



Municipality of Skagway Alaska

SKAGWAY, ALASKA



Skagway WWTP Odor Control Improvements – Bid Package

Project Manual - Volume 1 of 1

June, 2020

HDR Project No. 10108243



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DIVISION 00

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SECTION 00 01 07
SEALS AND SIGNATURES

 <p>3/31/2020</p>	<p>The technical material and data contained in these Specifications for the Municipality of Skagway Wastewater Treatment Plant Odor Control Improvements was prepared under the supervision and direction of the undersigned, whose seal, as a Professional Engineer licensed to practice as such is affixed below.</p> <hr/> <p>Jonathan Ryan Moyers, PE 3/31/2020</p> <p>My license renewal date is 12/31/2021</p>
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END OF SECTION

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SECTION 00 11 13



MUNICIPALITY OF SKAGWAY

GATEWAY TO THE KLONDIKE
P.O. BOX 415, SKAGWAY, ALASKA 99840
(PHONE) (907) 983-2297
(FAX) (907) 983-2151
www.skagway.org

June 2, 2020

REQUEST FOR BIDS

Wastewater Treatment Facility Odor Control Improvements Project

The Municipality of Skagway is accepting bids to construct a new Ultraviolet Odor Control System, new Odor Control Duct and Accessories, new Instrumentation for Process Control, and subsidiary and incidental work in accordance with the plans and specifications.

Bids shall include all labor, equipment, transportation, and materials to complete the specified work. Bids should also include mobilization and demobilization to and from the Project site. Alaska Labor Standards, reporting and prevailing wage rate determination is made part of this bid package. If this project is over \$25,000, a notice of award will be sent to the Alaska Department of Labor - Wage and Hour Section. The State will require that certified payroll forms are completed and the State has the right to randomly audit the successful bidders company to ensure Davis Bacon Wages are being paid for this project.

A full copy of the Request for Bids can be obtained by e-mailing m.gihl@skagway.org. Technical questions regarding this project must be directed in writing to the Borough Manager at manager@skagway.org.

Substantial completion will be no later than December 15, 2020. Final project completion will be no later than December 31, 2020. Bidders are expected to be familiar with the potential extreme and challenging weather conditions in Skagway, Alaska and the Municipality will assume all bidders have considered weather in preparing their bids and rely on all bidders having considered Skagway weather in submitting their bids. Extraordinary weather delays may be considered and addressed through contract modification in the sole discretion of the Municipality. Liquidated damages shall be a part of the final contract.

Bidders are encouraged to familiarize themselves with this project through contact with the Borough Manager and by visiting the site of the project.

The Municipality of Skagway shall not be responsible for any costs incurred in the preparation of bids. The Municipality reserves the right to reject any or all bids.

Bids must be sealed and clearly labeled with the following information:

1. Project Name: “Wastewater Treatment Facility Odor Control Improvements”
2. Date and Time of Bid Due Date (2:00 p.m. on Tuesday, June 30, 2020)
3. Bidder’s name

Bids are due no later than 2:00 p.m. on Tuesday, June 30, 2020 mailed to the address listed above, or by email to m.gihl@skagway.org. Only one emailed bid will be accepted, the Municipality will not accept multiple emailed bids or emails attempting to change or modify bids. All bidders are expected to consider weather in determining how to deliver their bids timely and there shall be no exceptions for a late received bid on account of weather. Faxed bids will not be accepted and there will not be a public opening, the borough office is closed.

The Municipality of Skagway is an equal opportunity employer.

General Conditions and Notices

Bid Evaluation/Award: The Municipality of Skagway (Municipality) may award a contract based on bids received as a result of this Request for Bids if it is in the best interest of the Municipality. A bid award will be based on the overall bid price, but the Municipality may reject the low bid if such rejection is determined to be in the best interests of the Municipality. The Municipality reserves the right to reject any or all bids received if determined to be in the best interest of the Municipality. The Municipality reserves the right to waive minor informalities and irregularities of bids received if it is in the best interest of the Municipality.

Bid Package Fee: There is not a fee for this bid package.

Bid Security: Each bid shall be accompanied by bid security as described in Specification Section 00 21 13 – Instructions to Bidders.

Project Completion: Substantial completion will be no later than December 15, 2020. Final project completion will be no later than December 31, 2020. Bidders are expected to be familiar with the potential extreme and challenging weather conditions in Skagway, Alaska and the Municipality will assume all bidders have considered weather in preparing their bids and will rely on all bidders having considered Skagway weather in submitting their bids. Extraordinary weather delays may be considered and addressed through contract modification in the sole discretion of the Municipality.

Project Description: The successful Bidder will be responsible for providing the following services:

- Bids shall include all labor, equipment, transportation, supplies and materials to complete the work as specified in this Request for Bids. Bids shall include all mobilization and demobilization to and from the Project site.
- Successful Contractor must supply all material and supplies.
- Successful Bidder/Contractor shall provide a project schedule to the Borough Manager prior to starting work.
- All work shall conform to all Federal, State, and Local laws, regulations and codes. The Successful Bidder/Contractor shall comply with the Migratory Bird Treaty Act and shall comply with the provisions of those federal laws as applicable to migratory birds, eggs, and nests in Skagway Borough.
- Successful Bidder/Contractor shall obtain any and all necessary permits from Federal, State, or local authorities for this project, including payment of any applicable fees and costs associated with the permit/process.
- The Successful Bidder/Contractor shall properly dispose of all debris and/or material at the end of each work day. Contractor may coordinate disposal with the Public Works Department.
- Before acceptance of the Project as complete, the Municipality shall inspect and verify that the work is complete. All work found unacceptable shall be redone

at the Successful Bidder/Contractor's expense to the satisfaction and acceptance of the Municipality. All work determined to be incomplete shall be completed in accordance with the contract specifications.

- Alaska Labor Standards, reporting and prevailing wage rate determination is made part of this bid package. If this project is over \$25,000, a notice of award will be sent to the Alaska Department of Labor - Wage and Hour Section. The State will require that certified payroll forms are completed and the State has the right to randomly audit the successful bidder's company to ensure Davis Bacon Wages are being paid for this project.

Project Site: It is the sole responsibility of the Bidder to evaluate the jobsite and make their own technical assessment of the project site for determining the proposed work process, schedule, site conditions and equipment utilization and to make a valid financial bid. The Municipality will not make any additional compensation or payments if the project conditions are different from the conditions expected, anticipated or assumed by the Bidder.

Construction Standards: All work and equipment must comply with the Uniform Building Code latest version.

Project Contact: Bidders are encouraged to familiarize themselves with project requirements. All inquiries must be in writing and directed to the Borough Manager at manager@skagway.org.

Submittal Deadline and Location: Bidders are responsible to assure delivery prior to deadline. Only bids received prior to the date, time and received at the location specified shall be considered. Faxed or e-mailed bids will not be accepted. Bidders are fully responsible for ensuring their bids physically arrive in Skagway timely, regardless of weather.

Bids to Remain Open: Bidders shall guarantee their Bids for a period of sixty (60) calendar days from the date of the bid opening.

Beginning of Work: Physical work may begin upon the Bidder signing the Contract and the Notice of Award and the Notice to Proceed from the Municipality.

Liquidated Damages: The Bidder will pay the Municipality up to \$1500 per day in liquidated damages if the project is not completed in accordance with the Bid specifications. If the Municipality determines that the project is defective and that repairs must be made to meet the Bid specifications, the Bidder will pay the Municipality up to \$1500 per day for each day which the project fails to meet the approval of the Municipality, up to the time that the Municipality agrees that the project has been completed in accordance with the Bid specifications.

Delays beyond Bidders Control: Suspension of work caused by Acts of God, which are beyond the control of the Bidder, shall not be cause for termination. If such Acts suspend work on the project, any delay caused will be negotiated and an addendum to this contract will be issued, which will be signed by both the Municipality and the Bidder, outlining the time schedule and costs associated with any delay in substantially completing the project.

Insurance & Indemnification: No contract for services shall be issued or continued unless there is presented to the Municipality of Skagway a certificate of insurance showing that the business owner/operator has obtained at least two million dollars (\$2,000,000.00) general liability insurance. Proof of such insurance shall be provided to the Municipality as a condition of entering the contract. Failure to maintain such insurance shall constitute a material breach of contract. The certificate of insurance must establish that the Municipality is named as an additional insured on such policy, and that the insurer shall notify the Municipality twenty (20) days before the policy is canceled, or terminated. Additionally, the Successful Bidder/Contractor shall execute an instrument under the terms of which the Successful Bidder/Contractor shall agree to indemnify, defend and hold harmless the Municipality of Skagway from any and all claims for injury, including death, or damage to persons or property as a result of the Successful Bidder/Contractor's activities.

Bidder shall provide Worker's Compensation Insurance in compliance with the laws of the State of Alaska, AS 23.30 et seq., and federal jurisdiction where the work is being performed.

Compensation: The Municipality agrees to pay Contractor an amount not to exceed that as specified and accepted in the bid upon completion of the project.

Responder's Responsibility: Responding Bidders have the responsibility of understanding what is required by this solicitation. The Municipality shall not be held responsible for any firm's lack of understanding. Should a firm not understand any aspect of this solicitation, or require further explanation or clarification regarding the intent or requirements of this solicitation, it shall be the responsibility of the Bidder to submit any question or questions to the Municipality. Further, by submitting a bid in response to this solicitation, a firm certifies that it has thoroughly read and understands this solicitation in its entirety.

Addenda: The Municipality will make reasonable efforts to provide Bidders with all addenda when issued. Addenda may be issued by any reasonable method such as hand delivery, mail, facsimile, and courier and in special circumstances, by phone. It is the Bidder's responsibility to ensure receipt of all addenda. No claim or protest will be allowed based on the Bidder's allegation that the Bidder did not receive all of the addenda or did not timely received all of the addenda.

Technical Questions: All technical questions shall be directed in writing to the Borough Manager no later than June 23, 2020 at 4:00 p.m. by email at manager@skagway.org.

Cost Incurred in Bid Preparation: No contract shall be in effect until the Municipality executes a written agreement. The Municipality shall not be liable for any cost incurred by any Bidder in the response to this Request for Bids, including any work done, even in good faith, prior to the execution of a contract.

Proprietary Information: Bidders shall not include proprietary information in bids if such information should not be disclosed to the public. Any language with a submittal purporting to render all or portions of a bid confidential will be disregarded. Proprietary information, which may be provided will be confidential, if expressly agreed by the Municipality, and if allowable by state law.

Minor Informalities: The Municipality reserves the right to waive any minor informality, negotiate changes or reject any and all bids and to not award the proposed contract, if it is in the Municipality's best interest. Minor informalities mean matters of form rather than substance which are evident from the submittal, or are insignificant matters that have a negligible effect on price, quantity, quality, delivery, or contractual conditions and can be waived or corrected without prejudice to other Bidders.

Receipt and Bid Opening: The Municipality must receive all bids including any amendment or withdrawal prior to the scheduled time for submitting bids. Any bid, amendment, or withdrawal, which has not been actually physically received by the Municipality prior to the scheduled time for submitting bids shall not be considered. No responsibility shall be attached to any officer, employee or agent of the Municipality for the premature opening of, or failure to open, a bid improperly delivered, addressed or identified.

Until the award of a contract, the Municipality reserves the right to reject any or all bids, to waive technicalities or to advertise for new bids without liability against the Municipality. Receipt of bids will be publicly acknowledged at the submittal deadline and location by reading the bids to any attendees at the municipal building.

Disqualification of Bidders: A Bidder may be disqualified for the following reasons:

- More than one bid for the same work from an individual, firm, or corporation under the same or different name. (A party that has quoted prices to a Bidder is not thereby disqualified from quoting prices to other Bidders or from submitting a bid directly for the project).
- Evidence of collusion among Bidders as set out in the Non-Collusion Declaration attached to the Official Bid documents.

Rejection of Bids: The Municipality reserves the right to reject any and all bids when such rejection is determined to be in the best interests of the Municipality; to reject the bid of a Bidder who has previously failed to perform properly, or complete on time, any contracts or projects; to reject the bid of an Bidder who is not, in the opinion of the Municipality and sole discretion of the Municipality, in a position to perform the contract; and to reject a bid as non-responsive where the Bidder fails to furnish the required documents, fails to complete the required documents in the manner directed, or makes unauthorized alterations to bid documents.

Non-Responsive Bids: Bids shall be considered non-responsive and shall be rejected if there are unauthorized additions, conditional or alternative bids, or irregularities of any kind which may tend to make the bid incomplete, indefinite, or ambiguous as to its meaning.

Documents for Successful Bidder: Prior to contract execution and Notice to Proceed, the successful Bidder shall complete and submit the following documents within seven (7) days following Notice of Intent to Award, as well as any other documents that may be requested by the Municipality.

- Proof of Insurance
- Performance Bond (if required)
- Payment bond (if required)
- Copy of Subcontractor Agreements (if applicable)
- Copy of State and Municipal Business License

Award and Execution of Contract: All Bidders will be notified of Municipality's intent to award the contract and the successful Bidder will be requested to execute certain documents that shall include a contract agreement. No contract shall be considered as effective until it has been fully executed by both parties (Bidder and Municipality).

Failure to Execute Contract: Failure of the successful Bidder to execute and return the contract agreement and other documents within seven (7) days after receipt of the Municipality's Notice of Intent to Award, will be just cause for the rejection of the award. Award may then be made to the next lowest responsive, responsible and qualified Bidder, or the work may be re-advertised, in the sole discretion of the Municipality.

If the Municipality does not execute the contract agreement within fifteen (15) days following receipt from the Bidder of all required documents appropriately executed for the award of the contract, the Bidder shall have the right to withdraw its bid without penalty.

Skagway Bidder Preference: A bid shall be awarded to a Skagway bidder if Bidder's bid is not more than five percent higher than the lowest responsive nonresident bidder's. A bid shall be rejected if it contains a material alteration or an erasure. The Municipality may reject the bid of a bidder who failed to perform or failed to timely perform on a previous contract with the Municipality or any municipality. The Borough manager may reject any and all bids and waive any informalities or minor irregularities in the bids. Where all bids are rejected, and new bids are called for on substantially the same purchase or contract, each of the bidders whose bids were rejected shall be timely notified of the new call for bids and of changes, if any, in the specifications and requirements.

Permit Responsibility: Successful Bidder/Contractor shall obtain any and all necessary permits from Federal, State and local authorities for this project, including any applicable fees and costs associated with the permit/process.

Davis Bacon: Alaska Labor Standards, reporting and prevailing wage rate determination is made part of this bid package. If this project is over \$25,000, a notice of award will be sent to the Alaska Department of Labor - Wage and Hour Section. The State will require that certified payroll forms are completed and the State has the right to randomly audit the successful bidders company to ensure Davis Bacon Wages are being paid for this project.

Payment and Performance Bond: If this project is under \$50,000 no bonding is required and the bonding bid sheet does not need to be completed. If this project is over \$50,000 but under \$150,000, bidder must sign the bonding exemption checklist & have it notarized. Answers to questions on Bonding Exemption Checklist page may require bonding papers or a letter from bonding company saying contractor is bondable for this project for the amount of the project. If this project is over \$150,000, bonding **IS** required. For purposes of bid documents, a signed letter from a surety company committing to the bonding of the contractor in the amount of the project will suffice until the time of actual signing of the contract, when bond must be on hand. (See Bonding Exempt Checklist)

Ownership of Bid Submittals: Once bids are opened, they become the property of the Municipality, and shall not be returned. Bids may be withdrawn by submitting a written withdrawal request to the same address to which the bid was submitted if said request is received by the Municipality one (1) hour prior to the bid opening time and date. The bid shall be returned to the Bidder unopened.

Bid Form: Bids will be considered non-responsive if the following documents are not completely filled out and submitted at the time of bidding:

- Completed Official Bid Form
- Contracting Officer Documentation
- Non-Collusion Declaration
- Bonding Exempt Checklist
- Bonding paperwork (if required)

INSTRUCTIONS TO BIDDERS

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ARTICLE 1 – DEFINED TERMS

- 1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:
- A. *Issuing Office* – The office from which the Bidding Documents are to be issued.
 - B. *Successful Bidder* – The lowest responsive Bidder submitting a responsive bid to whom Owner (on the basis of Owner’s evaluation as hereinafter provided) makes an award.
 - C. *Owner* – Municipality of Skagway, Alaska

ARTICLE 2 – COPIES OF BIDDING DOCUMENTS

- 2.01 Complete sets of the Bidding Documents may be obtained from the Issuing Office in the number and format stated in the advertisement or invitation to bid.
- 2.02 Complete sets of Bidding Documents shall be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
- 2.03 Owner and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids for the Work and do not authorize or confer a license for any other use.

ARTICLE 3 – QUALIFICATIONS OF BIDDERS

- 3.01 To demonstrate Bidder’s qualifications to perform the Work, Bidder shall submit with its Bid (a) written evidence establishing its qualifications such as financial data, previous experience, and present commitments, and (b) the following additional information:
- A. Evidence of Bidder’s authority to do business in the state where the Project is located.
 - B. Bidder’s state or other contractor license number, if applicable.
 - C. Subcontractor and Supplier qualification information; coordinate with provisions of Article 12 of these Instructions, “Subcontractors, Suppliers, and Others.”
 - D. Other required information regarding qualifications.
- 3.02 A Bidder’s failure to submit required qualification information within the times indicated may disqualify Bidder from receiving an award of the Contract.
- 3.03 No requirement in this Article 3 to submit information will prejudice the right of Owner to seek additional pertinent information regarding Bidder’s qualifications.
- 3.04 Bidder is advised to carefully review those portions of the Bid Form requiring Bidder’s representations and certifications.

ARTICLE 4 – SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE; OWNER’S SAFETY PROGRAM; OTHER WORK AT THE SITE

- 4.01 *Site and Other Areas*
- A. The Site is identified in the Bidding Documents. By definition, the Site includes rights-of-way, easements, and other lands furnished by Owner for the use of the Contractor. Any additional lands required for temporary construction facilities, construction equipment, or storage of

materials and equipment, and any access needed for such additional lands, are to be obtained and paid for by Contractor.

4.02 Existing Site Conditions

A. Subsurface and Physical Conditions; Hazardous Environmental Conditions

1. The Supplementary Conditions identify:
 - a. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site.
 - b. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).
 - c. reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site.
 - d. Technical Data contained in such reports and drawings.
2. Owner will make copies of reports and drawings referenced above available to any Bidder on request. These reports and drawings are not part of the Contract Documents. Bidder is responsible for any interpretation or conclusion Bidder draws from any Technical Data or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.
3. If the Supplementary Conditions do not identify Technical Data, the default definition of Technical Data set forth in Article 1 of the General Conditions will apply.
4. Geotechnical Baseline Report: The Bidding Documents contain a Geotechnical Baseline Report (GBR). The GBR describes certain select subsurface conditions that are anticipated to be encountered by Contractor during construction in specified locations ("Baseline Conditions"). The GBR is a Contract Document.

The Baseline Conditions in the GBR are intended to reduce uncertainty and the degree of contingency in submitted Bids. However, Bidders cannot rely solely on the Baseline Conditions. Bids should be based on a comprehensive approach that includes an independent review and analysis of the GBR, all other Contract Documents, Technical Data, other available information, and observable surface conditions. Not all potential subsurface conditions are baselined.

Nothing in the GBR is intended to relieve Bidders of the responsibility to make their own determinations regarding construction costs, bidding strategies, and Bid prices, nor of the responsibility to select and be responsible for the means, methods, techniques, sequences, and procedures of construction, and for safety precautions and programs incident thereto.

- B. Underground Facilities: Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or adjacent to the Site are set forth in the Contract Documents and are based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner, or others.
- C. Adequacy of Data: Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions, and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated subsurface or physical conditions appear in Paragraphs 5.03, 5.04, and 5.05 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental Condition at the

Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work, appear in Paragraph 5.06 of the General Conditions.

ARTICLE 5 – BIDDER’S REPRESENTATIONS

5.01 It is the responsibility of each Bidder before submitting a Bid to:

- A. examine and carefully study the Bidding Documents, and any data and reference items identified in the Bidding Documents;
- B. visit the Site, conduct a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfy itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;
- C. become familiar with and satisfy itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work;
- D. carefully study all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings;
- E. consider the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder’s safety precautions and programs;
- F. agree, based on the information and observations referred to in the preceding paragraph, that at the time of submitting its Bid no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents;
- G. become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents;
- H. promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder;
- I. determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work; and
- J. agree that the submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

ARTICLE 6 – PRE-BID CONFERENCE

6.01 A non-mandatory pre-Bid conference will be held at 12:00 p.m. on the 16th day of June via teleconference. Owner shall provide details for the teleconference pre-bid meeting to all registered bidders prior to the meeting. Representatives of Owner and Engineer will be present to discuss the Project. Bidders are encouraged to attend and participate in the conference. Engineer will transmit to all prospective Bidders of record such Addenda as Engineer considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective.

