slump, in.	
	Minimum	Maximum
All concrete unless noted otherwise	2	5
Building columns	3	5
Mass concrete	1	3

- Maximum slumps listed are without a high range water-reducing agent. Maximum slump with high-range, water-reducing agent shall not exceed 8" (200 mm).
- I. Water-soluble chloride ion content, maximum: Exposure Categories C0, C1, and C2 shall comply with requirements of Chapter 4 of ACI 318.
- J. Concrete subject to Exposure Class F3: Comply with requirements for maximum percent of total cementitious materials by weight as provided in Chapter 4 of ACI 318.

2.06 MEASURING

- A. Ingredients:
- Cement: By weight or bag.
 - Aggregate: By weight.
 - Water: By weight or volume.

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CAST-IN-PLACE CONCRETE
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B. Equipment: Must provide easy, accurate control, and easy checking.

2.07 MIXING

A. Mixer: Mechanical batch type; minimum capacity, 1/2 cu yd (0.4 cu m).

B. Minimum time: One minute after ingredients are in mixer for mixer up to 1 cu yd (0.8 cu m) capacity; increase 15 seconds for each additional 1/2 cu yd (0.4 cu m) capacity. Mix until mass is homogeneous and uniform in color.

C. Mixing equipment shall be clean before using.

2.08 READY-MIX CONCRETE

A. May be used if concrete provided meets requirements of concrete specified and if concrete is furnished by an established, approved plant. Ready-mix plant equipment and facilities shall be certified in accordance with NRMCA QC 3.

B. Equipment and methods: ASTM C94/C94M. Curing and sealing compound:
1. Initial curing and sealing application: "Vocomp-20" by W. R. Meadows, Inc., or equal.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify reinforcement, anchorages, and other items to be cast in concrete are properly placed and secured.

B. Verify openings, recesses, and similar variations to concrete shape are formed and secured.

C. Verify concrete may be placed without resulting in voids and honeycomb areas. Make provisions for release of trapped air.

D. Verify forms are securely braced and tied.

E. Verify elevations and dimensions are accurate.

3.02 PREPARATION

A. Remove laitance from previously placed or existing concrete. Thoroughly clean surface *and apply bonding agent* before placing additional concrete.

B. Clean reinforcing steel and other embedded items.

C. Provide for transport and placement of materials.

D. Provide for adequate means and equipment to consolidate concrete. Standby vibrators or other consolidation equipment shall be on-site in case of equipment malfunction.

3.03 PLACING CONCRETE

A. Clean transporting equipment, reinforcing, and embedded items before placing concrete. Remove water and debris from places where concrete will be placed.

B. Place no concrete until forms, reinforcing, and embedded items have been verified as adequately supported and accurately placed and reinforcing steel placement has been checked by Owner.

- C. Hot weather concreting:
1. Applies to concrete when:
 - a. Combination of concrete temperature, air temperature, direct sunlight, humidity, and wind velocity indicate a rate of evaporation of 0.2 lb/sq ft/hr (1.0 kg/m²/hr) or greater. Provide equipment at site for measuring evaporation rate.
 - b. Concrete temperature requires an increase in water demand beyond maximum water/cementitious materials ratio to provide workability throughout placement and finishing process.
 2. Conform to ACI 305R recommendations and requirements in addition to requirements of Contract Documents.
 3. Control concrete temperature at time of placing by cooling of ingredients and/or use of crushed ice.
 4. Keep subgrade continuously wet for 24 hours prior to concrete placement.
 5. Cool concrete handling equipment, forms and embedded items to below 90°F (32°C) using fog spray and shading as required.
 6. Provide wind breaks to protect from moisture evaporation, when necessary.
 7. Schedule placements during cooler part of day or after dark for slabs or other locations having large exposed surfaces.
- D. Employ best industry practices to prevent segregation during placing. Do not drop concrete more than 5' (1500 mm). Use elephant trunk, tremied, or pumped concrete to provide proper placement. Place in layers approximately 18" (450 mm) deep.
- E. Place concrete continuously in each section until completed. Permit not more than 30 minutes between depositing adjacent layers of concrete within each section, unless an acceptable set retarder is used in concrete mix.
- F. Thoroughly compact, puddle, and vibrate concrete into corners and around reinforcing and embedded items. Use internal vibration where size of section permits.
- G. Maintain concrete placing temperature between 50°F (11°C) and 90°F (32°C) except as specified for hot and cold weather concreting.
- H. Place sections of concrete in sequence which eliminates shrinkage effects to greatest extent practicable.
- I. Immediately following both placement and form removal, thoroughly clean up concrete spatter, leakage, and spills.
- J. Paint steel surfaces where existing coatings are damaged by placement or cleanup operations.

3.04 FINISHING

- A. Flatwork:
1. Tamp concrete to force coarse aggregate down from surface.
 2. Screed with straightedge, eliminate high and low places, bring surface to required finish elevations; *slope uniformly to drains*.
 3. Dusting of surface with dry cement or sand during finishing processes not permitted.
 4. Apply hardeners, curing and sealing compounds and similar materials in accordance with manufacturer's instructions during or after finishing.
 5. Finish surfaces in accordance with ACI 117:
 6. Trowel finish:
 - a. Float surface to true, even plane.
 - b. Steel trowel to smooth, uniform finish, free of defects; steel trowel second time to final burnish finish; use edger on exposed edges.

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CAST-IN-PLACE CONCRETE
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3.05 CURING

- A. Cure concrete; begin curing as soon as possible after placement of concrete.
- B. Use of liquid membrane-forming curing compound permitted for all concrete except where product would impair bond of other applied materials to surface, or where other method of curing is specified for particular use.
- C. Plastic film curing:
 - 1. Dampen surface of concrete and lay plastic film with minimum 6" (150 mm) side laps and free of wrinkles; tape side laps.
 - 2. Hold film in place with lumber or use similar provisions to prevent exposure of concrete for 7 days after placing.
 - 3. Immediately repair tears in film.
- D. Cure wearing courses, and miscellaneous cementitious placements by one of specified methods.

3.06 CURING AND SEALING COMPOUND

- A. Initial curing and sealing application shall be applied immediately after concrete has sufficiently set to allow application without damaging surface.
- B. Second application shall be applied 28 days after slab is cast.
- C. Final application shall be applied immediately before turning slab area over to Owner.

END OF SECTION

- 1) B. Ahmed
- 2) L. Thomas

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Structural materials.
- B. Structural design requirements.
- C. Structural fabrication and erection.
- D. Inspection and testing.

1.02 INFORMATIONAL SUBMITTALS

- A. Product Data:
 - 1. List of manufactured materials proposed, identifying manufacturer and type.
- B. Quality assurance data:
 - 1. Certificates of compliance with standards specified for items specified in this Division.
 - 2. Certified copies of mill tests.
 - 3. Welder's qualifications.

1.03 ACTION SUBMITTALS

- A. Shop Drawings for structural materials:
 - 1. Shop Drawings for structural material including erection plans and connection details. Each Shop Drawing showing connection details designed by engineer retained by Contractor shall be sealed, signed, and dated by that engineer.
 - 2. Revised Shop Drawings shall be labeled with revision number and revision date with all changes clearly identified by "clouding," and signed and dated by engineer retained by Contractor certifying drawing revision.
 - 3. Shop Drawings submitted without seal, signature, date, certification statement of engineer retained by Contractor and not identifying revisions will be returned to Contractor without review.
 - 4. Details of the proposed typical beam connections shall be submitted prior to development of corresponding detail drawings.
 - 5. Erection drawings shall be submitted prior to or with the submittal of the referenced detail drawings.

1.04 QUALITY ASSURANCE

- A. Fabricator shall have not less than 5 years' experience in fabrication of structural aluminum.
- B. Where tests or inspections indicate noncompliance with Contract Documents, repair or replace defective materials at Contractor's expense.