ARTICLE 7 – INTERPRETATIONS AND ADDENDA

7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to Engineer in writing. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda delivered to all parties recorded as having received the Bidding Documents. Questions received less than seven days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

7.02 Addenda may be issued to clarify, correct, supplement, or change the Bidding Documents.

ARTICLE 8 – BID SECURITY

8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of five percent of Bidder's maximum Total Lump Sum Bid price (determined by adding the base bid and all alternates) and in the form of a certified check, bank money order, or a Bid bond (on the form included in the Bidding Documents) issued by a surety meeting the requirements of Paragraphs 6.01 and 6.02 of the General Conditions.

8.02 The Bid security of the apparent Successful Bidder will be retained until Owner awards the contract to such Bidder, and such Bidder has executed the Contract Documents, furnished the required contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be released. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 15 days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited. Such forfeiture shall be Owner's exclusive remedy if Bidder defaults.

8.03 The Bid security of other Bidders that Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of seven days after the Effective Date of the Contract or 61 days after the Bid opening, whereupon Bid security furnished by such Bidders will be released.

8.04 Bid security of other Bidders that Owner believes do not have a reasonable chance of receiving the award will be released within seven days after the Bid opening.

ARTICLE 9 – CONTRACT TIMES

9.01 Bidder shall set forth in the Bid the time by which Bidder shall achieve Substantial Completion. The Owner will take Bidder's time commitment regarding Substantial Completion into consideration during the evaluation of Bids, and it will be necessary for the apparent Successful Bidder to satisfy Owner that it will be able to achieve Substantial Completion within the time such Bidder has designated in the Bid. Bidder shall also set forth in the Bid its commitments regarding the achievement of Milestones and readiness for final payment. The Successful Bidder's time

commitments will be entered into the Agreement (or incorporated in the Agreement by reference to the specific terms of the Bid).

ARTICLE 10 – LIQUIDATED DAMAGES

10.01 Provisions for liquidated damages, if any, for failure to timely attain a Milestone, Substantial Completion, or completion of the Work in readiness for final payment, are set forth in the Agreement and in the Request for Bids.

ARTICLE 11 – SUBSTITUTE AND “OR-EQUAL” ITEMS

11.01 The Contract for the Work, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, and those “or-equal” or substitute or materials and equipment subsequently approved by Engineer prior to the submittal of Bids and identified by Addendum. No item of material or equipment will be considered by Engineer as an “or-equal” or substitute unless written request for approval has been submitted by Bidder and has been received by Engineer at least 15 days prior to the date for receipt of Bids. Each such request shall comply with the requirements of Paragraphs 7.04 and 7.05 of the General Conditions. The burden of proof of the merit of the proposed item is upon Bidder. Engineer’s decision of approval or disapproval of a proposed item will be final. If Engineer approves any such proposed item, such approval will be set forth in an Addendum issued to all prospective Bidders. Bidders shall not rely upon approvals made in any other manner. Substitutes and “or-equal” materials and equipment may be proposed by Contractor in accordance with Paragraphs 7.04 and 7.05 of the General Conditions after the Effective Date of the Contract. No materials or equipment will be considered as “or equal” after Contractor’s bid is accepted and Contractor enters an Agreement with the Owner, except as may be required by the General Conditions in the sole discretion of the Engineer and Owner.

11.02 All prices that Bidder sets forth in its Bid shall be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, as supplemented by Addenda. Any assumptions regarding the possibility of post-Bid approvals of “or-equal” or substitution requests are made at Bidder’s sole risk.

ARTICLE 12 – SUBCONTRACTORS, SUPPLIERS, AND OTHERS

12.01 A Bidder shall be prepared to retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of the Work if required by the Bidding Documents (most commonly in the Specifications) to do so. If a prospective Bidder objects to retaining any such Subcontractor, Supplier, or other individual or entity, and the concern is not relieved by an Addendum, then the prospective Bidder should refrain from submitting a Bid.

12.02 Subsequent to the submittal of the Bid, Owner may not require the Successful Bidder or Contractor to retain any Subcontractor, Supplier, or other individual or entity against which Contractor has reasonable objection.

12.03 The apparent Successful Bidder, and any other Bidder so requested, shall within five days after Bid opening, submit to Owner a list of the Subcontractors or Suppliers proposed for the following portions of the Work:

- A. Electrical Subcontractor
- B. Instrumentation and Controls Subcontractor

- C. Mechanical and Piping Systems Subcontractor
- D. HVAC Subcontractor
- E. Concrete Work Subcontractor

If requested by Owner, such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, or other individual or entity. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute, in which case apparent Successful Bidder shall submit a substitute, Bidder's Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and Owner may consider such price adjustment in evaluating Bids and making the Contract award.

- 12.04 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, or other individuals or entities. Declining to make requested substitutions will constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to subsequent revocation of such acceptance as provided in Paragraph 7.06 of the General Conditions.
- 12.05. Contractor's failure to submit the subcontractor list in accordance with this provision constitutes a material breach of the Agreement.

ARTICLE 13 – PREPARATION OF BID

- 13.01 The Bid Form is included with the Bidding Documents.
 - A. All blanks on the Bid Form shall be completed in ink and the Bid Form signed in ink. Erasures or alterations shall be initialed in ink by the person signing the Bid Form. A Bid price shall be indicated for each section, Bid item, alternate, adjustment unit price item, and unit price item listed therein.
 - B. If the Bid Form expressly indicates that submitting pricing on a specific alternate item is optional, and Bidder elects to not furnish pricing for such optional alternate item, then Bidder may enter the words "No Bid" or "Not Applicable."
- 13.02 A Bid by a corporation shall be executed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate address and state of incorporation shall be shown.
- 13.03 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The partnership's address for receiving notices shall be shown.
- 13.04 A Bid by a limited liability company shall be executed in the name of the firm by a member or other authorized person and accompanied by evidence of authority to sign. The state of formation of the firm and the firm's address for receiving notices shall be shown.
- 13.05 A Bid by an individual shall show the Bidder's name and address for receiving notices.
- 13.06 A Bid by a joint venture shall be executed by an authorized representative of each joint venturer in the manner indicated on the Bid Form. The joint venture's address for receiving notices shall be shown.

- 13.07 All names shall be printed in ink below the signatures.
- 13.08 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form.
- 13.09 Postal and e-mail addresses and telephone number for communications regarding the Bid shall be shown.
- 13.10 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located, or Bidder shall covenant in writing to obtain such authority and qualification prior to award of the Contract and attach such covenant to the Bid. Bidder's state contractor license number, if any, shall also be shown on the Bid Form.

ARTICLE 14 – BASIS OF BID

14.01 Base Bid with Alternates

- A. Bidders shall submit a Bid on a lump sum basis for the base Bid and include a separate price for each alternate described in the Bidding Documents and as provided for in the Bid Form. The price for each alternate will be the amount added to or deleted from the base Bid if Owner selects the alternate.
- B. In the comparison of Bids, alternates will be applied in the same order of priority as listed in the Bid Form.

14.02 Allowances

- A. For cash allowances the Bid price shall include such amounts as the Bidder deems proper for Contractor's overhead, costs, profit, and other expenses on account of cash allowances, if any, named in the Contract Documents, in accordance with Paragraph 13.02.B of the General Conditions.

ARTICLE 15 – SUBMITTAL OF BID

- 15.01 One (1) copy of the Bid shall be submitted in one sealed envelope or container, which shall contain the items of information listed in Section 00 41 13 Bid Form. With each copy of the Bidding Documents, a Bidder is furnished one separate unbound copy of the Bid Form, and, if required, the Bid Bond Form. The unbound copy of the bid Form is to be completed and submitted with the Bid Security and the other documents required to be submitted under the terms of Article 7 of the Bid Form. Bids may also be emailed to m.gihl@skagway.org. Only one emailed bid will be accepted, the Municipality will not accept multiple emailed bids or emails attempting to change or modify bids. All bidders are expected to consider weather in determining how to deliver their bids timely and there shall be no exceptions for a late received bid on account of weather. Faxed bids will not be accepted and there will not be a public opening, the borough office is closed.
- 15.02 A Bid shall be received no later than the date and time prescribed and at the place indicated in the advertisement or invitation to bid and shall be enclosed in a plainly marked package with the Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted), the name and address of Bidder, and shall be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid shall be addressed to Municipality of Skagway, 700 Spring Street, P.O. Box 415, Skagway AK 99840.

- 15.03 Bids received after the date and time prescribed for the opening of bids, or not submitted at the correct location or in the designated manner, will not be accepted and will be returned to the Bidder unopened.

ARTICLE 16 – MODIFICATION AND WITHDRAWAL OF BID

- 16.01 A Bid may be withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids. Upon receipt of such notice, the unopened Bid will be returned to the Bidder.
- 16.02 If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in the manner specified in Paragraph 16.01 and submit a new Bid prior to the date and time for the opening of Bids.
- 16.03 If within 24 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid, that Bidder will be disqualified from further bidding on the Work.

ARTICLE 17 – OPENING OF BIDS

- 17.01 Bids will be opened at the time and place indicated in the advertisement or invitation to bid. There will not be a public opening, the borough office is closed. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

ARTICLE 18 – BIDS TO REMAIN SUBJECT TO ACCEPTANCE

- 18.01 All Bids will remain subject to acceptance for the period of time stated in the Bid Form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

ARTICLE 19 – EVALUATION OF BIDS AND AWARD OF CONTRACT

- 19.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible. If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of the Bid, then the Owner will reject the Bid as nonresponsive; provided that Owner also reserves the right to waive all minor informalities not involving price, time, or changes in the Work.
- 19.02 If Owner awards the contract for the Work, such award shall be to the responsible Bidder submitting the lowest responsive Bid.
- 19.03 Evaluation of Bids
- A. In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Bid Form or prior to the Notice of Award.
 - B. In the comparison of Bids, alternates will be applied in the same order of priority as listed in the Bid Form. To determine the Bid prices for purposes of comparison, Owner shall announce

to all bidders a “Base Bid plus alternates” budget after receiving all Bids, but prior to opening them. For comparison purposes alternates will be accepted, following the order of priority established in the Bid Form, until doing so would cause the budget to be exceeded. After determination of the Successful Bidder based on this comparative process and on the responsiveness, responsibility, and other factors set forth in these Instructions, the award may be made to said Successful Bidder on its base Bid and any combination of its additive alternate Bids for which Owner determines funds will be available at the time of award.

- 19.04 In evaluating whether a Bidder is responsible, Owner will consider the qualifications of the Bidder and may consider the qualifications and experience of Subcontractors and Suppliers proposed for those portions of the Work for which the identity of Subcontractors and Suppliers must be submitted as provided in the Bidding Documents.
- 19.05 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders and any proposed Subcontractors or Suppliers.

ARTICLE 20 – BONDS AND INSURANCE

- 20.01 Article 6 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner’s requirements as to performance and payment bonds and insurance. When the Successful Bidder delivers the Agreement (executed by Successful Bidder) to Owner, it shall be accompanied by required bonds and insurance documentation.

ARTICLE 21 – SIGNING OF AGREEMENT

- 21.01 When Owner issues a Notice of Award to the Successful Bidder, it shall be accompanied by the unexecuted counterparts of the Agreement along with the other Contract Documents as identified in the Agreement. Within 15 days thereafter, Successful Bidder shall execute and deliver the required number of counterparts of the Agreement (and any bonds and insurance documentation required to be delivered by the Contract Documents) to Owner. Within ten days thereafter, Owner shall deliver one fully executed counterpart of the Agreement to Successful Bidder, together with printed and electronic copies of the Contract Documents as stated in Paragraph 2.02 of the General Conditions.

ARTICLE 22 – SALES AND USE TAXES

- 22.01 Contractor shall be responsible for all taxes and duties arising out of the sale of the Goods and the furnishing of any Special Services. Refer to Paragraph SC-7.09 of the Supplementary Conditions for additional information.

ARTICLE 23 – WAGE RATE REQUIREMENTS

- 23.01 If the contract price is in excess of \$100,000, provisions of the Contract Work Hours and Safety Standards Act at 29 CFR 5.5(b) shall apply.
- 23.02 State of Alaska Davis-Bacon wage rates apply. Copies of State certified payroll records must be submitted monthly with the Application for Payment.
- 23.03 The Contractor is hereby made aware that the provisions of Title 36 of the Alaska Statutes and Title 8 of the Alaska Administrative Code will be enforced on the project. The Contractor will be required to become familiar with the State Statute and pay his/her labor the local prevailing wage rates. The most recent State of Alaska, Department of Labor-Laborer’s and Mechanics Minimum Rates of Pay will be used with any updated changes throughout the entire duration of this project. Current State of Alaska, Department of Labor wages rates can be obtained from the State of

Alaska website (<http://www.labor.state.ak.us/lss/pamp600.htm>) and have been attached to this Section.

BID FORM

MUNICIPALITY OF SKAGWAY, ALASKA — WWTP ODOR CONTROL IMPROVEMENTS PROJECT

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Attachments:

- Contracting Officer Documentation
- Non-Collusion Declaration
- Bonding Exempt Checklist

ARTICLE 1 – BID RECIPIENT

- 1.01 This Bid is submitted to: Municipality of Skagway, Alaska: herein after referred to as Owner.
- 1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 – BIDDER’S ACKNOWLEDGEMENTS

- 2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.
- 2.02 BIDDER will sign and deliver the required number of counterparts of the AGREEMENT with the Bonds and other documents required by the Bidding Requirements within 15 days after the date of OWNER's Notice of Award.

ARTICLE 3 – BIDDER’S REPRESENTATIONS

- 3.01 In submitting this Bid, Bidder represents that:
 - A. Bidder has examined and carefully studied the Bidding Documents, and any data and reference items identified in the Bidding Documents, and hereby acknowledges receipt of the following Addenda:

<u>Addendum No.</u>	<u>Addendum, Date</u>
_____	_____
_____	_____
_____	_____
_____	_____

- B. Bidder has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfied itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
- C. Bidder is familiar with and has satisfied itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work.
- D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.
- E. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and any Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information,

observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs.

- F. Bidder agrees, based on the information and observations referred to in the preceding paragraph, that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.
- G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
- H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and confirms that the written resolution thereof by Engineer is acceptable to Bidder.
- I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work.
- J. The submission of this Bid constitutes an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, and that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

ARTICLE 4 – BIDDER'S CERTIFICATION

4.01 Bidder certifies that:

- A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;
- B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;
- C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and
- D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:
 - 1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process;
 - 2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
 - 3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and
 - 4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

ARTICLE 5 – BASIS OF BID

5.01 This section, in general, describes the bid items included in the bid schedule. The description of Bid Items is provided for clarity purposes only. It is not intended to replace, supersede, or preclude any information in the plans and specifications. Unless specified otherwise, all lump sum bid items will be paid as a percentage of actual work complete. Percent complete will be based on the schedule of values submitted by the Contractor and approved by the engineer. The schedule of values will break down the lump sum bid items into discrete work activities beyond the breakdown shown on the Bid Form. The schedule of values must be submitted and approved by the Engineer before the Contractor can request a payment for work under this Contract. The BASIS OF BID shall be the Total Lump Sum Bid (Total of Lump Sum Bid Items A-B).

Descriptions of the project Bid Items are provided below:

5.02 **Item A – BASE BID;** This lump sum Bid Item includes all other work not specifically designated in all other Bid Items. Provide all labor, equipment, materials and services to construct and commence operation of the Skagway WWTF Odor Control Improvements. The Bid Item includes work shown and/or specified for Odor Control Improvements to Building #1 including Installation of Building #1 Ultraviolet Odor Control Unit (Owner-furnished), Corrosion Resistant Odor Control Fan (Owner-furnished) with Sound Attenuating Walk-in Enclosure, Fabric Curtain System around Truck Load-out Area, Building #1 Odor Control Duct and Accessories, electrical, instrumentation, equipment, civil related work, mechanical related work, COVID-19 special conditions, and all state and local permits, complete.

5.03 **Item B – Cash Allowance for Hidden Utilities;** This lump sum Bid Item includes the cash allowance for hidden utilities as described in Section 01 21 00 Allowance (for Lump Sum Projects)

5.04 Contractor Take Note: It is the intent of the Owner to award a contract to the lowest responsive, responsible bidder on the basis of the combined total of Bid Items. Bidders must include lump sum bid prices for all Bid Items. Bids received that do not include pricing for Bid Items will be considered non-responsive. The purpose and intent of using a basis of award is to allow the Owner to construct the greatest possible number of Bid Items based upon the responsible bids received and the funding available. The Owner reserves the right to authorize construction of any combination of, or all of, the bid alternates defined at the bid amounts presented in the Contractor’s Bid Proposal.

Total Lump Sum Bid: Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

Schedule A - CAPITAL COST TABLE

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>	<u>QTY</u>	<u>PRICE</u>	<u>TOTAL</u>
A.	Base Bid which includes:				
1.	Mobilization (Division 1)	Lump Sum	All Req'd	\$ _____	\$ _____

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>	<u>QTY</u>	<u>PRICE</u>	<u>TOTAL</u>
2.	Fabric Curtain System (Section 10 65 00)	Lump Sum	All Req'd	\$ _____	\$ _____
3.	Odor Control Duct and Accessories (Section 40 10 16)	Lump Sum	All Req'd	\$ _____	\$ _____
4.	Mist and Grease Eliminator Filters (Section 40 27 06)	Lump Sum	All Req'd	\$ _____	\$ _____
5.	Odor Control Fan Accessories (Section 44 11 10)	Lump Sum	All Req'd	\$ _____	\$ _____
6.	Installation of Owner-furnished Equipment (Sections 01 12 100; 44 11 10; 44 31 43)	Lump Sum	All Req'd	\$ _____	\$ _____
7.	Odor Control Equipment – Balancing and Testing (Section 44 31 83)	Lump Sum	All Req'd	\$ _____	\$ _____
8.	Site Work – including Concrete (Divisions 01 and 03)	Lump Sum	All Req'd	\$ _____	\$ _____
9.	Mechanical - HVAC (Division 23)	Lump Sum	All Req'd	\$ _____	\$ _____
10.	Electrical (Division 26)	Lump Sum	All Req'd	\$ _____	\$ _____
11.	COVID-19 Quarantine (Section 01 11 06)	Contingent Sum	All Req'd	\$ _____	\$ _____

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>	<u>QTY</u>	<u>PRICE</u>	<u>TOTAL</u>
12.	COVID-19 Shutdown (Section 01 11 06)	Contingent Sum	All Req'd	\$_____	\$_____
13.	COVID-19 Job Site Work Plan (Section 01 11 06)	Lump Sum	All Req'd	\$_____	\$_____
14.	All work required to complete the Contract not included in Items #1-#13.	Lump Sum	All Req'd	\$_____	\$_____
	Subtotal of all items in Bid Item A – Base Bid.	Lump Sum	All Req'd	\$_____	\$_____
					Dollars
(words)					
B	Cash Allowance for Hidden Utilities (Section 01 21 00.	Lump Sum	All Req'd	\$ <u>10,000</u>	\$ <u>10,000</u>
					Dollars
(words)					
C	Grand Total - Bid Price (Items A thru B)				
					Dollars
(words)					

Note: Unit and lump sum prices must be shown in words and figures in the proposal for each item being bid, and in the event of discrepancy the words shall control.

ARTICLE 6 – TIME OF COMPLETION

- 6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.
- 6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 7 – ATTACHMENTS TO THIS BID

- 7.01 The following documents are submitted with and made a condition of this Bid:
 - A. Required Bid security;
 - B. List of Proposed Subcontractors;
 - C. List of Proposed Suppliers;
 - D. List of Project References;
 - E. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such license within the time for acceptance of Bids;
 - F. Contractor’s License No.:
 - G. Contracting Officer Documentation; and
 - H. Non-Collusion Declaration for Municipality of Skagway
 - I. Bonding Exempt Checklist
 - J. Bonding Paperwork

ARTICLE 8 – DEFINED TERMS

- 8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 9 – BID SUBMITTAL

BIDDER: *Indicate correct name of bidding entity*

By: _____
Signature

Printed name
(If Bidder is a corporation, a limited liability company, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest: _____
Signature

Printed name

Title: _____

Submittal Date:

Address for giving notices:

Telephone Number:

Fax Number:

Contact Name and e-mail address:

Bidder's License No.:

(where applicable)

Contracting Officer Document

(Project Name)

Company Name

Company Address (Street or P.O. Box, City, State, Zip)

**TO THE BOROUGH MANAGER
MUNICIPALITY OF SKAGWAY**

In compliance with your Request for Bids dated, _____, the Undersigned proposes to furnish and deliver all the materials, supplies and equipment, including mobilization and demonization, and do all the work and labor required in the construction of the above referenced Project, located at or near **Skagway, Alaska**, according to the plans and specifications and for the amount and prices named herein as indicated on the Project Bid Form consisting of **1** sheet, which is made a part of this Bid.