PART 2 PRODUCTS

2.01 DESIGN REQUIREMENTS

- A. Design, furnish, and install supplementary aluminum framing and supports required for Contractor-installed items under this contract. Supplementary aluminum is defined as:
 - 1. Aluminum necessary to support piping in addition to new aluminum sized on Drawings.
 - 2. Aluminum shown conceptually on Drawings and not sized.
- B. Design structural aluminum connections not sized on Drawings.

STRUCTURAL METAL FRAMING

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- C. Design in accordance with Specifications for Aluminum Structures” by Aluminum Association and these specifications.
- D. Design shall be performed by a professional engineer licensed in the State of Florida, retained by Contractor.

2.02 MATERIALS

- A. Aluminum shapes and plates: Alloy 6061-T6, ASTM B209/B209M or B211/B211M.
- B. Aluminum fasteners:
 - 1. Bolts: Anodized Alloy 2024-T4.
 - 2. Washers: Alclad 2024-T4.
 - 3. Nuts: 6061-T6 or 6262-T9.
- C. Stainless steel plates: ASTM A240/A240M, Type 316.
- D. Stainless steel bolts: Type 304.
- E. Stainless steel threaded rods: ½-inch diameter; Type 304

2.03 ALUMINUM FABRICATION

- A. Conform to following standards of AA:
 - 1. “Specifications for Aluminum Structures.”
 - 2. “Engineering Data for Aluminum Structures.”
 - 3. “Aluminum Standards and Data.”
- B. Welding: AWS D1.2 and AA “Specifications for Aluminum Structures.”
- C. Connection details:
 - 1. Connections, or parts thereof, not sized on Drawings shall be designed by professional engineer retained by Contractor.
 - 2. Where loads or reactions are not shown, provide minimum two 5/8” (16 mm) diameter bolts at each connection face. Shop welding of connection clip angles to members shall be adequate for minimum of 2,000 lb (910 kg) shear.
 - 3. Attach air ducts to pipe supports with use of ½-inch Type 304 stainless steel threaded rod.
- D. Shop connections: Either weld or bolt, unless type is specifically shown.
- E. Field connections:
 - 1. Provide aluminum fasteners for field connections.
 - 2. Provide stainless steel Type 304 bolts, nuts, and washers where shown on Drawings and at locations where aluminum clip angles connect to steel.
- F. Protection of dissimilar materials:
 - 1. Aluminum surfaces in contact with steel: Provide 1 coat of zinc chromate primer in accordance with FS TT-P-645 or, provide plastic shim plates or plastic washers for bolts.
 - 2. Aluminum surfaces in contact with concrete: Provide additional stainless steel plate, or provide 1 heavy coat of alkali-resistant bituminous paint meeting the requirements of Bureau of Reclamation Specification CTP-1.

2.04 GROUT

- A. Type: Nonshrink, flowable, nonmetallic, and free of chloride, gypsum or corrosive-type materials: ASTM C1107, Grade C; formulation suitable for application. Dry-pack grout not permitted.

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STRUCTURAL METAL FRAMING
SECTION 05 10 00 - Page 3

- B. Minimum strength: 5,000 psi at 28 days.
- C. Use for grouting beneath baseplates and bearing plates.

PART 3 EXECUTION**3.01 ERECTION**

- A. Erect plumb and level; introduce temporary bracing required to support erection loads.
- B. Mount supports and adjust elevations so that the piping being supported is straight, and level or plumb as needed.
- C. Use light drifting necessary to draw holes together. Drifting to match unfair holes is not allowed. Use of twist drills to enlarge holes to make connections is only permitted for slip-critical connections and is subject to Engineer's review. If diameter of enlarged hole exceeds original bolt diameter by 1/4" (6.4 mm) or more, provide a larger bolt so final hole does not exceed bolt diameter by more than 3/16" (4.8 mm).
- D. Grouting:
 - 1. Roughen concrete surfaces by light chipping to remove laitance to approximately 1/4" (6 mm). Do not expose reinforcing steel.
 - 2. Remove foreign materials; prepare surfaces in strict conformance to manufacturer's instructions.
 - 3. Mix, place, and cure grout in strict accordance to manufacturer's instructions.
 - 4. Grout under baseplates to provide full bearing area after steel has been plumbed and aligned. Grout shall be placed in manner to prevent forming air pockets.
 - 5. Grout thickness: 1 1/2" (38 mm), unless shown otherwise.