The Undersigned declares that he has carefully examined the contract requirements and that he has made a personal examination of the site of the work; that he understands that the quantities, where such are specified in the Project Bid Form or on the plans for this project, are approximate only and subject to increase or decrease, and that he is willing to perform increased or decreased quantities of work at unit prices bid under the conditions set forth in the Contract Documents.

The Undersigned hereby agrees to execute the contract within 7 calendar days or such further time as may be allowed in writing by the Borough Manager, after receiving notification of the acceptance of this bid, and it is hereby mutually understood and agreed that in the case the Undersigned does not, the accompanying bid security shall be forfeited to the Municipality of Skagway as liquidated damages, and the Borough Manager may proceed to award the contract to others.

Signature: _____

THIS IS TO CERTIFY that on this _____ day of _____, 20____, _____
_____ personally appeared before me, to me known to be the individual described in and who executed the within Bid Form for the Municipality of Skagway and acknowledged that he signed the same as his free and voluntary act and deed, for the uses and purposes therein mentioned.

GIVEN UNDER MY HAND and official seal the day and year last above written.

Notary Public in and for Alaska

My commission expires: _____

NON-COLLUSION DECLARATION FOR MUNICIPALITY OF SKAGWAY

The undersigned declares, under penalty of perjury under the laws of the United States, that neither he nor the firm, association, or corporation of which he is a member, has, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with this bid.

The undersigned has read the foregoing and hereby agrees to the conditions stated therein by affixing his signature below:

Signature of Authorized Company representative

Typed name and Title of Authorized Company Representative

Phone Number

Fax Number

THIS IS TO CERTIFY that on this _____ day of _____, 20____, _____
_____ personally appeared before me, to me
known to be the individual described in and who executed the within Non-Collusion Declaration for the
Municipality of Skagway and acknowledged that he signed the same as his free and voluntary act and deed,
for the uses and purposes therein mentioned.

GIVEN UNDER MY HAND and official seal the day and year last above written.

Notary Public in and for Alaska
My commission expires: _____

BONDING EXEMPTION CHECKLIST – MUNICIPALITY OF SKAGWAY

Contractors are exempt from payment, performance and material bonding requirements for projects over \$50,000 and not exceeding \$150,000 if the following conditions apply. Please complete and submit the Bonding Exemption Checklist entirely in all cases.

- 1. Has Contractor been licensed in the State of Alaska for **at least** two (2) years? Please provide documentation. (If answer is no to this question and no documentation is provided, then a letter from your bonding company stating you are bondable for this project is required, or provide a letter from a responsible bank in the United States stating that you have enough money to set up an escrow account in the name of the Municipality to equal the value of the contract.)
 Yes No
- 2. Has Contractor defaulted on a contract during the last three (3) years? (If answer is yes to this question, a letter from your bonding company stating you are bondable for this project is required, or provide a letter from a responsible bank in the United States stating that you have enough money to set up an escrow account in the name of the Municipality to equal the value of the contract.)
 Yes No
- 3. Please attach a financial statement prepared within the last nine (9) months, certified by a public accountant, demonstrating that the contractor has a net worth of not less than twenty percent (20%) of the amount of the contract. Bidder must place their financial information in a sealed envelope marked “Financial Information, Proprietary”. All financial paperwork will remain confidential. Is financial statement attached? (If answer is no to this question, a letter from your bonding company stating you are bondable for this project is required, or provide a letter from a responsible bank in the United States stating that you have enough money to set up an escrow account in the name of the Municipality to equal the value of the contract.)
 Yes No
- 4. Does the total amount of **all** contracts which contractor anticipates performing during the contract period exceed your net worth by more than seven (7) times? Please provide documentation. (If answer is yes to this question or no documentation provided, then a letter from your bonding company stating you are bondable for this project is required, or provide a letter from a responsible bank in the United States stating that you have enough money to set up an escrow account in the name of the Municipality to equal the value of the contract.)
 Yes No
- 5. Is letter from bonding company or bank provided?
 Yes No

Signature: _____

THIS IS TO CERTIFY that on this _____ day of _____, 20____, _____ personally appeared before me, to me known to be the individual described in and who executed the within the Bonding Exemption Checklist for the Municipality of Skagway and acknowledged that he signed the same as his free and voluntary act and deed, for the uses and purposes therein mentioned.

GIVEN UNDER MY HAND and official seal the day and year last above written.

Notary Public in and for Alaska
My commission expires: _____

BID BOND (PENAL SUM)
For
Skagway Wastewater Treatment Facility Odor Control Improvements Project
Municipality of Skagway, Alaska
BID BOND

Any singular reference to Bidder, Surety, Owner or other party shall be considered plural where applicable.

BIDDER (*Name and Address*):

SURETY (*Name, and Address of Principal Place of Business*):

OWNER (*Name and Address*):

BID

Bid Due Date:

Description **Skagway WWTF Odor Control Improvements Project**

BOND

Bond Number:

Date:

Penal sum _____ \$ _____

(Words)

(Figures)

Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.

BIDDER

SURETY

(Seal)

(Seal)

Bidder's Name and Corporate Seal

Surety's Name and Corporate Seal

By:

Signature

By:

Signature (Attach Power of Attorney)

Print Name

Print Name

Title

Title

Attest:

Signature

Attest:

Signature

Title

Title

Note: Addresses are to be used for giving any required notice.

Provide execution by any additional parties, such as joint venturers, if necessary.

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond shall be Owner's sole and exclusive remedy upon default of Bidder.
2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.
3. This obligation shall be null and void if:
 - 3.1 Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or
 - 3.2 All Bids are rejected by Owner, or
 - 3.3 Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).
4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.
5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.
6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety and in no case later than one year after the Bid due date.
7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.
9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.
10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.
11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

SECTION 00 52 13



MUNICIPALITY OF SKAGWAY

GATEWAY TO THE KLONDIKE
P.O. BOX 415, SKAGWAY, ALASKA 99840
(PHONE) (907) 983-2297
(FAX) (907) 983-2151
www.skagway.org

AN AGREEMENT BETWEEN CONTRACTOR AND THE MUNICIPALITY OF SKAGWAY

This agreement is entered into between (CONTRACTOR name) (hereinafter referred to as CONTRACTOR) and the MUNICIPALITY of Skagway (hereinafter referred to as MUNICIPALITY) for the purpose of (named project). By signature on this agreement the parties agree to the following terms and conditions:

I. SCOPE OF WORK:

- A) CONTRACTOR shall perform services as directed by the MUNICIPALITY of Skagway for (project), per the request for bids (Attachment A) and CONTRACTORS bid submitted on (date) (Attachment B). CONTRACTOR shall follow the Bid Documents and Plans that were part of the advertised RFB and all general conditions, special conditions, and addendum, including all questions by bidders and responses.
- B) CONTRACTOR shall verify all site measurements and locations and follow the conditions listed below:
 - 1) (Project requirements listed)
 - 2) The CONTRACTOR, for and in consideration of the payment or payments herein specified and agreed to by MOS, hereby covenants and agrees to furnish all labor, equipment, transportation, mobilization and demobilization, and materials required to complete the project at Skagway, Alaska in accordance with the terms and conditions of the RFB Titled **Project**

II. COMPENSATION AND DURATION

- A. CONTRACTOR has submitted a bid in the amount of \$(0.00) (Dollar amount written out) to perform the work as outlined and described in the, RFB, CONTRACTORS submitted bid, and the scope of work described above. The

MUNICIPALITY agrees to pay CONTRACTOR an amount not to exceed that as specified and accepted in the bid proposal upon completion of the project. The MUNICIPALITY must receive payment requests no later than 4-business days prior to scheduled finance meetings of the Assembly finance committee.

- B. The parties expressly agree that CONTRACTOR shall be and is an independent CONTRACTOR and is not an employee or agent of MUNICIPALITY, and is, therefore, entitled to no insurance coverage, whether workers' compensation or otherwise and no other benefits accorded to MUNICIPALITY. No withholding, FICA, or other taxes (whether income, sales or otherwise) or other amounts will be withheld from the payments due to CONTRACTOR, it being understood that CONTRACTOR is solely responsible therefore, provided MUNICIPALITY shall be entitled to withhold certain amounts from any payments as have been provided for elsewhere in this Agreement.
- C. The CONTRACTOR agrees to receive the total amount as set forth in the RFB and the Schedule of Values as full compensation for furnishing all the equipment, materials, transportation, mobilization and demobilization and labor which may be required in the performance and completion of the whole work to be done under this Contract, and in all respects to complete the Contract to the satisfaction of MUNICIPALITY.
- D. CONTRACTOR shall have all work completed no later than (date).

III. MUNICIPALITY'S RESPONSIBILITY

- A. MUNICIPALITY shall designate a person to act as the MUNICIPALITY'S representative with respect to the services to be rendered under this agreement. This representative shall have complete authority to transmit instructions, receive information, interpret and define the MUNICIPALITY'S policies and decisions with respect to the CONTRACTOR'S services. Designation of a Municipal representative shall not change any of the CONTRACTOR'S obligations and responsibilities under this Contract. CONTRACTOR shall remain responsible and liable for all acts and omissions related to the CONTRACTOR's means and methods of performing the work.

IV. CONTRACTOR'S RESPONSIBILITIES

- A. CONTRACTOR shall provide a representative for the project who shall have complete authority to transmit instructions, receive information, interpret and define the CONTRACTOR'S policies and decisions with respect to the project. This provision is a material provision of the contract and the failure of the CONTRACTOR to have an available representative may result in the Municipality terminating the contract for this breach, stopping all or part of the project until the CONTRACTOR fully complies with this provision, or any other remedy or action the Municipality determines to be in the best interests of the project and Municipality.
- B. CONTRACTOR agrees that all work will meet all federal state and local laws, and will be of the highest quality workmanship. CONTRACTOR agrees that

all material and labor shall be in strict and entire conformity with the terms, specifications and conditions of the RFB, and will abide by and perform all stipulations, covenants and agreements specified in the RFB. The CONTRACTOR shall comply with the Migratory Bird Treaty Act and shall comply with the provisions of those federal laws as applicable to migratory birds, eggs, and nests in Skagway Borough

- C. If any equipment, material or labor shall be rejected by MUNICIPALITY as defective or unsuitable, the equipment, labor or materials shall be removed or replaced with other equipment, labor or materials specified by MUNICIPALITY, at the sole cost and expense of the CONTRACTOR.
- D. CONTRACTOR shall not begin work on any additional services, which are not included in the Agreement as provided for the RFB until the MUNICIPALITY has authorized performance of such services in writing specifying the work to be performed and the time for performance. CONTRACTOR shall provide the MUNICIPALITY with a bid estimate of the costs of the additional work and it is agreed both the CONTRACTOR and the MUNICIPALITY shall sign an addendum to this Agreement prior to any additional work for the amount to be paid to the CONTRACTOR for the additional work. CONTRACTOR agrees and acknowledges that no oral authorization for additional work will be honored or paid.
- E. CONTRACTOR shall be responsible for performing all services as described in this Agreement for the price quoted in the accepted proposal.
- F. CONTRACTOR covenants, warrants and represents that CONTRACTOR has no interest and shall not acquire any interest, direct or indirect, which would conflict in any manner with the subject matter or the performance of this Agreement. CONTRACTOR further covenants, warrants and represents that in the performance of this Agreement, no person having any such interest shall be employed.

V: INSURANCE AND INDEMNIFICATION

- A. CONTRACTOR shall present to the MUNICIPALITY a certificate of insurance showing that the CONTRACTOR has obtained at least two million dollars (\$2,000,000.00) general liability insurance, which certificate of insurance shall name the MUNICIPALITY of Skagway as an additional insured. Proof of such insurance shall be provided to the MUNICIPALITY as a condition of entering the contract. Failure to provide the certificate of insurance as required by this provision at the time of signing the contract shall constitute a material breach by the CONTRACTOR and the MUNICIPALITY may choose not to proceed with the CONTRACTOR in its sole discretion. Failure to maintain such insurance shall constitute a material breach of contract and entitle the MUNICIPALITY to terminate the CONTRACTOR and this Agreement in its sole discretion. The certificate of insurance must establish that the MUNICIPALITY is named as an additional insured on such policy, and that the insurer thereof shall notify the MUNICIPALITY twenty (20) days before the policy is canceled

or terminated. The CONTRACTOR shall indemnify, defend and hold harmless the MUNICIPALITY of Skagway from any and all claims for injury or damage to persons or property, including death, arising out of or relating to the CONTRACTOR'S acts or omissions. CONTRACTOR'S insurance coverage shall apply to any coverage carried by the MUNICIPALITY which may cover the work specified in this Agreement. CONTRACTOR'S insurance carrier must be an admitted carrier in the State of Alaska or must be Best Rated or better. "CONTRACTOR" shall be defined to include CONTRACTOR'S employees, subcontractors, consultants, representatives, and invitees for purposes of the defend and indemnification provisions of this Paragraph.

- B. Worker's Compensation Insurance is required in compliance with the laws of the State of Alaska, AS 23.30 et seq., and federal jurisdiction where the work is being performed.
- C. Professional Liability (Errors and Omissions) and Professional Pollution Liability and Contractors' Pollution Liability – 2,000,000 each claim and in the aggregate.

VI: TERMINATION AND SUSPENSION

- A. The Municipality reserves the right to terminate the services of the CONTRACTOR at any time when the Municipality determines that termination is in the best interests of the Municipality. If the Municipality terminates the contract pursuant to this section, the Municipality shall notify the CONTRACTOR in writing as of the effective date to stop work and the CONTRACTOR shall immediately stop all work, including providing direction to subcontractors to stop and to cease from ordering any materials or supplies for the Project. Upon termination pursuant to this section, CONTRACTOR shall have sixty (60) days to submit any and all claims to the Municipality for any unpaid work actually performed by the CONTRACTOR before the date of termination and for which the CONTRACTOR has not been paid, together with all back-up documentation in support of the claim. "Unpaid work" is defined as actual work performed in accordance with the specifications and project schedule and "unpaid work" is specifically not to include the costs of the work to the CONTRACTOR. The failure of the CONTRACTOR to submit a claim within 60 days forever waives any claim by the CONTRACTOR based upon the Municipality's termination for any payment for work claimed by the CONTRACTOR to have not been paid as of the date of termination. CONTRACTOR and the Municipality agree to make a good faith effort to resolve any claim submitted by the CONTRACTOR pursuant to this section within thirty days (30) of receipt by the Municipality, unless that time is otherwise extended by the parties in writing. If the parties fail to reach an agreement on payment to the CONTRACTOR within the 30 days, the Municipality shall pay the amount determined by the Municipality to be fair

and reasonable, based on the back-up documents provided by the CONTRACTOR and the Municipality's records. In the event the parties do not reach agreement, the CONTRACTOR may pursue its remedies pursuant to Section IX (k) below unless the CONTRACTOR failed to submit the claim within 60 days of termination.

- B. Suspension of work caused by Acts of God, which are beyond the control of the CONTRACTOR, shall not be cause for termination. If such Acts suspend work on the project, any delay caused will be negotiated and an addendum to this contract will be issued, which will be signed by both the MUNICIPALITY and the CONTRACTOR, outlining the time schedule and costs associated with any delay in substantially completing the project.

VII: LIQUIDATED DAMAGE

- A. The CONTRACTOR agrees that if the project is not completed in accordance with the Proposal specification and this Agreement, the CONTRACTOR shall be liable to the MUNICIPALITY for the following:

- 1) The CONTRACTOR will forfeit all payments outstanding under the Bid Proposal.
- 2) The CONTRACTOR will pay the MUNICIPALITY up to \$1500 per day as liquidated damages if the project is not completed in accordance with the Proposal specifications. If the MUNICIPALITY determines that the project is defective and that repairs must be made to meet the Proposal specifications, the CONTRACTOR will pay the MUNICIPALITY up to \$1500 per day for each day that the project fails to meet the approval of the MUNICIPALITY, up to the time that the MUNICIPALITY agrees that the project has been completed in accordance with the Proposal specifications. If there are any certifications or permits necessary for acceptance of the project, the project shall not be determined complete until the CONTRACTOR has secured all such certifications or permits and liquidated damages shall continue to accrue.

VIII: EQUAL EMPLOYMENT OPPORTUNITY.

- A. The CONTRACTOR will not discriminate against any employee or applicant for employment in violation of law, to include without limitation, because of race, color, religion, sex, national origin, physical handicap, age, or status as a disable veteran. The CONTRACTOR shall take affirmative action to ensure that applicants are employed and the employees are treated during employment without regard to their race, color, religion, sect, national origin, physical handicap, age, or status as a disabled veteran. Such actions shall include, but not be limited to the following: Employment, upgrading, demotions, or transfers; recruitment or recruitment advertising; layoff or terminations; rates

of pay or other forms of compensation; selection for training, including apprenticeship; and participation in recreational and educational activities. The CONTRACTOR agrees to post in conspicuous places in his/her places of work available for employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause. The CONTRACTOR will, in all solicitations or advertisements for employees placed by or on behalf of the CONTRACTOR, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, national origin, physical handicap, age, status as a disabled veteran. The CONTRACTOR will cause the foregoing provisions to be inserted in all subcontracts for any work covered by this Agreement.

IX: MISCELLANEOUS

A. Written notice shall be provided to the parties, by certified mail, return receipt requested, at the following addresses:

Municipality	Municipality of Skagway PO Box 415 Skagway, AK 99840 Attn: Brad Ryan, Borough Manager
Contractor	(Contractor Information)

- B. CONTRACTOR agrees that the MUNICIPALITY shall have the right to inspect any or all of the project and any books, papers, records, and/or accounts of records of the CONTRACTOR at any reasonable time. All original books, papers, records and accounts related to this project shall be maintained for a minimum of three years after the completion of the project.
- C. This Agreement is binding upon the heirs, successors and assign of the parties.
- D. This Agreement cannot be assigned without prior written consent of the other party. This provision is a material provision of the contract and the assignment by the CONTRACTOR without prior written approval of the Municipality may result in the Municipality terminating the contract for this breach, stopping all or part of the project until the CONTRACTOR fully complies with this provision, or any other remedy or action the Municipality determines to be in the best interests of the project and Municipality, all in the sole discretion of the Municipality. The Municipality will not consent to any assignment to a LLC without a personal guarantee by the CONTRACTOR or a guarantee by all of the members of the LLC.

- E.** This Agreement represents the entire Agreement of the parties and no other Agreement whether oral or written which is not specifically set forth in this Agreement or an addendum to this Agreement will have any force or effect upon the other party.
- F.** This Agreement can be modified if agreed to by both parties in writing. Any modification will address any changes in cost and will be agreed to in writing prior by both parties. Any modification to the bid proposal or price done without the written consent of the MUNICIPALITY by the CONTRACTOR shall be void for which the Municipality shall have no liability or obligation to pay. CONTRACTOR agrees and acknowledges that no employee nor the borough manager, nor the mayor, nor any assembly member nor any representative of the Municipality has any actual or apparent authority to orally modify or change any of the terms of this contract.
- G.** CONTRACTOR's or the MUNICIPALITY'S waiver of any term or condition in this Agreement shall not constitute a waiver of any other term or condition in this Agreement.
- H.** If any term of this Agreement is held to be invalid, void or unenforceable by a court of competent jurisdiction, the remaining provisions of this Agreement shall be valid and binding upon the parties.
- I.** The CONTRACTOR agrees to abide by all federal, state and local laws, ordinances and regulations in the performance of the project.
- J.** Titles and headings to sections are inserted for convenience of reference only and are not intended to be a part of or to affect the meaning or interpretation of this Agreement.
- K.** The Superior Court for the State of Alaska, First Judicial District at Juneau, Alaska shall be the exclusive jurisdiction for any action of any kind and any nature arising out of or related to this Agreement or arising out of or relating to the performance of this Agreement. CONTRACTOR agrees that venue for trial in any action shall be in Skagway, Alaska. The laws of the State of Alaska shall govern the rights and obligations of the parties. The CONTRACTOR specifically waives any right or opportunity to request a change of venue for trial pursuant to A.S. 22.10.040.

The CONTRACTOR acknowledges that the CONTRACTOR has read and understands the terms of this Agreement and has had the opportunity to review the Agreement with counsel of his/her choice, and is executing this Agreement of his/her own free will. CONTRACTOR acknowledges and agrees that CONTRACTOR is not relying on any representations by any Municipal employee, the Mayor, an assembly member, the borough attorney, the borough manager or any consultant of the MUNICIPALITY in deciding to enter this Agreement and perform this project.

The term of the agreement is the period of time from the date this Agreement is made and entered into, to the time at which CONTRACTOR fulfills its obligations under this Agreement. CONTRACTOR warrants and represents that the person who executes and signs this Agreement on behalf of the CONTRACTOR is lawfully authorized to execute and sign the Agreement, and to bind CONTRACTOR to the terms and conditions of the Agreement and the RFB.

Andrew Cremata, Mayor
For the Municipality of Skagway

Contractor
For (Company)

Date _____

Date _____

ATTEST:

Emily Deach, Borough Clerk
(SEAL)

PERFORMANCE BOND

CONTRACTOR *(name and address):*

SURETY *(name and address of principal place of business):*

OWNER: Municipality of Skagway, Alaska; P.O. BOX 415, Skagway, Alaska 99840

CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description *(name and location):*

BOND

Bond Number:

Date *(not earlier than the Effective Date of the Agreement of the Construction Contract):*

Amount:

Modifications to this Bond Form: None See Paragraph 16

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

SURETY

Contractor's Name and Corporate Seal *(seal)*

Surety's Name and Corporate Seal *(seal)*

By: _____
Signature

By: _____
Signature *(attach power of attorney)*

Print Name

Print Name

Title

Title

Attest: _____
Signature

Attest: _____
Signature

Title

Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after:

3.1 The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

3.2 The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

3.3 The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence,

to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:

5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:

7.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

7.2 additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and

7.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.

9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.

10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

11. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit shall be applicable.

12. Notice to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

14. Definitions

14.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims

for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

14.2 Construction Contract: The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

14.3 Contractor Default: Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

14.4 Owner Default: Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

14.5 Contract Documents: All the documents that comprise the agreement between the Owner and Contractor.

15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

16. Modifications to this Bond are as follows:

PAYMENT BOND

CONTRACTOR *(name and address)*:

SURETY *(name and address of principal place of business)*:

OWNER: Municipality of Skagway, Alaska; P.O. BOX 415, Skagway, Alaska 99840

CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description *(name and location)*:

BOND

Bond Number:

Date *(not earlier than the Effective Date of the Agreement of the Construction Contract)*:

Amount:

Modifications to this Bond Form: None See Paragraph 18

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

SURETY

_____ *(seal)*

Contractor's Name and Corporate Seal

_____ *(seal)*

Surety's Name and Corporate Seal

By: _____
Signature

By: _____
Signature *(attach power of attorney)*

Print Name

Print Name

Title

Title

Attest: _____
Signature

Attest: _____
Signature

Title

Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.
2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.
4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.
5. The Surety's obligations to a Claimant under this Bond shall arise after the following:
 - 5.1 Claimants who do not have a direct contract with the Contractor,
 - 5.1.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
 - 5.1.2 have sent a Claim to the Surety (at the address described in Paragraph 13).
 - 5.2 Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).
6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.
7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:
 - 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and
 - 7.2 Pay or arrange for payment of any undisputed amounts.
 - 7.3 The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.
8. The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.
9. Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.
10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.
11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

12. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.
13. Notice and Claims to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.
14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.
15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.
16. **Definitions**
 - 16.1 **Claim:** A written statement by the Claimant including at a minimum:
 1. The name of the Claimant;
 2. The name of the person for whom the labor was done, or materials or equipment furnished;
 3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
 4. A brief description of the labor, materials, or equipment furnished;
 5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
 6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
 7. The total amount of previous payments received by the Claimant; and
 - 16.2 **Claimant:** An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.
 - 16.3 **Construction Contract:** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.
 - 16.4 **Owner Default:** Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.
 - 16.5 **Contract Documents:** All the documents that comprise the agreement between the Owner and Contractor.
8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.
17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.
18. Modifications to this Bond are as follows:

SECTION 00 62 16
CERTIFICATE OF LIABILITY INSURANCE



CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME	
	PHONE (Area, No., Ext.)	FAX (Area, No.)
INSURED	INSURER A	
	INSURER B	
	INSURER C	
	INSURER D	
	INSURER E	

COVERAGES CERTIFICATE NUMBER: REVISION NUMBER:

THIS IS TO CERTIFY THAT ALL POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NO WARRANTY AS TO ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSURANCE TYPE	TYPE OF INSURANCE	APPLICABLE PERIOD	POLICY NUMBER	POLICY EFF. DATE	POLICY EXPIRATION DATE	LIMITS
GENERAL LIABILITY	COMMERCIAL GENERAL LIABILITY CLAIMS MADE BASIS					EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Occurrence) \$ MED EXP (Any one person) \$ PERSONAL & ADVERTISING \$ GENERAL AGGREGATE \$ PRODUCTS & COMPLETED OPERATIONS \$
	COMMERCIAL GENERAL LIABILITY PER POLICY	INSURER				
AUTOMOBILE LIABILITY	ANY AUTO MEDICAL PAID HIRING/LEASING UMBRELLA LIAB EXCESS LIAB	RESTRICTED UNRESTRICTED AUTOS				UNRESTRICTED BODILY INJURY/PROPERTY DAMAGE \$ BODILY INJURY (Per person) \$ BODILY INJURY (Per household) \$ TOTAL BODILY INJURY (Per accident) 0% deductible \$ EACH OCCURRENCE \$ AGGREGATE \$
	WORKERS COMPENSATION AND EMPLOYERS LIABILITY ANY OCCURRENCE AFTER OCCURRENCE DATE DISEASE (12 MONTH) POLICY EXPIRATION DATE	Y/N				DISABILITY BENEFIT \$ MEDICAL BENEFIT \$ INDIRECT BENEFIT \$ DISEASE - POLICY LIMIT \$

DESCRIPTION OF OPERATIONS/LOCATIONS/VOLICERS (Attach ACORD 10 - Additional Remarks Schedule, if more space is required)

CERTIFICATE HOLDER	CANCELLATION
	SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.
	AUTHORIZED REPRESENTATIVE

END OF SECTION

RELEASE AND WAIVER OF MECHANICS AND MATERIALMEN'S LIENS
FOR SUBCONTRACTORS AND
MATERIAL AND EQUIPMENT SUPPLIERS
EMPLOYED BY THE CONTRACTOR

PROJECT TITLE: Wastewater Treatment Facility Odor Control Improvements Project

OWNER NAME: Municipality of Skagway, Alaska

STATE OF _____ COUNTY OF _____

_____ is _____
(Name) (Title)
of _____
(Company Name)

and is familiar with the facts herein stated;

That said person or Company (hereinafter referred to as subcontractor/supplier) performed work, labor, services and/or furnished material for the work as defined in the Contract Documents, as defined in the agreement between the said Owner and _____ (hereinafter referred to as contractor) for the said project. (Name of General Contractor)

That said subcontractor/supplier, has been paid \$ _____ by the said Contractor under the terms and conditions of its contract and/or purchase orders including labor, material and equipment furnished by it through _____, 20____, the receipt and sufficiency of which is hereby acknowledged, the undersigned does hereby waive all liens and claims which it may have against the above project/property through the aforesaid date, and further, the undersigned represents that no other person or party has any right to a lien on the above project/property on account of any work performed or materials furnished to said subcontractor/supplier, or person, under its contract and/or purchase orders.

Dated this _____ day of _____, 20____.

(Name of Subcontractor/Supplier)

By: _____

Title: _____

Subscribed and sworn to before me, the undersigned Notary Public within and for the State of _____ and the County of _____ this _____ day of _____, 20____, in the City of _____.

My Commission Expires:

Notary Public within and for said County and State

END OF SECTION 00 65 20

SECTION 00 72 13
EJCDC C-700 GENERAL CONDITIONS

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by



Issued and Published Jointly by



These General Conditions have been prepared for use with the Agreement Between Owner and Contractor for Construction Contract (EJCDC® C-520, Stipulated Sum, or C-525, Cost-Plus, 2013 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other.

To prepare supplementary conditions that are coordinated with the General Conditions, use EJCDC's Guide to the Preparation of Supplementary Conditions (EJCDC® C-800, 2013 Edition). The full EJCDC Construction series of documents is discussed in the Commentary on the 2013 EJCDC Construction Documents (EJCDC® C-001, 2013 Edition).

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
 3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 5. *Bidder*—An individual or entity that submits a Bid to Owner.
 6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
 7. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
 8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.
 9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.
 10. *Claim*—(a) A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein: seeking an adjustment of Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract; or (b) a demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal; or seeking resolution of a contractual issue that Engineer

has declined to address. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. (“CERCLA”); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5101 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. (“RCRA”); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
12. *Contract*—The entire and integrated written contract between the Owner and Contractor concerning the Work.
13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents. .
15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
17. *Cost of the Work*—See Paragraph 13.01 for definition.
18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
20. *Engineer*—The individual or entity named as such in the Agreement.
21. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
22. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated in the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, does not establish a Hazardous Environmental Condition.
23. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

24. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
25. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date or by a time prior to Substantial Completion of all the Work.
26. *Notice of Award*—The written notice by Owner to a Bidder of Owner’s acceptance of the Bid.
27. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
28. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
29. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor’s plan to accomplish the Work within the Contract Times.
30. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.
31. *Project Manual*—The written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.
32. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative or “RPR” includes any assistants or field staff of Resident Project Representative.
33. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
34. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer’s review of the submittals and the performance of related construction activities.
35. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor’s Applications for Payment.
36. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.

37. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands furnished by Owner which are designated for the use of Contractor.
38. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
39. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.
40. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.
41. *Successful Bidder*—The Bidder whose Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.
42. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
43. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.
44. *Technical Data*—Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (a) subsurface conditions at the Site, or physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) or (b) Hazardous Environmental Conditions at the Site. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then the data contained in boring logs, recorded measurements of subsurface water levels, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical or environmental report prepared for the Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06.
45. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
46. *Unit Price Work*—Work to be paid for on the basis of unit prices.
47. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

48. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 Terminology

- A. The words and terms discussed in the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives:*
 1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.
- C. *Day:*
 1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.
- D. *Defective:*
 1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - a. does not conform to the Contract Documents; or
 - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - c. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or 15.04).
- E. *Furnish, Install, Perform, Provide:*
 1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
 4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.
- F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

- A. *Bonds*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.
- B. *Evidence of Contractor’s Insurance*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.
- C. *Evidence of Owner’s Insurance*: After receipt of the executed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or otherwise), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.
- B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 *Before Starting Construction*

- A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise specifically required by the Contract Documents), Contractor shall submit to Engineer for timely review:
 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;
 2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Initial Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.03.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
 3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

2.06 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.
- B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the recipient's use of software application packages, operating systems, or

computer hardware differing from those used in the drafting or transmittal of the items, or from those established in applicable transmittal protocols.

ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents.
- C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic or digital versions of the Contract Documents (including any printed copies derived from such electronic or digital versions) and the printed record version, the printed record version shall govern.
- D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
- E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

3.02 *Reference Standards*

- A. Standards Specifications, Codes, Laws and Regulations
 - 1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
 - 2. No provision of any such standard specification, manual, reference standard, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

- A. *Reporting Discrepancies:*
 - 1. *Contractor's Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict,

error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

2. *Contractor's Review of Contract Documents:* If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:
 - a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder.
- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.
- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to Owner and Contractor that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

- A. Contractor and its Subcontractors and Suppliers shall not:
 - 1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or
 - 2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

- A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to such date.

4.03 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 11.
- B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times and Contract Price. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.
- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
 2. abnormal weather conditions;
 3. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and
 4. acts of war or terrorism.
- D. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5.
- E. Paragraph 8.03 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.
- F. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor.

- G. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

- A. *Limitation on Use of Site and Other Areas:*
 - 1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
 - 2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.12, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part

by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.
- C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. *Loading of Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

- A. *Reports and Drawings:* The Supplementary Conditions identify:
 - 1. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site;
 - 2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); and
 - 3. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
 - 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
 - 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
 - 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

- A. *Notice by Contractor:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site either:
1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate; or
 2. is of such a nature as to require a change in the Drawings or Specifications; or
 3. differs materially from that shown or indicated in the Contract Documents; or
 4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

- B. *Engineer's Review:* After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine the necessity of Owner's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- C. *Owner's Statement to Contractor Regarding Site Condition:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.
- D. *Possible Price and Times Adjustments:*
1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
 - b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,

- c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
 - a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or
 - b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
 - c. Contractor failed to give the written notice as required by Paragraph 5.04.A.
 3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
 4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

5.05 *Underground Facilities*

- A. *Contractor's Responsibilities:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:
 1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and
 2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;
 - c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 - d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then Contractor shall, promptly after

becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.

- C. *Engineer's Review:* Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the Underground Facility in question; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and advise Owner in writing of Engineer's findings, conclusions, and recommendations. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
- D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question, addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. *Possible Price and Times Adjustments:*
 - 1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;
 - b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;
 - c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; and
 - d. Contractor gave the notice required in Paragraph 5.05.B.
 - 2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
 - 3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

5.06 *Hazardous Environmental Conditions at Site*

- A. *Reports and Drawings*: The Supplementary Conditions identify:
1. those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
 2. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
 2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off.
- H. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.
- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6 – BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of all of Contractor's obligations under the Contract. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the Supplementary Conditions, or other specific provisions of the Contract. Contractor shall also furnish such other bonds as are required by the Supplementary Conditions or other specific provisions of the Contract.
- B. All bonds shall be in the form prescribed by the Contract except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (as amended and supplemented) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.
- C. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds in the required amounts.
- D. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state or jurisdiction where any part of the Project is located, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the bond and surety requirements above.
- E. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.
- F. Upon request, Owner shall provide a copy of the payment bond to any Subcontractor, Supplier, or other person or entity claiming to have furnished labor or materials used in the performance of the Work.

6.02 *Insurance—General Provisions*

- A. Owner and Contractor shall obtain and maintain insurance as required in this Article and in the Supplementary Conditions.
- B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- C. Contractor shall deliver to Owner, with copies to each named insured and additional insured (as identified in this Article, in the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Contractor has obtained and is

maintaining the policies, coverages, and endorsements required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

- D. Owner shall deliver to Contractor, with copies to each named insured and additional insured (as identified in this Article, the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Owner has obtained and is maintaining the policies, coverages, and endorsements required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- E. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, shall not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.
- F. If either party does not purchase or maintain all of the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.
- G. If Contractor has failed to obtain and maintain required insurance, Owner may exclude the Contractor from the Site, impose an appropriate set-off against payment, and exercise Owner's termination rights under Article 16.
- H. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price shall be adjusted accordingly.
- I. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests.
- J. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner and other individuals and entities in the Contract.

6.03 *Contractor's Insurance*

- A. *Workers' Compensation:* Contractor shall purchase and maintain workers' compensation and employer's liability insurance for:
 - 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts.
 - 2. United States Longshoreman and Harbor Workers' Compensation Act and Jones Act coverage (if applicable).
 - 3. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees (by stop-gap endorsement in monopolist worker's compensation states).

4. Foreign voluntary worker compensation (if applicable).
- B. *Commercial General Liability—Claims Covered:* Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against:
1. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees.
 2. claims for damages insured by reasonably available personal injury liability coverage.
 3. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.
- C. *Commercial General Liability—Form and Content:* Contractor's commercial liability policy shall be written on a 1996 (or later) ISO commercial general liability form (occurrence form) and include the following coverages and endorsements:
1. Products and completed operations coverage:
 - a. Such insurance shall be maintained for three years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
 2. Blanket contractual liability coverage, to the extent permitted by law, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
 3. Broad form property damage coverage.
 4. Severability of interest.
 5. Underground, explosion, and collapse coverage.
 6. Personal injury coverage.
 7. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together); or CG 20 10 07 04 and CG 20 37 07 04 (together); or their equivalent.
 8. For design professional additional insureds, ISO Endorsement CG 20 32 07 04, "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.
- D. *Automobile liability:* Contractor shall purchase and maintain automobile liability insurance against claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy shall be written on an occurrence basis.
- E. *Umbrella or excess liability:* Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the paragraphs above. Subject to industry-standard exclusions, the coverage afforded shall follow form as to each and every one of the underlying policies.
- F. *Contractor's pollution liability insurance:* Contractor shall purchase and maintain a policy covering third-party injury and property damage claims, including clean-up costs, as a result

of pollution conditions arising from Contractor's operations and completed operations. This insurance shall be maintained for no less than three years after final completion.

- G. *Additional insureds*: The Contractor's commercial general liability, automobile liability, umbrella or excess, and pollution liability policies shall include and list as additional insureds Owner and Engineer, and any individuals or entities identified in the Supplementary Conditions; include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds; and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements.
- H. *Contractor's professional liability insurance*: If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance shall provide protection against claims arising out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable. It shall be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.
- I. *General provisions*: The policies of insurance required by this Paragraph 6.03 shall:
 - 1. include at least the specific coverages provided in this Article.
 - 2. be written for not less than the limits of liability provided in this Article and in the Supplementary Conditions, or required by Laws or Regulations, whichever is greater.
 - 3. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least 10 days prior written notice has been given to Contractor. Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.
 - 4. remain in effect at least until final payment (and longer if expressly required in this Article) and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract Documents.
 - 5. be appropriate for the Work being performed and provide protection from claims that may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable.
- J. The coverage requirements for specific policies of insurance must be met by such policies, and not by reference to excess or umbrella insurance provided in other policies.

6.04 *Owner's Liability Insurance*

- A. In addition to the insurance required to be provided by Contractor under Paragraph 6.03, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.
- B. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

6.05 *Property Insurance*

- A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the full insurable replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:
 - 1. include the Owner and Contractor as named insureds, and all Subcontractors, and any individuals or entities required by the Supplementary Conditions to be insured under such builder's risk policy, as insureds or named insureds. For purposes of the remainder of this Paragraph 6.05, Paragraphs 6.06 and 6.07, and any corresponding Supplementary Conditions, the parties required to be insured shall collectively be referred to as "insureds."
 - 2. be written on a builder's risk "all risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; water damage (other than that caused by flood); and such other perils or causes of loss as may be specifically required by the Supplementary Conditions. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance may be provided through other insurance policies acceptable to Owner and Contractor.
 - 3. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.
 - 4. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects).

5. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).
 6. extend to cover damage or loss to insured property while in transit.
 7. allow for partial occupation or use of the Work by Owner, such that those portions of the Work that are not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
 8. allow for the waiver of the insurer's subrogation rights, as set forth below.
 9. provide primary coverage for all losses and damages caused by the perils or causes of loss covered.
 10. not include a co-insurance clause.
 11. include an exception for ensuing losses from physical damage or loss with respect to any defective workmanship, design, or materials exclusions.
 12. include performance/hot testing and start-up.
 13. be maintained in effect, subject to the provisions herein regarding Substantial Completion and partial occupancy or use of the Work by Owner, until the Work is complete.
- B. *Notice of Cancellation or Change:* All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured.
- C. *Deductibles:* The purchaser of any required builder's risk or property insurance shall pay for costs not covered because of the application of a policy deductible.
- D. *Partial Occupancy or Use by Owner:* If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide notice of such occupancy or use to the builder's risk insurer. The builder's risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder's risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
- E. *Additional Insurance:* If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.05, it may do so at Contractor's expense.
- F. *Insurance of Other Property:* If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, such as tools, construction equipment, or other personal property owned by Contractor, a Subcontractor, or an employee of Contractor or a Subcontractor, then the entity or individual owning such property item will be responsible for deciding whether to insure it, and if so in what amount.

6.06 *Waiver of Rights*

- A. All policies purchased in accordance with Paragraph 6.05, expressly including the builder's risk policy, shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all Subcontractors, all individuals or entities identified in the Supplementary Conditions as insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.
- B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for:
 - 1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and
 - 2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 6.06.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them.
- D. Contractor shall be responsible for assuring that the agreement under which a Subcontractor performs a portion of the Work contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by builder's risk insurance and any other property insurance applicable to the Work.

6.07 *Receipt and Application of Property Insurance Proceeds*

- A. Any insured loss under the builder's risk and other policies of insurance required by Paragraph 6.05 will be adjusted and settled with the named insured that purchased the

policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

- B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.05 shall distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.
- C. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the money so received applied on account thereof, and the Work and the cost thereof covered by Change Order, if needed.

ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES

7.01 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.02 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.03 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.
- B. All materials and equipment incorporated into the Work shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and

guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.04 "Or Equals"

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.
 - 1. If Engineer in its sole discretion determines that an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer shall deem it an "or equal" item. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that:
 - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
 - 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
 - 3) it has a proven record of performance and availability of responsive service; and
 - 4) it is not objectionable to Owner.
 - b. Contractor certifies that, if approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. *Contractor's Expense:* Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.
- C. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal", which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

- D. *Effect of Engineer's Determination:* Neither approval nor denial of an "or-equal" request shall result in any change in Contract Price. The Engineer's denial of an "or-equal" request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.
- E. *Treatment as a Substitution Request:* If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer considered the proposed item as a substitute pursuant to Paragraph 7.05.