3.02 INSPECTION AND TESTING OF BOLTED CONNECTIONS

- A. Inspection and testing:
 - 1. In accordance with Section 9 of "Specification for Structural Joints Using ASTM A325 or A490 Bolts," Direct Tension Indicator (DTI) manufacturer's installation and inspection instructions, and these specifications.
- B. Inspection and testing shall also include following:
 - 1. Verify that bolt, nut, washer, and DTI types conform to materials specified.
 - 2. Verify bolts, nuts, washers and DTI are properly marked in accordance with appropriate ASTM specifications including manufacturer symbol.
 - 3. Verify appropriate test certificates have been furnished by manufacturer for bolts, nuts, washers and DTI washers according to ASTM specification requirements.
 - 4. Verify certificate lot numbers coincide with lot numbers on containers at job site.
 - 5. Verify bolting crews are installing bolts in accordance with references specified.
 - 6. Verify bearing-type connection bolts are snug tight bringing all plies into contact.

END OF SECTION

- 1) B. Ahmed
- 2) L. Thomas

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METAL FABRICATIONS
SECTION 05 50 00 - Page 1**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Welding materials.
- B. Anchor rods for installation of other steel, iron and metal items.
- C. Adhesive anchors.
- D. Mechanical anchors.

1.03 INFORMATIONAL SUBMITTALS

- A. Product Data: List of manufactured materials proposed, identifying manufacturer and type.
- B. Test Reports: ICC-ES evaluation reports for post-installed adhesive anchors, mechanical anchors, masonry anchors provided to verify conformance to specifications.

1.04 ACTION SUBMITTALS

- A. Shop Drawings for other steel, iron or metal items as defined in AISC Code of Standard Practice.
 - 1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
 - 2. Indicate welded connections using standard AWS A2.0 welding symbols.
 - 3. Indicate net weld lengths.

1.05 QUALITY ASSURANCE

- A. Perform welding in accordance with AWS D1.2 "Structural Welding Code - Aluminum," and AWS D1.6 Structural Welding – Stainless Steel as applicable.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Adhere to product storage and handling requirements.
- B. Accept metal fabrications on site in labeled shipments. Inspect for damage.
- C. Protect metal fabrications from damage by exposure to weather.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Aluminum plates and shapes: Type 6061-T6, ASTM B209/B209M or B211/B211M. Weld in conformance to requirements of AWS D1.2 and AA "Specifications for Aluminum Structures."
- B. Stainless steel plates and shapes: Type 316.
- C. Aluminum bolts: Anodized alloy 2024-T4.
- D. Stainless steel bolts and washers: ASTM F593. Type 304.
- E. Stainless steel nuts: ASTM F594., Type 304.
- F. Stainless steel treaded rod: ½-inch diameter, Type 304.

METAL FABRICATIONS

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2.02 WELDING MATERIALS

- A. Aluminum: AWS D1.2; type as required for materials being welded.
- B. Stainless steel: AWS D1.6; type as required for materials being welded.

2.03 ADHESIVE ANCHORS

- A. Threaded rods anchored in concrete with 2-component blend of resin and hardener. Filler material may be mixed with resin and hardener in accordance with manufacturer's directions.
- B. Anchor rod system shall have passed mandatory creep tests requirements of AC 308.
- C. Threaded rod type:
 - 1. All-threaded.
 - 2. Stainless steel: ASTM F593 (AISI 304).
 - 3. Diameter: ½"

2.05 MECHANICAL ANCHORS

- A. Torque controlled wedge-type with expanding cone or undercut anchor.
- B. Size and locations: As shown or required for equipment installation.
- C. Ductile, Category 1, approved for use in seismic applications, cracked and uncracked concrete, and shall have ICC approval in accordance with AC 193.
- D. Type:
 - 1. As indicated on Drawings:
 - 2. Expansion anchor:
 - a. Stainless steel.
 - b. Manufacturer: "Kwik-Bolt TZ" "HSL-3" by Hilti, "Strong-Bolt 2" by Simpson Strong-Tie, or equal.
 - 3. Undercut anchor:
 - a. Stainless steel.
 - b. Manufacturer: "HDA Undercut Anchors" by Hilti, or equal. Use for nonstructural anchoring of light weight equipment or where specifically identified for use on Drawings. Resulting anchor loads shall be less than manufacturer's allowable loads.