7.05 *Substitutes*

- A. Unless the specification or description of an item of material or equipment required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment under the circumstances described below. To the extent possible such requests shall be made before commencement of related construction at the Site.
 - 1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.
 - 2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.
 - 3. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
 - a. shall certify that the proposed substitute item will:
 - 1) perform adequately the functions and achieve the results called for by the general design,
 - 2) be similar in substance to that specified, and
 - 3) be suited to the same use as that specified.
 - b. will state:
 - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times,
 - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and
 - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
 - c. will identify:
 - 1) all variations of the proposed substitute item from that specified, and

- 2) available engineering, sales, maintenance, repair, and replacement services.
 - d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.
 - C. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
 - D. *Reimbursement of Engineer's Cost:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
 - E. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
 - F. *Effect of Engineer's Determination:* If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Proposal.

7.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.
- B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within five days.

- E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.
- F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
- G. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.
- H. On a monthly basis Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions.
- J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.
- K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.
- L. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.
- N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.

- O. Nothing in the Contract Documents:
1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier, or other individual or entity; nor
 2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

7.07 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.08 *Permits*

- A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work

7.09 *Taxes*

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

7.10 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It shall not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Owner or Contractor may give notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.11 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

7.12 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
 - 1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
 - C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
 - D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
 - E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
 - F. Contractor's duties and responsibilities for safety and protection shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).
 - G. Contractor's duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.13 *Safety Representative*

- A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

7.14 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or

exchanged between or among employers at the Site in accordance with Laws or Regulations.

7.15 *Emergencies*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

7.16 *Shop Drawings, Samples, and Other Submittals*

A. *Shop Drawing and Sample Submittal Requirements:*

1. Before submitting a Shop Drawing or Sample, Contractor shall have:
 - a. reviewed and coordinated the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
 - c. determined and verified the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that submittal, and that Contractor approves the submittal.
3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.

- B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.

1. *Shop Drawings:*

- a. Contractor shall submit the number of copies required in the Specifications.
- b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to

provide and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.D.

2. *Samples:*
 - a. Contractor shall submit the number of Samples required in the Specifications.
 - b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 7.16.D.
3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
- C. *Other Submittals:* Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.
- D. *Engineer's Review:*
 1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
 2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto.
 3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
 4. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order.
 5. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 7.16.A and B.
 6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
 7. Neither Engineer's receipt, review, acceptance or approval of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.

8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.D.4.

E. *Resubmittal Procedures:*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.
2. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.
3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

7.17 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
 1. observations by Engineer;
 2. recommendation by Engineer or payment by Owner of any progress or final payment;
 3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 4. use or occupancy of the Work or any part thereof by Owner;
 5. any review and approval of a Shop Drawing or Sample submittal;
 6. the issuance of a notice of acceptability by Engineer;
 7. any inspection, test, or approval by others; or
 8. any correction of defective Work by Owner.

- D. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract shall govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.
- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Contractor under Paragraph 7.18.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
 - 1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
 - 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

7.19 *Delegation of Professional Design Services*

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable Laws and Regulations.
- B. If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and other submittals prepared by such professional. Shop

Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this paragraph, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 7.16.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner or Engineer.

ARTICLE 8 – OTHER WORK AT THE SITE

8.01 *Other Work*

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
- B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any utility work at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.
- D. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 8, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

8.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:
 - 1. the identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
 - 2. an itemization of the specific matters to be covered by such authority and responsibility; and
 - 3. the extent of such authority and responsibilities.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 *Legal Relationships*

- A. If, in the course of performing other work at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner, or any utility owner for whom the Owner is responsible causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment shall take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract. When applicable, any such equitable adjustment in Contract Price shall be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due to Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this paragraph.
- C. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due to Contractor.

- D. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9 – OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

9.02 *Replacement of Engineer*

- A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents shall be that of the former Engineer.

9.03 *Furnish Data*

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

- A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.
- B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
- C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

- A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 *Undisclosed Hazardous Environmental Condition*

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.
- B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.08. Particularly, but without limitation, during

or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Project Representative*

- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 10.08. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent, or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

10.04 *Rejecting Defective Work*

- A. Engineer has the authority to reject Work in accordance with Article 14.

10.05 *Shop Drawings, Change Orders and Payments*

- A. Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 7.16.
- B. Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, are set forth in Paragraph 7.19.
- C. Engineer's authority as to Change Orders is set forth in Article 11.
- D. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.06 *Determinations for Unit Price Work*

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.07 *Decisions on Requirements of Contract Documents and Acceptability of Work*

- A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.08 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 15.06.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 10.08 shall also apply to the Resident Project Representative, if any.

10.09 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs (if any) of which Engineer has been informed.

ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK

11.01 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
 - 1. *Change Orders:*
 - a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.
 - b. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, without the recommendation of the Engineer. Such an amendment shall be set forth in a Change Order.
 - 2. *Work Change Directives:* A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.04 regarding change of Contract Price. Contractor must submit any Change Proposal seeking an

adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive. Owner must submit any Claim seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 60 days after issuance of the Work Change Directive.

3. *Field Orders*: Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.02 *Owner-Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes shall be supported by Engineer's recommendation, to the extent the change involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters. Such changes may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph shall obligate Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.03 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.

11.04 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.
- B. An adjustment in the Contract Price will be determined as follows:
 1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03); or
 2. where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.C.2); or
 3. where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on

the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.04.C).

- C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit shall be determined as follows:
1. a mutually acceptable fixed fee; or
 2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. for costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee shall be 15 percent;
 - b. for costs incurred under Paragraph 13.01.B.3, the Contractor's fee shall be five percent;
 - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.04.C.2.a and 11.04.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of five percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted work the maximum total fee to be paid by Owner shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;
 - d. no fee shall be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
 - e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
 - f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 11.04.C.2.a through 11.04.C.2.e, inclusive.

11.05 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of Article 12.
- B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor's progress.

11.06 *Change Proposals*

- A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under

the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.

1. *Procedures:* Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.
 2. *Engineer's Action:* Engineer will review each Change Proposal and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.
 3. *Binding Decision:* Engineer's decision will be final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- B. *Resolution of Certain Change Proposals:* If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

11.07 Execution of Change Orders

- A. Owner and Contractor shall execute appropriate Change Orders covering:
1. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;
 2. changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
 3. changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.02, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters; and
 4. changes in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 11.06, or Article 12.

- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 11.07, it shall be deemed to be of full force and effect, as if fully executed.

11.08 *Notification to Surety*

- A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12 – CLAIMS

12.01 *Claims*

- A. *Claims Process:* The following disputes between Owner and Contractor shall be submitted to the Claims process set forth in this Article:
 - 1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
 - 2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents; and
 - 3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.
- B. *Submittal of Claim:* The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim shall rest with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.
- C. *Review and Resolution:* The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim shall be stated in writing and submitted to the other party, with a copy to Engineer.
- D. *Mediation:*
 - 1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate shall stay the Claim submittal and response process.
 - 2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process shall resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim

submittal and decision process shall resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.
- E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim shall be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the Work*

- A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
 1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or
 2. To determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 13.01.C, and shall include only the following items:
 1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, and vacation and holiday pay applicable

thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.
4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
5. Supplemental costs including the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
 - c. Rentals of all construction equipment and machinery, and the parts thereof, whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
 - d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
 - e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
 - f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 6.05), provided such losses and damages have resulted from causes

other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

- 1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
- 2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
- 3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
- 4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
- 5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee:* When the Work as a whole is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 11.04.C.

E. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

13.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

- B. *Cash Allowances*: Contractor agrees that:
 - 1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 - 2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.
- C. *Contingency Allowance*: Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

13.03 *Unit Price Work*

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of the following paragraph.
- E. Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price if:
 - 1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement;
 - 2. there is no corresponding adjustment with respect to any other item of Work; and
 - 3. Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price, and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 14 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

14.01 *Access to Work*

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

14.02 *Tests, Inspections, and Approvals*

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work shall be governed by the provisions of Paragraph 14.05.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
 - 1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
 - 2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
 - 3. by manufacturers of equipment furnished under the Contract Documents;
 - 4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
 - 5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests shall be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

- E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to

cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

- A. *Contractor's Obligation:* It is Contractor's obligation to assure that the Work is not defective.
- B. *Engineer's Authority:* Engineer has the authority to determine whether Work is defective, and to reject defective Work.
- C. *Notice of Defects:* Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.
- D. *Correction, or Removal and Replacement:* Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.
- E. *Preservation of Warranties:* When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
- F. *Costs and Damages:* In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

- A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.
- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.
 - 1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
 - 2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, then Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.
- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will

include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 Progress Payments

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. *Applications for Payments:*
1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens, and evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.
 2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
 3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.
- C. *Review of Applications:*
1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
 2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

- a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
- a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
- a. to supervise, direct, or control the Work, or
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
 - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
- a. the Work is defective, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or

- e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due:*

- 1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. *Reductions in Payment by Owner:*

- 1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
 - a. claims have been made against Owner on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;
 - b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
 - c. Contractor has failed to provide and maintain required bonds or insurance;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
 - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
 - f. the Work is defective, requiring correction or replacement;
 - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - h. the Contract Price has been reduced by Change Orders;
 - i. an event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;
 - j. liquidated damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
 - k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
 - l. there are other items entitling Owner to a set off against the amount recommended.
- 2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount

remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed shall be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 15.01.C.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than seven days after the time of payment by Owner.

15.03 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
 - 1. At any time Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through E for that part of the Work.
 - 2. At any time Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
 - 3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
 - 4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.05 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 *Final Payment*

- A. *Application for Payment:*
 - 1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of

inspection, annotated record documents (as provided in Paragraph 7.11), and other documents, Contractor may make application for final payment.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents;
 - b. consent of the surety, if any, to final payment;
 - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.
 - d. a list of all disputes that Contractor believes are unsettled; and
 - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

B. *Engineer's Review of Application and Acceptance:*

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to the provisions of Paragraph 15.07. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Completion of Work:* The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment.

D. *Payment Becomes Due:* Thirty days after the presentation to Owner of the final Application for Payment and accompanying documentation, the amount recommended by Engineer (less any further sum Owner is entitled to set off against Engineer's recommendation,

including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

15.07 *Waiver of Claims*

- A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 15.05, from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.
- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted or appealed under the provisions of Article 17.

15.08 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents), any Work is found to be defective, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 - 1. correct the defective repairs to the Site or such other adjacent areas;
 - 2. correct such defective Work;
 - 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
 - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).
- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

- E. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension. Any Change Proposal seeking such adjustments shall be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
 - 1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule);
 - 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
 - 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
 - 4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) ten days written notice that Owner is considering a declaration that Contractor is in default and termination of the contract, Owner may proceed to:
 - 1. declare Contractor to be in default, and give Contractor (and any surety) notice that the Contract is terminated; and
 - 2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.
- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within seven days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
- E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses,

and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

- F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.
- G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and
 - 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid on account of loss of anticipated overhead, profits, or revenue, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for

expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this Article:
 - 1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and
 - 2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents, and arising after final payment has been made.
- B. *Final Resolution of Disputes:* For any dispute subject to resolution under this Article, Owner or Contractor may:
 - 1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions; or
 - 2. agree with the other party to submit the dispute to another dispute resolution process; or
 - 3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18 – MISCELLANEOUS

18.01 *Giving Notice*

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:
 - 1. delivered in person, by a commercial courier service or otherwise, to the individual or to a member of the firm or to an officer of the corporation for which it is intended; or
 - 2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the sender of the notice.

18.02 *Computation of Times*

- A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

18.03 *Cumulative Remedies*

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

18.04 *Limitation of Damages*

- A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

- A. A party's non-enforcement of any provision shall not constitute a waiver of that provision, nor shall it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

18.07 *Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

SUPPLEMENTARY CONDITIONS

Prepared by



Issued and Published Jointly by



This **Supplementary Conditions** has been prepared for use with the Standard General Conditions of the Construction Contract (EJCDC® C-700, 2013 Edition). Their provisions are interrelated and a change in one may necessitate a change in the other. The suggested language contained in the **Guide to the Preparation of Instructions to Bidders** (EJCDC® C-200, 2013 Edition) is also carefully integrated with the suggested language of this document. The full EJCDC Construction series of documents is discussed in the **Commentary on the 2013 EJCDC Construction Documents** (EJCDC® C-001, 2013 Edition).

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I. SUPPLEMENTARY CONDITIONS

A. *Caption and Introductory Statements*

Supplementary Conditions

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract, EJCDC® C-700 (2013 Edition). All provisions that are not so amended or supplemented remain in full force and effect.

The terms used in these Supplementary Conditions have the meanings stated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added thereto.

ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

SC-1.01 Defined Terms

SC-1.01. Add to the list of definitions in Paragraph 1.01.A by inserting the following as numbered items in their proper alphabetical positions:

Geotechnical Baseline Report (GBR) — The interpretive report prepared by or for Owner regarding subsurface conditions at the Site, and containing specific baseline geotechnical conditions that may be anticipated or relied upon for bidding and contract administration purposes, subject to the controlling provisions of the Contract, including the GBR's own terms. The GBR is a Contract Document.

Geotechnical Data Report (GDR) — The factual report that collects and presents data regarding actual subsurface conditions at or adjacent to the Site, including Technical Data and other geotechnical data, prepared by or for Owner in support of the Geotechnical Baseline Report. The GDR's content may include logs of borings, trenches, and other site investigations, recorded measurements of subsurface water levels, the results of field and laboratory testing, and descriptions of the investigative and testing programs. The GDR does not include an interpretation of the data. If opinions, or interpretive or speculative non-factual comments or statements appear in a document that is labeled a GDR, such opinions, comments, or statements are not operative parts of the GDR and do not have contractual standing. Subject to that exception, the GDR is a Contract Document.

SC-1.01.A.8 Add the following language at the end of the last sentence of Paragraph 1.01.A.8:

The Change Order Form to be used on this Project is EJCDC C-941.

SC-1.01.A.48 Add the following language at the end of the last sentence of Paragraph 1.01.A.48:

A Work Change Directive cannot change Contract Price or Contract Times without a subsequent Change Order.

SC-1.01.A.49 Add the following new Paragraph after Paragraph 1.01.A.49:

Abnormal Weather Conditions- Conditions of extreme or unusual weather for a given region, elevation, or season as determined by the Engineer, after consultation with Owner. Extreme or unusual weather that is typical for a given region, elevation or season shall not be considered Abnormal Weather Conditions.

ARTICLE 2 – PRELIMINARY MATTERS

SC-2.01 Delivery of Bonds and Evidence of Insurance

SC-2.01 Delete Paragraph 2.01.C in its entirety.

SC-2.02 Copies of Documents

SC-2.02.A. Amend the first sentence of Paragraph 2.02.A. to read as follows:

Owner shall furnish to Contractor five copies of the Contract Documents (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF).

SC-2.02 Add the following new paragraph immediately after Paragraph 2.02.B:

Conformed documents incorporate and integrate Addenda and amendments negotiated prior to the Effective Date of the Contract. The conformed documents are produced for the convenience of the user and are not binding on the Owner nor do conformed documents take the place of the Contract Documents.

SC-2.05.A. Before Starting Construction: Add the following language to the end of 2.05.A:

2.05.A.4 A preliminary schedule of payments showing projected cash flow over the duration of the Project.

ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE

SC-3.01 Intent

SC-3.01 Add the following language at the end of Paragraph 3.01.A:

The Order of Precedence of the Contract Documents shall be as stated in the Agreement.

SC-3.01 Add the following new paragraphs immediately after Paragraph 3.01.E:

F. The Specifications may vary in form, format and style. Some specification sections are written in varying degrees of streamlined or declarative style and some sections may be relatively narrative by comparison. Omissions of such words and phrases as "the Contractor shall," "in conformity with," "as shown," or "as specified" are intentional in streamlined sections. Omitted words and phrases shall be supplied by inference. Similar types of provisions may appear in various parts of a section or articles within a part depending on the format of the section. The Contractor shall not take advantage of any variation of form, format or style in making claims for extra Work.

- G. The cross referencing of specification sections under the subparagraph heading "Related Sections include but are not necessarily limited to:" and elsewhere within each specification section is provided as an aid and convenience to the Contractor. The Contractor shall not rely on the cross referencing provided and shall be responsible to coordinate the entire Work under the Contract Documents and provide a complete Project whether or not the cross referencing is provided in each section or whether or not the cross referencing is complete.

SC-3.03 Reporting and Resolving Discrepancies

- SC-3.03 Delete Paragraph 3.03.A.3 and insert the following: "Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity or discrepancy in the Contract Documents unless the Contractor had actual knowledge of or reasonably should have identified the conflict, error, ambiguity or discrepancy."

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

SC-4.01 *Commencement of Times: Notice to Proceed*

- SC-4.01.A Amend the last sentence of Paragraph 4.01.A by striking out the following words:

In no event will Contract Times commence to run later than the sixtieth day after the Bid opening or the thirtieth day after the Effective Date of the Contract, whoever date is earlier.

SC-4.02 *Starting the Work*

- SC-4.02.A Add: "Starting work does not include mobilization to the site."

SC-4.03 *Reference Points*

- SC-4.03.A Delete this section in its entirety

SC-4.05 *Delays in Contractor's Progress*

- SC-4.05.A Delete the first sentence and substitute: "If the Owner or Engineer are the sole cause for a delay, disruption, or interference with the performance of work, the Contractor may be entitled to an equitable adjustment in the Contract Times or the Contract Price."

- SC-4.05.C Change the word "shall" in the first sentence to "may."

- SC-4.05.C.2 Amend Paragraph 4.05.C.2 by striking out the following text: "abnormal weather conditions;" and inserting the following text: "abnormal weather conditions for Skagway, Alaska"

- SC-4.05.G Add: "together with all supporting documentation. The failure of the Contractor to submit all supporting documentation with the claim for equitable adjustment shall be deemed a waiver of the claim."

Abnormal Weather Conditions;

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

SC-5.02 Use of Site and Other Areas

SC-5.02.A.2 Insert “defend” before the word “indemnify” in (c) in the paragraph; Also Insert in the last phrase after the word “Work”: “or any omissions by the Contractor or any under the Contractor’s control or for whom the Contractor is responsible...”

SC-5.03 Subsurface and Physical Conditions

SC-5.03 Add the following new paragraphs immediately after Paragraph 5.03.B:

C. The following reports of explorations and tests of subsurface conditions at or adjacent to the Site are known to Owner:

1. Report dated *August 27, 2010, prepared by Carson Dorn, Inc., entitled: “Municipality of Skagway Wastewater Treatment Plant Upgrade – Subsurface Soil Investigation”, consisting of 6 pages.* The Technical Data contained in such report upon whose accuracy Contractor may rely are those indicated in the definition of Technical Data in the General Conditions.

D. The following drawings of physical conditions relating to existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities) are known to Owner:

1. Drawings dated *1976, prepared by Engineering-Science of Alaska, PO Box L, Haines, AK, entitled: “Sewage Treatment Plant – City of Skagway, AK”, consisting of 23 sheets numbered 1 to 23, inclusive.*
2. Drawings dated *September, 2010, prepared by HDR Alaska, 2525 C Street, Anchorage, Alaska, entitled: “Wastewater Treatment Plant Upgrade – Municipality of Skagway, AK”, consisting of 60 sheets numbered 1 to 60, inclusive.*

E. Upon request, given a minimum of 3 days advance notice, Contractor may examine copies of reports and drawings identified in SC 5.03.C and SC 5.03.D that were not included with the Bidding Documents at City Hall, Skagway, Alaska during regular business hours, or may request copies from Engineer.

SC-5.04 Differing Subsurface or Physical Conditions

SC-5.04.D.1 Delete “shall” and Substitute “may”: Delete section b. related to unit prices

SC-5.04.D.4 Add: “together with all supporting documentation. The failure of the Contractor to submit all supporting documentation with the claim for equitable adjustment shall be deemed a waiver of the claim.”

SC-5.05 Underground Facilities

SC-5.05.E.1 Delete “shall” and substitute “may”; Delete 5.05 (E)(1)b

SC-5.05.E.3 Add: “together with all supporting documentation. The failure of the Contractor to submit all supporting documentation with the claim shall be deemed a waiver of the claim.”

SC-5.06 Hazardous Environmental Conditions

SC 5.06 Delete Paragraphs 5.06.A and 5.06.B in their entirety and insert the following:

A. No reports or drawings related to Hazardous Environmental Conditions at the Site are known to Owner.

B. The Contractor’s Scope of Work:

1. The Contractor’s scope of Work shall include implementation of all necessary safety, public health and environmental procedures and requirements relating to sanitary sewage encountered during the work.

SC 5.06.I Delete Paragraph 5.06.I

SC 5.06.J Insert “defend” before the word “indemnify” in the first sentence; Delete the last sentence

ARTICLE 6 – BONDS AND INSURANCE

SC-6.02 Insurance—General Provisions

SC-6.02 Add the following language at the end of Paragraph 6.02.A:

“Surety and Insurance companies from which the bonds and insurance for this Project are purchased shall possess a financial strength rating of at least A- and a financial size category of VII or higher from A.M. or an equivalent rating service, in addition to the other requirements specified herein.