PART 3 EXECUTION**3.01 ERECTION**

- A. Bolt pipe supports to adjacent concrete surfaces as shown on drawings.
- B. Install items and piping plumb and level, accurately fitted, free from distortion or defects.
- C. Make provisions for erection stresses. Install temporary bracing to maintain alignment, until permanent bracing and attachments are installed.
- D. Field weld components where indicated on Drawings.

3.02 PREPARATION

- A. Clean aluminum items to bare metal where site welding is required.

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METAL FABRICATIONS
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- B. Supply setting templates for metal items required to be cast into concrete or embedded in masonry.

3.03 ADHESIVE ANCHORS AND ADHESIVE MASONRY ANCHORS

- A. Install in strict accordance with manufacturer's written instructions.
- B. Perform work using manufacturer's standard equipment including adhesive cartridges, dispensing guns, mixer tubes and extensions, brush, and air nozzle for compressed air cleaning of holes. Contractor shall possess equipment at site prior to start of installation and workers shall demonstrate knowledge of procedure for installing anchors prior to installation.
- C. Use hammer drill except where holes are within 6" (150 mm) of edge of concrete or masonry, core drill holes.
- D. Inspect existing concrete and masonry at anchor locations for soundness. Report to Engineer cracked, deteriorated or weak concrete or masonry detected from drilling operation or from inspection.

3.04 MECHANICAL ANCHORS

- A. Install in strict accordance with manufacturer's written instructions.
- B. Use manufacturer's installation equipment.

END OF SECTION

- 1) B. Ahmed
- 2) L. Thomas

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fiberglass reinforced plastic (FRP) ducts and fittings.
- B. Manual balancing dampers.
- C. Flexible connections.

1.02 INFORMATIONAL SUBMITTALS

- A. Shop Drawings: Data concerning dimensions, capacities, ratings and appropriate identification.
- B. Product Data: Manufacturer's technical product data for each type of ductwork and accessory, including dimensions, capacities, and materials of construction; and installation instructions.

1.03 QUALITY ASSURANCE

- A. Furnish and install, fittings, dampers, and all appurtenances in accordance with the requirements of the Drawings.
- B. All FRP fabrication shall meet or exceed quality requirements of ASTM D3982, ASTM C582, ASTM 2996, NPS 15-69, and ASTM E 84.

PART 2 PRODUCTS

2.01 FRP DUCT

- A. Supply and install fiberglass reinforced plastic (FRP) ductwork designed and fabricated for odor control service to carry warm, moisture-laden air with hydrogen sulfide, mercaptans and other organic and inorganic compounds typically associated with wastewater treatment without damage.
- B. FRP Duct:
 - 1. Diameter: Shown on the Drawings: 14-inch and 18-inch; OD or ID.
 - 2. Minimum Wall Thickness: 0.25 inches.
 - 3. Operating Pressure: 7-inches H₂O WG (negative).
 - 4. Operating Temperature Range: 50 to 180° F.
 - 5. Maximum Operating Air Velocity: 3000 ft./min.
- C. Resin:
 - 1. Corrosion resistant and fire retardant.
 - 2. Shall not contain pigments, dyes, colorants or fillers.
 - 3. Acceptable resins:
 - a. AOC Vipel K022
 - b. Ashland Chemical Hetron FR992
 - c. Interplastics CoRezyn 8442
 - d. Or approved equal.
- D. Reinforcement
 - 1. Surfacing Veil shall be "C" glass veil with a silane finish and a styrene soluble binder or approved equal.
 - 2. Chopped Strand Mat shall be Type E Glass with a minimum 1-1/2 ounce per square foot with silane finish and styrene soluble binder.
 - 3. Woven Roving shall be Type E glass minimum 24 ounces per square yard.
 - 4. Continuous Roving for a filament binding shall be Type E glass with a silane finish.