SC-6.02.A Delete “Owner”

SC-6.02 Add the following paragraph immediately after Paragraph 6.02.B:

1. Contractor may obtain worker’s compensation insurance from an insurance company that has not been rated by A.M. Best, provided that such company (a) is domiciled in the state in which the project is located, (b) is certified or authorized as a worker’s compensation insurance provider by the appropriate state agency, and (c) has been accepted to provide worker’s compensation insurance for similar projects by the state within the last 12 months.

SC-6.02.B Delete “Owner”

SC-6.02.D Delete this paragraph

SC-6.02.E Delete “Contractor”

SC-6.02.F Delete this paragraph

SC-6.02.H Delete this paragraph

SC-6.02.I Delete this paragraph

SC-6.03 Contractor's Insurance

SC 6.03 Add the following new paragraph immediately after Paragraph 6.03.I.5:

6. Ensure Contractor provides the Owner with the valid Certificate of Insurance and amendatory endorsements or copies of the applicable policy language affecting coverage, in advance of the performance of any work and as soon as possible, prior to or upon renewal, exhibiting coverage as required by the Contract and the Supplementary Conditions.

SC 6.03 Add the following new paragraph immediately after Paragraph 6.03.J:

K. The limits of liability for the insurance required by Paragraph 6.03 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

1. Workers' Compensation, and related coverages under Paragraphs 6.03.A.1 and A.2 of the General Conditions:

State:	<u>Statutory</u>
Federal, if applicable (e.g., Longshoreman's):	<u>Statutory</u>
Jones Act coverage, if applicable:	
Bodily injury by accident, each accident	\$ <u>2,000,000</u>
Bodily injury by disease, aggregate	\$ <u>2,000,000</u>
Employer's Liability:	
Bodily injury, each accident	\$ <u>2,000,000</u>
Bodily injury by disease, each employee	\$ <u>2,000,000</u>
Bodily injury/disease aggregate	\$ <u>2,000,000</u>
For work performed in monopolistic states, stop-gap liability coverage shall be endorsed to either the worker's compensation or commercial general liability policy with a minimum limit of:	\$ <u>2,000,000</u>
Foreign voluntary worker compensation	<u>Statutory</u>

2. Contractor's Commercial General Liability under Paragraphs 6.03.B and 6.03.C of the General Conditions:

General Aggregate	\$ <u>5,000,000</u>
Products - Completed Operations Aggregate	\$ <u>5,000,000</u>
Personal and Advertising Injury	\$ <u>1,000,000</u>

Each Occurrence (Bodily Injury and Property Damage) \$ 5,000,000

3. Automobile Liability under Paragraph 6.03.D. of the General Conditions:

Combined Single Limit of \$ 2,000,000

4. Excess or Umbrella Liability:

Per Occurrence \$ 2,000,000

General Aggregate \$ 2,000,000

5. Contractor's Pollution Liability:

Each Occurrence \$ 2,000,000

General Aggregate \$ 2,000,000

If box is checked, Contractor is not required to provide Contractor's Pollution Liability insurance under this Contract

6. Additional Insureds: In addition to Owner and Engineer, include as additional insureds the following:

a) Municipality of Skagway, Alaska, 700 Spring Street, Skagway, Alaska 99840

b) HDR, Inc, 2525 C Street, Suite 500, Anchorage, Alaska, 99503-2632

7. Contractor's Professional Liability:

Each Claim \$ 2,000,000

Annual Aggregate \$ 2,000,000

SC-6.04 *Owner's Liability Insurance*

SC-6.04 **Delete this Section.**

SC-6.05 *Property Insurance*

SC-6.05.A. Delete Paragraph 6.05.A of the General Conditions and substitute the following in its place:

Contractor shall provide and maintain installation floater insurance for property under the care, custody, or control of Contractor. The installation floater insurance shall be a broad form or "all risk" policy providing coverage for all materials, supplies, machinery, fixtures, and equipment that will be incorporated into the Work. Coverage under the Contractor's installation floater will include:

1. any loss to property while in transit,
2. any loss at the Site, and
3. any loss while in storage, both on-site and off-site.

Coverage cannot be contingent on an external cause or risk, or limited to property for which the Contractor is legally liable. The Contractor will be solely responsible for any deductible carried under this coverage and claims on materials, supplies, machinery, fixture, and equipment that will be incorporated into the Work while in transit or in storage. This policy will include a waiver of subrogation applicable to Owner, Contractor, Engineer, all Subcontractors, and the officers, directors, partners, employees, agents and other consultants and subcontractors of any of them.

SC-6.06.C Delete this paragraph

ARTICLE 7 – CONTRACTOR’S RESPONSIBILITIES

SC-7.01 Supervision and Superintendence

SC-7.01.B. Amend Paragraph 7.01.B to add the following sentences: “The Contractor shall identify their representative at the Site that shall have authority to act on behalf of Contractor. All communications given to or received from this representative shall be binding on Contractor. Any replacement proposed by the Contractor for the Contractor’s superintendent shall be a competent superintendent and shall be subject to the approval of the Owner. The Contractor’s superintendent shall present at the site at all times while Work is in progress and shall be available by phone for emergencies 24 hours a day, 7 days per week. If at any time the superintendent leaves the Project Site while Work is in progress, the Engineer and Owner shall be notified and provided with the name and contact information for the Contractor’s representative having responsible charge.”

SC-7.01.C. Add the following new paragraph immediately after Paragraph 7.01.B:

Any superintendent or other personnel, who repeatedly fails to follow the Engineer’s or Owner’s written or oral orders, directions, instructions, or determinations, shall be subject to removal from the project. Upon the written request of the Engineer, the Contractor shall immediately remove such superintendent or other personnel and name a replacement in writing. Noncompliance with the Engineer’s request to remove and replace personnel at any level shall be grounds for terminating the Contract.

SC-7.02 Labor; Working Hours

SC-7.02.B. Add the following new subparagraphs immediately after Paragraph 7.02.B:

1. Regular working hours will be between 7:00 a.m. and 5:00 p.m., excluding Saturdays and Sundays and legal holidays
2. Owner's legal holidays are:
 - New Year’s Day
 - President’s Day (3rd Monday in February)
 - Seward’s Day (Last Monday in March)
 - Memorial Day (Last Monday in May)

Veteran's Day

Thanksgiving (4th Thursday in November)

Christmas Day

SC-7.02.C. Add the following new paragraph immediately after Paragraph 7.02.B:

Contractor shall be responsible for the cost of any overtime pay or other expense incurred by the Owner for Engineer's services (including those of the Resident Project Representative, if any), Owner's representative, and construction observation services, occasioned by the performance of Work on Saturday, Sunday, any legal holiday, or as overtime on any regular work day. If Contractor is responsible but does not pay, or if the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under Article 15.

SC-7.02.C. Add the following new subparagraph immediately after Paragraph 7.02.C:

1. For purposes of administering the foregoing requirement, Engineer's labor costs shall be estimated average of \$150 per hour, additional overtime costs shall include expenses for materials, equipment, supplies, transportation and subsistence as actual cost plus a 10 percent markup.

SC-7.03 Services, Materials, and Equipment

SC-7.03.B. Add the following new subparagraphs immediately after Paragraph 7.03.B:

1. Where the Work requires equipment be furnished, due to the lack of standardization of equipment as produced by the various manufacturers, it may become necessary to make minor modifications in the structures, buildings, piping, mechanical work, electrical work, accessories, controls, or other work, to accommodate the particular equipment offered. Contractor's bid price for any equipment offered shall include the cost of making any necessary changes subject to the approval of Engineer.

SC-7.04 "Or Equals"

SC-7.04.A Amend the third sentence of Paragraph 7.04.A by striking out the following words:

Unless the specification or description contains or is followed by words reading that no like, equivalent, 'or equal' item is permitted.

SC-7.04.A.1 Amend the last sentence of Paragraph a.3 by striking out "and" and adding a period at the end of Paragraph a.3.

SC-7.04.A.1 Delete Paragraph 7.06.A.1.a.4 in its entirety and insert the following in its place:

"(Deleted)"

SC-7.05 Substitutes

SC-7.05.D Add the following paragraph after Paragraph 7.05.D: Reimbursement rates for the Engineer or their officers, directors, members, partners, employees, agents, and other

consultants and subcontractors for evaluation of proposed substitutes shall be on the basis established in Paragraph 15.01.E.4 of these Supplementary Conditions.

SC-7.06 Concerning Subcontractors, Suppliers and Others

SC-7.06.A Amend Paragraph 7.06.A by adding the following text to the end of the Paragraph:

The Contractor shall not award work valued at more than 50 percent of the Contract Price to Subcontractor (s), without written approval of the Owner.

SC-7.06.B Delete Paragraph 7.06.B in its entirety and insert the following in its place:

“(Deleted)”

SC-7.06.E Amend the second sentence of Paragraph 7.06.E by striking out “Owner may also require the Contractor to retain specific replacements; provided, however, that”

SC-7.06.F Delete “shall” and substitute “may”.

SC-7.07 Patent Fees and Royalties

SC-7.07.B *Delete Paragraph 7.07.B in its entirety*

SC-7.08 Permits

SC-7.08 Add the following paragraph and subparagraphs after Paragraph 7.8.A:

This Facility is located in the Municipality and permitting is administered by the Borough Permitting Department. Contractor shall obtain and be responsible for all permits including the Building Permit, Mechanical Permit, Plumbing Permit and Electrical Permit for the Work. The Owner shall pay the costs for the Building Permit, Mechanical Permit, Plumbing Permit and Electrical Permit, and associated plan check fees for the Work.

SC-7.08 Add a new paragraph immediately after Paragraph GC-7.08A. which is to read as follows:

B. In those instances where a certificate of occupancy must be obtained before the Work under this Contract can be occupied and placed into service by Owner, it shall be the responsibility of Contractor to arrange, coordinate, and pay any costs of obtaining said certificate.

SC-7.09 Taxes

SC 7.09 Add a new paragraph immediately after Paragraph 7.09.A:

B. Owner is exempt from payment of sales and compensating use taxes of the State of Alaska and of cities and counties thereof on all materials to be incorporated into the Work.

1. Owner will furnish the required certificates of tax exemption to Contractor for use in the purchase of supplies and materials to be incorporated into the Work.

2. Owner's exemption does not apply to construction tools, machinery, equipment, or other property purchased by or leased by Contractor, or to supplies or materials not incorporated into the Work.

SC-7.10 Laws and Regulations

SC 7.10.B Insert "defend" before the word "indemnify"

SC 7.10.C Delete Paragraph 7.10.C in its entirety

SC-7.12 Safety and Protection

SC 7.12.E Delete everything after the word "expense" in line 5.

SC-7.18 Indemnification

SC 7.18.A Insert "defend" before the word "indemnify"; Delete: everything after the word "Work" in line 8.

SC 7.18.B Insert "defense and" before the word "indemnification"

SC-7.20 Quality Control

SC 7.20 A. Contractor shall provide quality control, which shall include the initial and subsequent inspections of the Contractor's Work to ensure that the Work conforms to the Contract Documents.

B. Contractor shall designate the person responsible for the Contractor's Quality Control while Work is in Progress, and shall notify the Engineer, in writing, prior to any change in quality control representative assignment.

ARTICLE 8 – OTHER WORK AT THE SITE

SC-8.03 Legal Relationships

SC 8.03.A Delete "shall" and substitute "may"; after "interfering event" in line 9 Insert: "together with all supporting documentation. The failure of the Contractor to submit all supporting documentation with the claim shall be deemed a waiver of the claim."

SC 8.03.D Insert "defend" before the word "indemnify"

ARTICLE 9 – OWNER'S RESPONSIBILITIES

SC-9.01 Communications to Contractor

SC 9.01.A Insert after "General Conditions": "or as may be reasonable at the time or due to site conditions or the absence of the Engineer,"

SC-9.02 Replacement of Engineer

SC 9.02.A Delete: "provided Contractor makes no reasonable objection to the replacement engineer."

SC-9.03 *Furnish Data*

SC 9.03 Insert after “Owner”: “or Engineer”

SC-9.06 *Insurance*

SC 9.06 Delete this paragraph

SC-9.11 *Evidence of Financial Arrangements*

SC 9.11 Delete this paragraph

SC-9.12 *Safety Program*

SC 9.12.B Delete this paragraph

ARTICLE 10 – ENGINEER’S STATUS DURING CONSTRUCTION

SC-10.02 *Visit to Site*

SC 10.02.A Delete: everything after “Work” in next to last line and substitute: “will advise the Owner of defective work observed by the Engineer or which was reasonably observable by the Engineer.”

SC-10.03 *Project Representative*

SC-10.03 Add the following new paragraphs immediately after Paragraph 10.03.A:

B. The Resident Project Representative (RPR) will be Engineer's representative at the Site, will act as directed by and under the supervision of Engineer, and will confer with Engineer regarding RPR's actions.

SC-10.06 *Determinations for Unit Price Work*

SC 10.06 Delete this paragraph

SC-10.08 *Limitations of Engineer’s Authority and Responsibilities*

SC 10.08 Insert at end: “except for the Engineer’s negligent acts or omissions in making those decisions.”

SC 10.08.B Insert after the first “Work”: “except that Engineer shall not permit Contractor to continue work where the Engineer knows or has reason to know the Contractor is not in compliance with applicable Laws and Regulations.”

Insert at end: “except where the Engineer knows the Contractor failed to perform the Work in accordance with the Contract Documents and took no action to stop the Work or advise the Owner.”

ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK

SC-11.01 Amending and Supplementing Contract Documents

SC 11.01.A.2 Insert in the sentence referencing 30 days: “together with all supporting documentation. The failure of the Contractor to submit all supporting documentation with the claim shall be deemed a waiver of the claim.”

SC-11.04 Change of Contract Price

SC 11.04.B.1 Delete this section

SC 11.04.B.2 Delete: everything after “sum”

SC 11.04.B.3 Delete: “plus a Contractor’s fee for overhead and profit”

SC 11.04.C Delete Paragraph 11.04.C in its entirety.

Add the following new paragraph after Paragraph 11.04.C:

D. In the event the Contractor submits a request for additional compensation as a result of a Change or Differing Site Condition, or as a result of delays, acceleration, or loss of productivity, the Owner reserves the right, upon written request, to audit and inspect the Contractor’s books and records relating to the Project. Upon written request for an audit, the Contractor shall make its books and records available within 14 days of request. Owner shall specifically designate identity of the auditor. As part of the audit, Contractor shall make available its books and records relating to the Project, including but not limited to the Bidding Documents, cost reports, payroll records, material invoices, subcontracts, purchase orders, daily timesheets, and daily diaries. The Audit shall be limited to those cost items which are sought by the Contractor in a Change Order or Claim submission to the Owner.

ARTICLE 12 – CLAIMS

12.01 Claims

SC-12.01.B Delete Paragraph 12.01.B in its entirety and replace with the following:

B. SUBMITTAL OF A CLAIM: WRITTEN NOTICE STATING THE GENERAL NATURE OF EACH CLAIM SHALL BE DELIVERED BY THE CLAIMANT TO ENGINEER AND THE OTHER PARTY TO THE CONTRACT PROMPTLY (BUT NO EVENT LATER THAN 10 DAYS) AFTER THE START OF THE EVENT GIVING RISE THERETO. THE RESPONSIBILITY TO SUBSTANTIATE A CLAIM SHALL REST WITH THE PARTY MAKING THE CLAIM. NOTICE OF THE AMOUNT OR EXTENT OF THE CLAIM, WITH SUPPORTING DATA SHALL BE DELIVERED TO THE ENGINEER AND THE OTHER PARTY TO THE CONTRACT WITHIN 20 DAYS AFTER THE START OF SUCH EVENT (UNLESS ENGINEER, WITH APPROVAL OF THE OWNER, ALLOWS ADDITIONAL TIME FOR CLAIMANT TO SUBMIT ADDITIONAL OR MORE ACCURATE DATA IN SUPPORT OF SUCH CLAIM). A CLAIM FOR AN ADJUSTMENT IN CONTRACT TIMES SHALL BE PREPARED IN ACCORDANCE WITH THE PROVISION OF PARAGRAPH 11.01.B. EACH

CLAIM SHALL BE ACCOMPANIED BY CLAIMANT'S WRITTEN STATEMENT THAT THE ADJUSTMENT CLAIMED IS THE ENTIRE ADJUSTMENT TO WHICH THE CLAIMANT BELIEVES IT IS ENTITLED AS A RESULT OF SAID EVENT. THE OPPOSING PARTY SHALL SUBMIT ANY RESPONSE TO ENGINEER AND THE CLAIMANT. THE FAILURE TO PROVIDE ALL SUPPORTING DOCUMENTATION WITH SUBMITTAL OF THE CLAIM SHALL CONSTITUTE A WAIVER OF THE CLAIM.

ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

SC-13.01 Cost of the Work

- SC 13.01.A** Insert after “at issue” in first sentence: “except the Cost of Work does not include mobilization or demobilization of equipment, which costs are specifically required to be in the Bid Amount from the Contractor”
- SC 13.01.B.1** Delete: “without limitation”; Delete “Payroll costs shall include, but not be limited to” and Substitute: “Payroll costs may include, as negotiated by Contractor and Owner, and only after Contractor provides complete supporting documentation,”
- SC 13.01.B.2** Delete: “costs of transportation and” in line 2
- SC 13.01.C.3** Insert “actual” before “Work” in first sentence
- SC 13.01.C.4** Delete this paragraph
- SC 13.01.C.5** In section (a), delete “subsistence”: Substitute: “actual per diem expenses not to exceed the per diem for the State of Alaska”
- In section (b) delete: “including transportation and maintenance”; Delete: “supplies” “appliances” and “office”
- In section (c) delete: everything after the word Engineer in line 3 in the first sentence.
- Delete section (e)
- In section (h) delete: “and similar petty cash items”
- SC 13.01.D** Delete this paragraph
- SC 13.01.E.1** Insert after “Engineer”: “and Owner”

SC-13.02 Allowances

- SC 13.02.C** Delete Paragraph 13.02.C in its entirety and insert the following in its place:
“(Deleted)”

SC-13.03 Unit Price of Work

- SC 13.03** Delete this section

ARTICLE 14 – TESTS AND INSPECTIONS: CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

SC-14.02 Tests, Inspections and Approvals

- SC 14.02** Add the following language at the end of Paragraph 14.02.A

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“Contractor shall establish an inspection program and a testing plan acceptable to the Engineer and shall maintain complete inspection and testing records and make these available to the Engineer upon Written request”

SC 14.02.B Delete Paragraph 14.02.B and its subparagraphs in their entirety and replace with the following:

B. The Owner shall employ and pay for the services of an independent testing laboratory or the Engineer to perform all inspections, tests, or approvals required by the Contract Documents to satisfy the Special Inspections requirements of the International Building Code (IBC) adopted by the City. Contractor shall pay for all other inspections, tests, or approvals required by the Contract Documents, including:

- 1. Inspections, Tests or approvals covered by Paragraph 14.02.C and 14.02. D.**
- 2. Costs incurred with connections of tests or inspections conducted pursuant to Paragraph 14.05 and**
- 3. As otherwise specifically noted in the Contract Documents.**

SC - 14.03 Defective Work

SC 14.03.D Add the following language and subparagraphs at the end of Paragraph 14.03.D:

Tests required by Contract Documents to be performed by Contractor and that require test certificates be submitted to Owner or Engineer for acceptance shall be made by an independent testing laboratory or agency licensed or certified in accordance with Laws and Regulations and applicable state and local statutes. In the event state license or certification is not required, testing laboratories or agencies shall meet following applicable requirements:

- 1. Basic requirements of ASTM E329, Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials as Used in Construction and ASTM D3666, Standard Specification for Minimum Requirements for Agency Testing and Inspecting Bituminous Paving Materials, as applicable.**
- 2. Calibrate testing equipment at reasonable intervals by devices of accuracy traceable to either the National Bureau of Standards or accepted values of natural physical constants.**

SC - 14.05 Uncovering Work

SC 14.05.C.2 Delete “shall” and Substitute “may”

ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

SC-15.01.B Progress Payments

- SC-15.1.B** Amend the second Paragraph 15.01.B.1 by striking out the following text: “a bill of sale, invoice, or other.”
- SC 15.01.B.2** Add: “The Affidavit shall specifically state that the Contractor has no claim against the Owner for any additional payment or for additional time.”
- SC 15.01.B.3** Add the following at the end of Paragraph 15.01.B.3:
No payments shall be made that would deplete the retainage, place in escrow any funds that are required for retainage, or invest the retainage for the Benefit of the Contractor.
- SC 15.01.B.4** Add the following after Paragraph 15.01.B.3:
The Application for Payment Form to be used on this Project is EJCDC C-620.
- SC 15.01.C.3** Delete section (b)
- SC 15.01.C.4** In section (c), add: “except as to any failure to comply with applicable Laws and Regulations known to Engineer or that should reasonably have been known to the Engineer.”
- SC 15.01.D** Delete “Ten” and Substitute “Thirty”
- SC 15.01.E.3** Delete this section

SC-15.02 Contractor’s Warranty of Title

- SC 15.02.A** Amend Paragraph 15.02.A by striking out the following text: “no later than seven days after the time of payment by the Owner and insert “no later than the time of payment by the Owner”

SC-15.03 Substantial Completion

- SC 15.03.B** Add the following new subparagraph to Paragraph 15.03.B:
1. If some or all of the Work has been determined not to be at a point of Substantial Completion and will require re-inspection or re-testing by Engineer, the cost of such re-inspection or re-testing, including the cost of time, travel and living expenses, shall be paid by Contractor to Owner. If Contractor does not pay, or the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under Article 15.

- SC 15.03.C** Delete “seven” and Substitute “fifteen”

SC-15.06 Final Payment

- SC-15.06.A.1** Insert after “final inspection”: “and has fully completed all punch list items”

SC-15.07 Waiver of Claims

- SC-15.07.B** Amend Paragraph 15.07.B to state "The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner and/or

Engineer other than those pending matters that have been duly submitted or appealed under the provisions of Article 17.”

ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

SC 16.01.A Delete “shall” and substitute “may”

16.03 *Owner May Terminate For Convenience*

SC 16.03.A Delete and Substitute: “Owner may terminate for convenience in accordance with Section VI A of the Agreement Between Municipality of Skagway and Contractor.”

SC 16.03.B Delete and Substitute: “Owner may terminate for convenience in accordance with Section VI A of the Agreement Between Municipality of Skagway and Contractor.”

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

SC 17.01 The Superior Court for the State of Alaska, First Judicial District at Juneau, Alaska, shall be the exclusive jurisdiction and venue for any action of any kind and any nature and any claim of any kind and any nature related to or arising out of the Agreement between the Contractor and Owner or arising out of or related in any way to performance of the Agreement by the Contractor.

SC 17.01.B Delete and Substitute: “The Superior Court for the State of Alaska, First Judicial District at Juneau, Alaska, shall be the exclusive jurisdiction and venue for any and all actions, disputes, and claims of any kind and any nature, arising out of or in any way relating to the performance of Work or arising out of or relating to in any way the Contract Documents.”

Add Article 19 titled “Federal Requirements”

ARTICLE 19 – FEDERAL REQUIREMENTS

SC-19.03 Conflict of Interest

SC-19.03 Add the following language after Article 19.02.B with the title “Conflict of Interest”.

- A. Contractor may not knowingly contract with a supplier or manufacturer if the individual or entity who prepared the plans and specifications has a corporate or financial affiliation with the supplier or manufacturer. Owner’s officers, employees, or agents shall not engage in the award or administration of this Contract if a conflict of interest, real or apparent, would be involved. Such a conflict would arise when: (i) the employee, officer, or agent; (ii) any member of their immediate family; (iii) their partner or (iv) an organization that employs, or is about to employ, any of the above, has financial interest in Contractor. Owner’s officers, employees, or agents shall neither solicit not accept gratuities, favors or anything of monetary value from Contractor or Subcontractors.**

SC-19.04 Add the following language after Article 19.03.A with the title “Gratuities”.

- A.** If the Owner finds after a notice and hearing that Contractor, or any of Contractor’s agents or representatives, offered or gave gratuities (in terms of entertainment, gifts, or otherwise) to any official, employee, or agent of Owner in an attempt to secure this Contract or favorable treatment in awarding, amending, or making any determinations related to the performance of this Contract, Owner may, by written notice to Contractor, terminate this Contract. Owner may also pursue other rights and remedies that the law or this Contract provides. However, the existence of the facts on which the Owner bases such findings shall be an issue and may be reviewed in proceedings under dispute resolution provisions of this Contract.
- B.** In the event this Contract is terminated as provided in Paragraph 19.04.A, Owner may pursue the same remedies against Contractor as it could pursue in the event of a breach of this Contract by Contractor. As a penalty, in addition to any other damages to which it may be entitled by law, Owner may pursue exemplary damages in an amount (as determined by the Owner) which shall not be less than three nor more than ten times the costs Contractor incurs providing any such gratuities to any such officer or employee.



DIVISION 01

GENERAL REQUIREMENTS



SECTION 01 11 00
SUMMARY OF WORK

PART 1 - GENERAL

1.1 DESCRIPTION

- A. General:
1. Furnish all labor, materials, tools, equipment and services as indicated in accordance with provisions of Contract Documents.
 2. It is the intent of the Contract Documents to describe a functionally complete project. Furnish and install all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure, complete, and functional installation.

1.2 WORK COVERED BY CONTRACT

- A. The Work of this Contract under the Base Bid generally includes the following:

Base Bid:

Provide all labor, equipment, materials and services to construct and commence operation of the Skagway WWTF Odor Control Improvements. The Base Bid Item includes work shown and/or specified for Odor Control Improvements to Building #1 including Installation of Building #1 Ultraviolet Odor Control Unit (Owner-furnished), Corrosion Resistant Odor Control Fan (Owner-furnished) with Sound Attenuating Walk-in Enclosure, Fabric Curtain Systems around Truck Load-out Area, Building #1 Odor Control Duct and Accessories, electrical, instrumentation, equipment, civil related work, mechanical related work, special COVID-19 conditions, and all state and local permits, complete.

- B. The Owner shall furnish the Ultraviolet Odor Control System. The Owner-furnished scope of supply shall generally be defined as:
1. The Ultraviolet Odor Control System (as defined in Sections 01 12 00 and 44 31 43; 2.2) including the exhaust fan (Section 44 11 10, minus auxiliary components noted within that Section), the Local Control Panel (LCP) (Section 01 12 00 and 44 31 43), and the Odor Control Unit (OCU) with internal instrumentation (44 31 43).
- C. All other components shall be provided and coordinated by the Contractor for a complete system.

1.3 CONTRACTOR'S USE OF PREMISES

- A. Contractor shall limit his use of the premises for Work and storage and allow for:
1. Owner occupancy.
 2. Uninterrupted operation of existing adjacent facilities.
- B. Coordinate use of premises under direction of Owner and Engineer.
- C. Contractor assumes full responsibility for the protection and safekeeping of products and materials Contractor has stored on or off of the site.
- D. Contractor shall move any stored products, or materials, under Contractor's responsibility, which interfere with operations of Owner or separate contractor/subcontractor.

- E. Contractor shall obtain and pay for the use of any additional storage or work areas if needed for Contractor operations.
- F. Contractor shall confine all materials storage, equipment storage and employee and subcontractor parking to the areas designated in the Contract Documents. Contractor shall not store materials or equipment, nor shall employees of the Contractor or subcontractors park automobiles in a manner that hinders Owner's access to the facility.
- G. Contractor shall restore any areas used for materials storage, trailers, offices, equipment storage, or employee and subcontractor parking to their original condition or better.

1.4 WORK SEQUENCE

- A. Organize and plan the construction activities to assure the safety and reliability of and to minimize the interruption to the electric system and all other utilities.
- B. The proposed Work sequence shall be submitted to the Engineer in the Schedule of Construction.

1.5 OWNER OCCUPANCY

- A. Owner will occupy the premises during the entire period of construction for the conduct of his normal operations. Coordinate with Owner in all construction operations to minimize conflicts and to facilitate Owner usage.

1.6 PARTIAL OWNER OCCUPANCY

- A. Schedule operations so as to complete certain areas of the Work, as designated under Sequence of Work, to enable Owner's occupancy prior to Substantial Completion of the entire Work.
- B. Owner will occupy new facilities for the purpose of conducting normal operations.
- C. Execute Certificate of Substantial Completion for each area listed above prior to Owner's occupancy.
 - 1. After Owner occupancy, Contractor shall allow:
 - a. Access for Owner's personnel.
 - b. Access for the public.
 - c. Operation of area HVAC, plumbing and electrical systems.
 - d. Operation of equipment and processes to remain in service during the course of the work
 - 2. After occupancy, Owner will provide:
 - a. Contractor access to finish punch list items.
 - b. Operation of area HVAC, plumbing and electrical systems.
 - c. Operation of equipment and processes to remain in service during the course of the work.
 - 3. Other conditions of occupancy:
 - a. The correction period for the occupied Work shall commence at the date of occupancy.

1.7 OUTAGES

- A. The Contractor shall submit a REMOVAL FROM SERVICE (RFS) REQUEST at least 14 days prior to the planned outage for approval by the Owner. RFS Forms are attached to the Contract Documents.

- B. The Contractor shall organize and plan the construction activities so that the number and length of any required outages shall be minimized.
- C. An outage to any customer shall require specific approval of the Owner. The Owner reserves the right to reject any request for an outage.
- D. In some cases it may be necessary, at Contractor's expense, to either install temporary facilities for service or schedule the Work during a period when the outage would have minimal impact on the customer.
- E. The Contractor shall provide the Owner at least 48 hours notice in advance of any requested outage so that the Owner may advise and coordinate the outage with the customers.

1.8 CONTRACTOR-FURNISHED PRODUCTS

- A. Furnish all products, other than Owner-furnished products designated above.
- B. Components required to be supplied in quantity within a specification section shall all be the same and shall be interchangeable.
- C. Unless otherwise indicated in the Contract Documents, provide materials and equipment that:
 - 1. is produced by reputable manufacturers having adequate experience in the manufacture of these items; and
 - 2. Is designed for the service intended; and
 - 3. have not been previously been incorporated into another project or facility; and
 - 4. have not changed ownership since their initial production or fabrication and shipment from the manufacturer's factory or facility; and
 - 5. if stored since their manufacture or fabrication, have, while in storage, been properly maintained and serviced in accordance with the manufacturer's recommendations for long-term storage; submit documentation under the relevant technical section that such maintenance and service has been performed; and
 - 6. have not been subject to degradation or deterioration since manufacture; and
 - 7. are the current model(s) or type(s) furnished by the Supplier and only modified as necessary to comply with the design.

1.9 UNDERGROUND UTILITIES

- A. Utilities known to the Engineer who may have underground facilities in the vicinity of the Work, may be contacted as follows:

Electric Service- Alaska Power & Telephone (AP&T)
 5th & Spring
 Skagway, Alaska
 Phone: 907-983-2202

Water Service- Skagway Public Works Department
 7th & Spring
 Phone: 907-983-2297

Tyson Ames/Public Works Director Telephone: 907-983-2449

1.10 PERMITS AND LICENSES

- A. The Owner has applied for and obtained, at Owner's expense, the following permits and approvals for the Work:
 - 1. Building Permit

- B. Contractor shall obtain, at his expense, all other permits and licenses necessary for the construction of the Work in accordance with Paragraph 7.08. Of the General Conditions Section 00 72 13.

1.11 TREE TRIMMING, CLEARING, AND TREE REMOVAL

- A. Provide all required labor and equipment for trimming, clearing, and tree removal as follows:

No tree clearing is anticipated for this contract.

1.12 PHASING

- A. The Contractor shall be responsible for determining phasing of the existing system and insuring that the phasing of the new system is correct

1.13 FENCES

- A. All fences affected by the Work shall be maintained by the Contractor until completion of the Work. Fences disturbed by the construction shall be restored by the Contractor to their original or better condition and to their original location unless otherwise indicated.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION - (NOT USED)

END OF SECTION

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SECTION 01 11 06
COVID-19 SPECIAL CONDITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. General:
1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division I Specification Sections, apply to this Section.

1.2 SUMMARY

- A. The WORK under this Section includes Contract provisions for dealing with COVID-19 Quarantining in Skagway, Alaska for workers that have traveled from outside Skagway to work on this project per mandatory Municipality of Skagway quarantine ordinances, resolutions and directives and/or any State mandated quarantine procedures. Quarantine housing and meal allowances for contractor's work staff that are required to quarantine in Skagway, Alaska for this project are considered part of the contingent sum for this bid item. Contractor shall be responsible for all health care of quarantined workers.
- B. The WORK also includes contract delays due to possible mandatory work shutdowns issued from the State of Alaska or the Municipality of Skagway due to COVID-19. This would include all labor and equipment standing by during a corona virus related shutdown period based on a daily rate included as a contingent sum bid item. All mobilization and demobilization of equipment and workers during a shutdown shall be included in the contingent sum bid item.
- C. The WORK also includes preparing a COVID-19 job site work plan for protecting workers and the public during this project from the Corona virus. Contractor shall bear all costs related to preparing the work plan and this portion of the WORK shall only be complete upon written acceptance of the plan by the municipality.
- D. Quarantine is a health related mandate. The Contractor shall voluntarily take all immediate and necessary action to quarantine workers to whom the quarantine mandate applies. In the event of any question or dispute as to whether quarantine applies to a worker, the Municipality shall make the determination in its discretion and the failure of the Contractor to comply the quarantine mandate shall mean the worker must be immediately excluded from the work site and the Municipality may take other action as deemed necessary for the protection of the health and safety of persons in Skagway.

1.3 SCHEDULE OF VALUES

- A. COVID-19 QUARANTINE (Bid Form Item No. 11) PRICE BASED ON CONTINGENT SUM PAY UNIT
1. Measurement for this Bid Item will be made as a Contingent Sum Pay Unit for costs incurred for COVID-19 Quarantining of Contractors work force.
 2. Costs associated with this Bid Item will include quarantine housing in Skagway and meal allowance for Contractors work staff that are traveling to Skagway from out of town and require a mandatory 14 day quarantine period in Skagway prior to beginning work. No wages will be paid for workers that are undergoing required quarantining.
 3. The costs associated with quarantining will only be paid for once per employee.
 4. Payment for COVID-19 Quarantine will be made at the amount shown on the Bid Schedule under Bid Item No. 11, which payment will constitute full compensation for all actual WORK described in this specification section, and as shown on the Drawings and directed by the ENGINEER.

- B. COVID-19 SHUTDOWN (Bid Form Item No. 12) PRICE BASED ON PER DAY
 - 1. Measurement for payment for COVID-19 Shutdown will be based upon a per Day actual cost associated with a mandatory Municipality of Skagway or State of Alaska shutdown, all in accordance with the requirements of the Contract Documents.
 - 2. Payment for COVID-19 Quarantine will be made at the amount shown on the Bid Schedule under Bid Item No. 12, which payment will constitute full compensation for all actual WORK described in this specification section, and as shown on the Drawings and directed by the ENGINEER.
- C. COVID-19 JOB SITE WORK PLAN (Bid Form Item No. 13) PRICE BASED ON LUMP SUM
 - 1. Measurement for payment for COVID-19 Job Site Work Plan will be based upon the satisfactory completion and acceptance of the COVID-19 Job Site Work Plan, all in accordance with the requirements of the Contract Documents.
 - 2. Payment for COVID-19 Job Site Work Plan will be made at the amount shown on the Bid Schedule under Bid Item No. 13, which payment will constitute full compensation for all actual WORK described in this specification section, and as shown on the Drawings and directed by the ENGINEER.

PART 2 - PRODUCTS

2.1 COVID-19 WORK PLAN REQUIREMENTS

- A. Contractor shall prepare and submit a COVID-19 work plan for to Municipality of Skagway to review and approve 21 days prior to beginning construction. The intent of the work plan is to prevent the spread of the Corona virus and to keep employees, workers and the public safe from the coronavirus pandemic. This includes but is not limited to social distancing, proper personal protective equipment (PPE), limiting group sizes and interactions, staggering work hours, testing employees, daily work sign-in sheets for each employee, and mandatory quarantine procedures, all in compliance with privacy and health care laws. COVID-19 work plans must also comply with Federal, State or Local laws, regulations and resolutions orders.

- B. Contractor shall communicate key CDC recommendations (and post signage where appropriate) to Contractor's staff and tradespeople:

[How to Protect Yourself](#)

[If You are Sick](#)

[COVID-19 Frequently Asked Questions](#)

Place posters that encourage [staying home when sick, cough and sneeze etiquette](#), and [hand hygiene](#) at the entrance to your workplace and in other workplace areas where they are likely to be seen.

OSHA Guidance on Preparing Workplaces for COVID-19 – go to www.osha.gov

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

- A. Do not begin WORK until written approval of the COVID-19 work plan has been received from the OWNER.

- B. The Municipality of Skagway recognizes that there may be an impact to project schedules by taking the necessary COVID-19 precautions. If this does occur, we encourage you to work with the project engineer to address time impacts. Any contractor who elects to discontinue construction operations due to supply chain disruptions or employee shortages shall submit a request in writing to the project engineer. The contractor shall be responsible for maintenance and water pollution control measures during the voluntary shutdown. The Engineer will review and approve non-working days or a mutual suspension per the "working day" exceptions in the General and Supplementary Conditions.
- C. Contractors are required to comply with applicable occupational safety and health standards, rules, regulations, and orders established by Local, State and Federal agencies.
- D. COVID-19 presents an unprecedented challenge for the construction industry, and society in general. We are all partners in this industry and, where possible, we should seek to work together in order to find reasonable solutions to project related issues caused by COVID-19.

END OF SECTION

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SECTION 01 11 20
JOB CONDITIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Job conditions.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.

1.2 PROJECT CONDITIONS

- A. Prior to installation of material, equipment and other work, verify with subcontractors, material or equipment manufacturers, and installers that the substrate or surface to which those materials attach is acceptable for installation of those materials or equipment. (Substrate is defined as building surfaces to which materials or equipment is attached to i.e., floors, walls, ceilings, etc.).
- B. Correct unacceptable substrate until acceptable for installation of equipment or materials.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 12 00

OWNER FURNISHED EQUIPMENT: ULTRAVIOLET ODOR CONTROL SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. General work included in this section:

1. The Work in this Section includes coordinating delivery, unloading, storage, and installation of Ultraviolet (Photoionization) Odor Control equipment under separate equipment procurement contracts.
2. Coordination and scheduling of Seller's field services for the equipment.
3. Owner has pre-purchased UV Odor Control equipment and related components from Ambio Biofiltration Ltd (Ambio) hereafter described as Ambio Pre-Purchase Contract.
 - a. Ambio Pre-Purchase Contract Scope of Supply:
 - 1) In general the equipment includes UV photoionization equipment, control systems, and internal instrumentation as well as the odor control exhaust fan.
 - 2) The Ambio Scope of Supply is comprised of One (1) UV Odor Control unit (OCU-101) with control panel and One (1) fiberglass odor control exhaust fan (EF-101) as shown in the project manual.
 - 3) Ambio will provide Operation and Maintenance Manuals and Freight.
 - 4) Ambio will provide field services as shown in the project manual, to be coordinated by the Contractor.
 - b. Refer to PART 2 for itemized lists of equipment.
 - c. Refer to shop drawings for detailed information on specific equipment and components
 - 1) Available digitally upon request and one (1) hard copy will be provided to the successful Contractor with the Notice of Award.

B. Related Sections include but are not necessarily limited to:

1. Division 0 – Bidding Requirements, Contract Forms, and Conditions of the Contract.
2. Division 1 – General Requirements

1.2 DEFINITIONS

A. UV Photoionization Odor Control System: The UV Odor Control System shall be as described in these Contract Documents and as shown on the Drawings. Installation of the UV Odor Control System shall be as described herein and specified.

B. Seller: The supplier of the UV Odor Control System as described in these Contract Documents. The supplier of the UV Odor Control System is Ambio Biofiltration Ltd.

1.3 SUBMITTALS

A. Shop Drawings:

1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.

2. Contractor shall submit, at a minimum the following UV Odor Control System information:
 - a. Identification of and Technical Information for Seller supplied materials and equipment, layouts, locations of equipment, supports, anchor bolts, hardware required to complete the installation and testing of the UV Odor Control System.
 - b. Contractor shall submit additional information for Contractor supplied materials and equipment required to complete the installation of the UV Odor Control system and indicate where Contractor coordination and installation assistance shall be provided.
 - c. The Contractor shall be responsible for design, furnishing and installing any additional supports as necessary to provide a complete and functioning system as specified 40 05 07 PIPE SUPPORT SYSTEMS.
 - d. Contractor shall provide a written statement to the Owner as an Informational Submittal, verifying the Contractor has reviewed and approved the Seller's UV Odor Control System Submittal and that the UV Odor Control System can be incorporated into the Work as described in the Contract Documents.
3. Informational Submittals:
 - a. Submittals other than Shop Drawings and samples required by the Contract Documents that do not require approval.
 - b. Representative types of informational submittal items include but are not limited to:
 - 1) Equipment delivery schedule.
 - 2) Installed equipment and systems performance test reports.
 - 3) Seller's installation certification letters.
 - 4) Warranties.