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- E. Construction:
1. Filament wound or contact molding or combination to meet design criteria
 2. Maximum allowable deflection for shall be ½ inch between supports
 3. Safety factor of 10 to 1 for pressure and 5 to 1 for vacuum.
 4. Out of roundness of duct shall be limited to $\pm 1/4$ "
- F. Laminates
1. All ductwork shall have a resin-rich inner surface, an interior corrosion barrier, an interior structural layer and an exterior corrosion layer and UV resistant coating.
 2. Inner surface: Nominal 10 mils thick composed of a single ply of the C glass surfacing veil embedded in a resin-rich surface. Resin content shall be at least 90%.
 3. Interior layer: Nominal 90 mils thick composed of at least two layers of chopped strand mat or equivalent chopped strand. Resin content shall be at least 75%.
 4. Structural layer: Type E glass to meet minimum wall thickness as specified. The total wall thickness noted above includes the inner surface.
 5. Contact molded structural layer shall include alternate layers of chopped strand mat and woven roving.
 6. Exterior corrosion layer: Single A or C Veil shall be applied to all duct exterior
 7. Exterior UV resistant coating: Factory applied paraffinated white gel coat with UV inhibitors.
- G. Manufacturer:
1. Belco Manufacturing
 2. Ershigs
 3. Bondstrand
 4. Fibercast
 5. Or Equal

2.02 FITTINGS

- A. All fittings such as elbows and tees shall be fabricated from the same resin, reinforcement, construction, and laminates and shall have the same strength as FRP ductwork.
- B. The internal diameter of all fittings shall be equal to the adjacent duct.
- C. The tolerance on angles of all fittings shall be ± 1 degree.
- D. The centerline radius of all elbows shall be 1.5 times the diameter.
- E. Elbows shall be smooth radius.

2.03 FLANGES

- A. Provide flanged connections at expansion joints and butterfly dampers.
- B. Flanges shall be hand lay-up construction.
- C. Dimensions shall be in accordance with ASTM D 3982, Table 1.
- D. Flanges shall be drilled in accordance with ASTM D 3982, Table 1 and shall conform to the bolt butterfly damper body bolt pattern. Backs of flange face shall be flat so that washer seats fully on bolt face and flange backing.
- E. Flange tolerances shall be in ASTM D 3982, Section 8, Tolerances. Gaskets shall be EPDM, full face and minimum 1/8-inch thickness.
- F. All bolts, nuts and washers shall be Type 304 stainless steel.

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2.04 JOINTS

- A. Provide all butt and strap joints in accordance with ASTM D 3982, Table 2 and manufacturer's drawings.
- B. Field weld kits shall be supplied by the duct manufacturer. All necessary fiberglass and reinforcing material shall be supplied pre-cut and individually packaged for each joint. Bulk Glass rolls will not be acceptable.
- C. All resin, catalyst and putty shall be supplied in quantities to complete all field joints plus 20% extra for waste.

2.05 EXPANSION JOINT

- A. Provide expansion joints where shown on the Drawings.
- B. Expansion joints shall be slip-type.
- C. Acceptable manufacturer:
 - 1. Mercer Rubber
 - 2. RM-Holz
 - 3. The Metraflex Company
 - 4. Or equal.

2.06 BUTTERFLY DAMPERS

- A. Butterfly type round FRP Damper fabrication shall meet the corrosion requirements specified in this Section for FRP duct work.
- B. Waffer style plastic body suitable for insertion between duct flanges.
- C. Frame and blade: premium vinyl ester. Blade shall fully encapsulate shaft.
- D. Shaft: Type 316 stainless steel for all dampers.
- E. Bearings and bushings: Teflon.
- F. Pins and all hardware: Type 316 stainless steel.
- G. Shaft seals: EPDM.
- H. Provide isolation dampers with a blade stop consisting of FRP angles with full circumference EPDM seals.
- I. Dampers shall be supplied with hand wheel actuators with a 5-stage locking quadrant indicator.
- J. Acceptable manufacturers:
 - 1. Ruskin
 - 2. Belco Manufacturing
 - 3. Ershigs
 - 4. Or equal.

2.07 DUCT HANGERS AND SUPPORTS

- A. All hangers and supports for FRP ducts shall be located as shown on drawings.

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- B. The locations of duct supports shown on the Drawings are approximate. Locations can be adjusted so long as new location is approved by the Owner and Engineer.
- C. Provide outer aluminum duct sleeve (cradle) of minimum 8" length for FRP ducts at each support point to protect ducts from connection damage, abrasion, and wear. Use aluminum cradle metal thickness as shown on drawings.
- D. Provide additional supports if required to meet the requirements of this specification.
- E. The Contractor shall be responsible for the overall stability of the entire support system.

2.08 FLEXIBLE DUCT CONNECTIONS

- A. Provide flexible rubber duct connector as shown on the drawings each with two adjustable stainless steel clamps.

PART 3 EXECUTION**3.01 FRP DUCTS**

- A. Install in accordance with the manufacturer's recommendations.

3.02 BUTTERFLY DAMPERS

- A. Install in ducts in locations shown on drawings.

3.03 FLEXIBLE DUCT CONNECTIONS

- A. Install for connections of ductwork to blower and at each headworks connection point.
- B. Installed width shall be not less than 12".

PART 4 INSPECTION AND FIELD TESTING**4.01 INSPECTION**

- A. Inspect installation for proper joints, sufficient supports, anchoring, interference, and damage to pipe, fittings, and coating. Repair damages prior to requesting substantial completion inspection by the Engineer and Owner. Make additional repairs as directed by Owner and Engineer.

4.02 FIELD TESTING

- A. Pressure test air duct system at a maximum pressure of 3.5 psi. FRP ducts on roof deck between dampers and the structure deck need not be pressure tested. Contractor shall furnish test equipment, labor, and materials at no extra cost to the Owner.
 1. Plug or cap ends of test sections as needed.
 2. Do not allow test pressures to exceed 4.0 psi at any time.
 3. After filling pipe with air to 3.5 psi, allow the air pressure to stabilize.
 4. Pressure test is satisfactory if the pressure loss is 1.0 psi or less during a test period of 15 minutes.
 5. Repair leaks and re-test system as required to the satisfaction of the Engineer and Owner.

END OF SECTION

- 1) B. Ahmed
- 2) L. Thomas

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Lightning protection system for cantilevered pipe supports including, but not be limited to:
1. Conductor and connections.
 2. Ground rods.
 3. Hardware.
 4. Interconnections of pipe supports with existing lightning protection system.

1.02 INFORMATIONAL SUBMITTALS

- A. Submit with Bid:
1. Product Data with complete list of material, including manufacturer's descriptive and technical literature, catalog cuts sheets for each type of system components.
 2. Certificate of qualifications for performing design and installation of lightning protection system.
 3. Unit adjustment labor and material pricing for system components.
- B. Product Data
1. Complete list of material, including manufacturer's descriptive and technical literature, catalog cuts sheets for each type of system components.
 2. Installation information.
- C. Shop Drawings:
1. Detail drawings consisting of system components layout drawings, and installation instructions. Detail drawings shall demonstrate that system has been coordinated and will function as a unit. Drawings shall show proposed layout and mounting and relationship to other parts of work.
- D. Operation and maintenance data.

1.03 QUALITY ASSURANCE

- A. Qualifications:
1. Manufacturer regularly engaged in production of lightning protection systems for a minimum of 5 years.
 2. Lightning protection system installer shall be a UL certified installer and shall offer a Master Label, UL certified installation when requested.
- B. Pipe support lightning protection system, design, and installation shall conform to applicable requirements of NFPA 70, NFPA 780, UL 96, UL 96A, UL 467, LPI 175, and UL Electrical Construction Equipment Directory.
- C. System furnished shall consist of standard products of manufacturer regularly engaged in production of lightning protection systems and shall be manufacturer's latest UL-approved design.
- D. System components shall be furnished by a company that has been engaged in manufacturing of lightning protection systems and equipment for a minimum of 5 years.
- E. Certifications:
1. Where material or equipment is specified to comply with requirements of UL, provide proof of such compliance. Label of or listing in Electrical Construction Equipment Directory will be acceptable evidence.
 2. Instead of label or listing, written certificate from approved, nationally recognized testing organization equipped to perform such services, stating that items have been tested and conform to UL requirements and testing methods may be submitted.

PART 2 PRODUCTS

2.01 SYSTEM DESCRIPTION

- A. Provide components that will not be adversely affected by environmental conditions encountered.
- B. Provide oversized conductors where unusual conditions exist which would cause corrosion of conductors.
- C. Design requirements:
 - 1. Connect cantilevered pipe supports (Pipe Support 1) on headworks upper deck to existing lightning protection system.
 - 2. Drive a ground rod for each cantilevered pipe support (Pipe Support 1) located at ground level. Connect pipe support to the ground rod.
 - 3. Design to provide shortest distance and most direct current path to ground from pipe supports.
 - 4. Do not use combination of materials that form electrolytic couple of such nature that corrosion is accelerated in presence of moisture unless moisture is permanently excluded from junction of such metals.
 - 5. Fabricate, assemble, erect, and place grounding system in proper operating condition in full conformity with Contract Documents.

2.02 GROUND RODS

- A. Type: Copper-clad steel, stainless steel, or solid copper; UL 467.
- B. Size: Not less than 3/4" (19 mm) in diameter and 10' (3 m) in length.
- C. Do not mix ground rods of copper-clad steel, stainless steel, galvanized, ferrous, and solid copper on Project Site.

2.03 CONDUCTORS

- A. Main and secondary conductors shall match existing conductors on structure.
- B. Conductors shall be in accordance with applicable parts of NFPA 780 and UL 96 for Class I or Class II materials.

2.04 CONNECTORS

- A. In general, connections, bonds, and splices shall be done by exothermic welds or by use of high-compression fittings.
 - 1. Exothermic welds and high compression fittings shall be listed for purpose.
 - 2. High compression fittings shall be type that requires hydraulically operated mechanism to apply minimum of 10,000 psi.
- B. Clamp-type connectors may be used for connection of roof conductor to air terminal and to guttering. Conform to UL 96, class as applicable, and style and size as required for installation.

2.05 ACCESSORIES

- A. Lightning protection components shall conform to UL 96, classes as applicable.

2.06 IDENTIFICATION AND TAGGING

- A. Materials furnished for lightning protection system shall bear UL label.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

- A. Install in accordance with manufacturer's recommendations.
- B. Install in neat, professional manner.

3.02 CONDUCTORS

- A. Conform to local code requirements.
- B. Main and secondary conductors shall preserve downward or horizontal course. Rigidly fasten at least every 3' (900 mm).
- C. Bends less than 8" (203 mm) radius and angles less than 90° in conductors not acceptable.
- D. Interconnections made within side-flash distances shall be at or above level of grounded metallic parts.
- E. Secondary conductors shall interconnect with grounded metallic parts within building.
- F. Conductors placed where there is probability of unusual wear, mechanical injury, or corrosion shall be of greater electrical capacity than would normally be used, or shall be protected.

3.03 GROUNDING

- A. Connections to structural framework shall be by means of nut and bolt or welding. Connections between columns and ground connections shall be made at bottom of columns.
- B. Connections between ground connectors and grounds or counterpoise and between counterpoise and grounds shall be electrically continuous.
- C. Store equipment and their components in a clean, dry place. Protect from weather, dirt, water, construction debris, and physical damage in accordance with manufacturer's instructions.

END OF SECTION

- 1) B. Ahmed
- 2) L. Thomas