B. Contract Closeout Information:

1. Operation and Maintenance Data:
 - a. See Specification Section 01 33 04 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.

1.4 DELIVERY, OFF-LOADING AND HANDLING

- A. The Contractor shall be responsible for coordinating the delivery of the equipment to the project site and special services with the UV Odor Control System Seller.
- B. Contractor shall coordinate for shipment and delivery of equipment directly with the Seller in accordance with an approved construction schedule.
 1. Contractor shall include the UV Odor Control System delivery milestones, testing and startup duration, etc. in their progress scheduling.
 2. Contractor shall be responsible for transfer of equipment to the Owner provided storage location at the WWTP.
- C. Immediately upon delivery of the equipment, Contractor, Owner, and Engineer shall inspect shipment to assure compliance with the Contract Documents and accepted submittals, and that products are properly protected and undamaged:
 1. Contractor and Owner shall agree in writing to conditions of delivery.
 2. All parts and equipment shall be delivered to the Owner provided storage location:
 - a. Deliveries must be made between 8:00 a.m. and 3:00 p.m. on weekdays.

- b. No deliveries on holidays or weekends shall be allowed.

D. Contractor shall off-load all UV Odor Control System parts and equipment:

- 1. Contractor shall unload parts and equipment within 24 hours of the time of delivery (does not include weekends or holidays):
 - a. Contractor shall pay for additional delivery fees resulting from Contractor's failure to unload parts and equipment within 24 hours of time of delivery.
 - b. Goods shall be delivered between 8:00 a.m. and 3:00 p.m., Monday through Friday.
 - c. Seller's representative to be present at unloading and storage.

E. Following the Owner's inspection the Contractor shall assume responsibility of the equipment through installation and shall pay for any damage incurred between delivery and final acceptance of the equipment.

1.5 STORAGE

A. Contractor shall store all parts and equipment in accordance with the requirements of the Seller's written instructions.

B. Contractor shall remove from on-site storage, unpack, assemble, and install equipment in accordance with the Seller's instructions.

1.6 INSTALLATION

A. Contractor shall install all parts and equipment in accordance with the Contract Documents and the equipment Seller's installation instructions:

- 1. Shop drawings for equipment covered by this section will be supplied by the Owner. Contractor to install per approved shop drawings.

B. Contractor shall install the UV Odor Control System:

- 1. Contractor is responsible for coordination of installing owner supplied equipment.
- 2. Install the equipment and provide all electrical, control, and utility connections at the points of interface as required for system operation and as required by Seller.
- 3. Install electrical and control panels, cabinets.
- 4. Install all electrical and control conduits, wiring and control panels including Programmable Controller (PLC) system.
- 5. Provide supports per the Details and Contract Documents.
- 6. Provide connections to equipment per Drawings and Sections 01 61 03 and 40 05 00.
- 7. Anchors and Anchor Bolts:
 - a. Contractor shall supply all anchors and anchor bolts for all Owner purchased equipment.
- 8. Installation of the catalyst material shall be as required by the UV Odor Control System Seller.
- 9. Cleaning shall be by the Contractor to remove all residuals of catalyst material, carbon dust, and dirt or other matter from the UV Odor Control System prior to commissioning/startup of the UV Odor Control System.

C. A pre-Installation Meeting shall be scheduled with the Owner, Engineer and Seller a minimum of 15 days in advance of the installation of the UV Odor Control System. The Contractor shall provide an Installation Coordinator for the pre-Installation meeting to be held on-site at the Skagway Wastewater Treatment Plant.

1.7 FIELD QUALITY CONTROL

A. Inspect delivery:

1. Contractor, Owner, and Engineer shall inspect all goods associated with the equipment upon delivery.
2. All products that are damaged, used, or in any other way unsatisfactory for use on the project shall be rejected.
3. Immediately upon delivery, an authorized representative thereof shall certify that equipment has been stored in accordance with the Seller's instructions:
 - a. Contractor shall immediately remedy deficiencies until storage is certified.

B. Seller's Field Services:

1. Contractor shall schedule Seller's field services within the time frame specified in this section:
 - a. Site visits to be between 8:00 a.m. and 3:00 p.m., Monday through Friday.
 - b. Contractor shall provide 21 days written request to Owner for Seller's field services.
 - c. Seller's field services shall be paid by Owner through the equipment purchase contract with the Seller.
2. Owner shall pay for Seller's field representative to provide the following services:
 - a. Inspect, check, test and adjust equipment as required and approve installation.
 - b. Be present when equipment is placed in operation.
 - c. Check for proper operation.
 - d. Operator training.
3. The cost of additional site visits or rescheduling of site visits due wholly or in part to deficiencies in the Contractor's work or scheduling shall be paid for by Contractor:
 - a. The Owner shall deduct from any progress payments due Contractor the cost of such visits, and a change order shall be issued reducing the contract amount.

C. Contractor's Responsibilities:

1. Assist Seller's representative in conducting commissioning.
2. Assist Seller's representative in conducting acceptance.
3. Performance retests to be paid by Seller.
4. Coordinate Municipality's personnel operator training.

PART 2 - PRODUCTS

2.1 OWNER SUPPLIED EQUIPMENT

A. Ambio equipment provided by the Owner:

List of consumables

Item	Name	Type:	Pieces, total
1	UV lamps	UVS 1000 H	128
2	Catalyst material	KAAK3KJ2,5	2.22 m ³
3	Wire mesh	Type FD 84	4
4	Filter	F5 843	4

List of components

Component	Pcs	Manufacturer	Types	Type in system	ATEX-code
Differential pressure switch	1	Dwyer	19050G	-00	II 2)G EExd IIB+HydrogenT6
Frequency converter	1	refer to BOM	19050G	-1	II 2)G EExd IIB+HydrogenT6
Fan	1	Aerovent	Size 200	CB-SW	
Control panel	1	Intemac Controls	tailor made	-	--
Electronic Ballast	64	DELTA Electronics, Inc.	T5	F5T254P230NB	
UV-devices	8	NEUTRALOX Umwelttechnik GmbH	Part of the photoionization system	UX 1016LHE5U	Ex II 3/--G EX op is IIA T3 GX
Overall system with UV devices	1	NEUTRALOX Umwelttechnik GmbH	Photoionization system	NX 6800 EX	

2.2 CONTRACTOR SUPPLIED EQUIPMENT AND MATERIALS

- A. Products to be provided by Contractor include, but are not limited to, concrete foundations, acoustical enclosure for exhaust fan, welding inserts, anchor bolts, connecting and interconnecting piping and valves, piping support systems, wiring, conduit, junction boxes, conduit splice boxes, piping, piping accessories, specialties, finish painting and expendable materials, including the startup disposables, all as necessary to provide a complete and properly functioning system.
- B. The Contractor shall provide incidental materials and equipment required to complete the installation of the UV Odor Control System such as equipment pad, washers, shims, fasteners, templates, gaskets, anchor bolts and other supports as needed to provide a complete and functioning system and as described in Section 01 61 03 EQUIPMENT: BASIC REQUIREMENTS.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Contractor shall be responsible for coordination with the Seller on the size, number and location of all anchor bolts required to install the UV Odor Control System.
- B. Installation work shall conform to equipment Seller's recommendations.
- C. Install piping, valves, and miscellaneous fittings as specified.
- D. Install instrumentation, process control systems, and electrical as specified.

3.2 COMMISSIONING, OPERATOR TRAINING AND ACCEPTANCE TESTING

- A. As specified in Section 01 75 00 FACILITY START-UP.
- B. Contractor shall be responsible for coordination with the Seller and Owner for Operator Training.
- C. Contractor shall assist the Seller and Owner with process startup and testing and provide a designated startup coordinator approved by the Owner and Engineer for these purposes as specified.
 - 1. A detailed Startup, Commissioning and Performance Testing Plan which describes the schedule and sequencing shall be developed by the Contractor and the UV Odor Control System Seller in coordination with the Owner and Engineer. This plan shall be submitted by the Contractor for approval by the Engineer at a minimum of 30 days prior to Startup and Commissioning.
- D. Representative of Contractor to be present during all visits by Seller's representative.
- E. Contractor shall notify Owner when Seller's services are required. Services will include:
 - 1. Installation Check:
 - a. Contractor shall rectify installation deficiencies identified by Seller's representative.
 - 2. Start-up and Testing:
 - a. Do not start-up or test equipment until Seller's representative approves installation.
 - b. Conduct start-up testing with assistance of Seller's representative.
 - c. Provide all additional labor and materials, in addition to the Seller's field services, required to complete the contract work.
 - 3. Manufacturer's (Seller's) Field Service Report.
 - 4. Operator Training:
 - a. Contractor shall notify Owner when Seller's training services are to be provided.

END OF SECTION

SECTION 01 21 00
ALLOWANCE (LUMP SUM PROJECTS)

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Provisions for handling Allowance.

1.2 ALLOWANCE

- A. Allowance(s) are established to provide the Owner with a method for compensating the Contractor for specific items of Work that are not completely defined in the Contract Documents prior to the award of contract and maybe required to complete the Work.
- B. Allowance(s) for minor changes are for the exclusive use of Owner as a result of changed conditions, design refinements, and unanticipated design issues.
 - 1. The Owner will issue a field order or directive to proceed with the work as defined in the Allowance below.
 - 2. The Owner can compensate the Contractor for the work as defined below without issuing a change order as long as the costs are within the Allowance amount stated in the Contract.
 - 3. Owner approval is required prior to the start of the work and/or authorization of progress payments for the Allowance(s).
 - 4. The Owner and Contractor can agree to compensate the Contractor for work covered by the Allowance(s) in one or more of the following methods;
 - a. Lump sum payment agreed to prior to beginning the work,
 - b. Agreed on unit prices measured against actual installed quantities, and/or
 - c. Contractor's actual costs as documented on force account sheets completed daily and approved by the Owner. Overhead and Profit will be compensated through the Contractor's Fee as defined in the Contract Documents.
- C. Include in the Bid an Allowance equal to \$ 10,000 .
 - 1. Include Allowance sum on Bid Form on the line provided.
 - 2. The Total Contract Price shall be the sum of the Base Bid and the Allowance.
 - 3. At Project closeout and prior to Final Payment, adjust the final Contract Sum accordingly by Change Order.
 - a. Amount of the Change Order shall reflect difference between actual costs of all approved contingency adjustments and the Allowance.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 25 13
PRODUCT SUBSTITUTIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. The procedure for requesting the approval of substitution of a product that is not equivalent to a product which is specified by descriptive or performance criteria or defined by reference to one or more of the following:
 - a. Name of manufacturer.
 - b. Name of vendor.
 - c. Trade name.
 - d. Catalog number.
 - 2. Substitutions are not "or-equals."
 - 3. This Specification Section does not address substitutions for major equipment.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
- C. Request for Substitution - General:
 - 1. Base all bids on materials, equipment, and procedures specified.
 - 2. Certain types of equipment and kinds of material are described in specifications by means of references to names of manufacturers and vendors, trade names, or catalog numbers.
 - a. When this method of specifying is used, it is not intended to exclude from consideration other products bearing other manufacturer's or vendor's names, trade names, or catalog numbers, provided said products are "or-equals," as determined by Engineer.
 - 3. Other types of equipment and kinds of material may be acceptable substitutions under the following conditions:
 - a. Or-equals are unavailable due to strike, discontinued production of products meeting specified requirements, or other factors beyond control of Contractor; or,
 - b. Contractor proposes a cost and/or time reduction incentive to the Owner.

1.2 QUALITY ASSURANCE

- A. In making request for substitution or in using an approved product, Contractor represents they:
 - 1. Have investigated proposed product, and have determined that it is adequate or superior in all respects to that specified, and that it will perform function for which it is intended.
 - 2. Will provide same guarantee for substitute item as for product specified.
 - 3. Will coordinate installation of accepted substitution into Work, to include building modifications if necessary, making such changes as may be required for Work to be complete in all respects.
 - 4. Waives all claims for additional costs related to substitution which subsequently arise.

1.3 DEFINITIONS

- A. Product: Manufactured material or equipment.

1.4 PROCEDURE FOR REQUESTING SUBSTITUTION DURING BIDDING PERIOD

- A. See Section 00 21 13, Instructions to Bidders.

1.5 PROCEDURE FOR REQUESTING SUBSTITUTION

- A. Substitution shall be considered only:
 - 1. After Award of Contract
 - 2. Under the conditions stated herein.

- B. Written request through Contractor only.
- C. Transmittal Mechanics:
 - 1. Follow the transmittal mechanics prescribed for Shop Drawings in Specification Section 01 33 00.
 - a. Product substitution will be treated in a manner similar to "deviations," as described in Specification Section 01 33 00.
 - b. List the letter describing the deviation and justifications on the transmittal form in the space provided under the column with the heading DESCRIPTION.
 - 1) Include in the transmittal letter, either directly or as a clearly marked attachment, the items listed in Paragraph D below.
- D. Transmittal Contents:
 - 1. Product identification:
 - a. Manufacturer's name.
 - b. Telephone number and representative contact name.
 - c. Specification Section or Drawing reference of originally specified product, including discrete name or tag number assigned to original product in the Contract Documents.
 - 2. Manufacturer's literature clearly marked to show compliance of proposed product with Contract Documents.
 - 3. Itemized comparison of original and proposed product addressing product characteristics including but not necessarily limited to:
 - a. Size.
 - b. Composition or materials of construction.
 - c. Weight.
 - d. Electrical or mechanical requirements.
 - 4. Product experience:
 - a. Location of past projects utilizing product.
 - b. Name and telephone number of persons associated with referenced projects knowledgeable concerning proposed product.
 - c. Available field data and reports associated with proposed product.
 - 5. Data relating to changes in construction schedule.
 - 6. Data relating to changes in cost.
 - 7. Samples:
 - a. At request of Engineer.
 - b. Full size if requested by Engineer.
 - c. Held until substantial completion.
 - d. Engineer not responsible for loss or damage to samples.

1.6 APPROVAL OR REJECTION

- A. Written approval or rejection of substitution given by the Engineer.
- B. Engineer reserves the right to require proposed product to comply with color and pattern of specified product if necessary to secure design intent.
- C. In the event the substitution is approved, the resulting cost and/or time reduction will be documented by Change Order in accordance with the General Conditions.
- D. Substitution will be rejected if:
 - 1. Submittal is not through the Contractor with his stamp of approval.
 - 2. Request is not made in accordance with this Specification Section.
 - 3. In the Engineer's opinion, acceptance will require substantial revision of the original design.
 - 4. In the Engineer's opinion, substitution will not perform adequately the function consistent with the design intent.
- E. Contractor shall reimburse Owner for the cost of Engineer's evaluation whether or not substitution is approved. Contractor shall reimburse the Owner for Engineer's evaluation at a rate of \$150 per hour.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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EXHIBIT A Substitution Request Form
(One Item per each Form)

Project:		Date:
Substitution Requestor:		
Contractor:		
Specification Section No:	Paragraph No. (i.e. 2.1.A.1.c):	Specified Item:
Proposed Substitution:		
Provide Product Data Sheets, Manufacturer's written installation instructions, drawings, diagrams, or any other information as an attached to this Form that will demonstrate the proposed substitution is an Approved Equal.		
In the lines provided state differences between proposed substitutions and specified item. Differences include but are not limited to interrelationship with other items; materials, equipment, function, utility, life cycle costs, applied finished, appearances, and quality.		
<p>_____</p> <p>_____</p> <p>_____</p>		
In the lines provided demonstrate how the proposed substitution is compatible with or modifies other systems, parts, equipment or components of the Project and Work under the Contract :		
<p>_____</p> <p>_____</p> <p>_____</p>		
In the lines provided, describe what effect the proposed substitution has on dimensions indicated on the Drawings and previously reviewed Shop Drawings?		
<p>_____</p> <p>_____</p> <p>_____</p>		
In the lines provided, describe what effect the proposed substitution has on the Construction Schedule and Contract Time.		
<p>_____</p> <p>_____</p> <p>_____</p>		
In the lines provided, describe what effect the proposed substitution has on the Contract Price. This includes all direct, indirect, impact and delay costs.		
<p>_____</p> <p>_____</p> <p>_____</p>		
Manufacturer's guarantees of the proposed and specified items are:		
<input type="checkbox"/> Same <input type="checkbox"/> Different (explain on attachment)		
The undersigned state that the function, utility, life cycle costs, applied finishes, appearance and quality of the proposed substitution are equal or superior to those of the specified item.		
For use by Project Representative:		
<input type="checkbox"/> Accepted <input type="checkbox"/> Accepted as Noted	_____	
<input type="checkbox"/> Not Accepted <input type="checkbox"/> Received Too Late	_____	
_____	_____	
(Date)	(Contractor's Signature)	
_____	_____	
(Telephone)	(Contractor's Firm)	

	(Firms Address)	

Comments:

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SECTION 01 26 13
REQUESTS FOR INFORMATION (RFI)

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section defines the process for handling Requests for Information (RFI).
- B. RFIs are intended to provide clarifications and interpretations of the Contract Documents and maintain progress of Work.
- C. RFIs are not intended for general communication, requesting substitutions, requesting proposed changes, resolution of nonconforming work, or coordination between contractors.

1.2 RFI SUBMITTAL PROCEDURE

- A. All RFIs shall be submitted on the form included with this Section, or on mutually agreeable forms.
- B. When needed, the RFI shall include backup information to clarify the request.
 - 1. Backup information can include verified field measurements, quantities, dimensions, photos showing existing conditions, and any other information that will assist the Engineer or Owner in reviewing and responding to the RFI.
- C. Within ten (10) working days of receipt of RFI, Engineer will return a response to the RFI, request additional information, or will provide a schedule of when a response will be issued.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 REQUESTS FOR INFORMATION

- A. Review of Contract Documents and Field Conditions:
 - 1. Before starting each portion of Work, carefully study and compare drawings, specifications and other contract documents, coordination drawings, shop drawings, prior correspondence or documentation relative to that portion of Work, and any other information furnished by Engineer and Owner.
 - 2. Evaluate field conditions and take field measurements related to that portion of Work.
 - 3. Any inconsistencies discovered in the above review of the contract documents and field conditions should be submitted to the Engineer in an RFI.
- B. Contractor's Responsibilities:
 - 1. When interpretation, clarification or explanation of portion of Construction Documents is needed by Contractor or its Subcontractor, Vendor or Supplier, the request shall be processed through the Contractor.
 - a. Review the RFI for completeness, quality, proper referencing drawings, specification or other contract documents.
 - b. When submitting RFI's generated from subcontractors, suppliers, and others, make every attempt to validate, resolve or respond to RFI by thoroughly researching and reviewing Contract Documents and field conditions before transmitting to the Engineer.
 - c. If the RFI is not clear, concise, complete and easily understood, do not submit the RFI to Engineer for response.
 - 2. Follow these procedures in developing an RFI:
 - a. List relevant Contract Documents when seeking information being requested.
 - 1) Reference all applicable Contract Drawings by sheet number.

- 2) Specifications by section and paragraph number
 - 3) Reference any other relevant documents.
 - b. Clearly state any additional information needed so request can be fully understood, including sketches, photos or other reference material.
 - c. Suggest any reasonable solutions and recommendations which will aid in determining a solution or response.
 - d. Any critical RFI's requiring a rapid response shall clearly indicate such with an explanation as to why RFI is critical.
 - e. Priority for responses shall be indicated when multiple RFI's are submitted within short period of time.
 3. A response to RFI shall not be considered a notice to proceed with a change that may revise the Contract Sum or Contract Time, unless authorized by Owner in writing.
 4. If response to RFI is determined incomplete, it shall be resubmitted with reason response is unacceptable and any necessary additional information within five (5) days of time of receipt of response to RFI.
- C. RFI Submittal Numbering:
1. RFI's shall be assigned unique numbers in sequential order (1, 2, 3, 4, etc.).
 2. A resubmitted RFI or a previously answered RFI requiring revising or further clarification shall be submitted using original RFI number proceeded by ".1 IN to indicate revision one of RFI (i.e.: RFI No. 34.1 for revision 1 to RFI No. 34).
- D. Invalid RFI
1. Engineer may return RFI without response for following reasons:
 - a. Request is unclear or incomplete.
 - b. Request was answered in a previous RFI.
 - c. Requested information is readily available in the Construction Documents.
 - d. Request is related to construction means, methods or techniques.
 - e. Request is related to health or safety measures.
 - f. Request is due to Contractor's lack of adequate coordination.
 - g. Issue relates to coordination between Subcontractors.
 - h. Request is a "Substitution Request."
 - i. Request is a "Contractor Proposed Change."
 - j. Request is due to non-conformance.
 2. Should the invalid RFIs continue to be provided, the Owner may deduct the cost of the Engineer's time to process, review and return the RFI's.

END OF SECTION



EXHIBIT A

Request for Information Form

Contractor's RFI No. _____

Engineer's RFI No. _____

Contract: _____

Contractor: _____

Owner: _____

Owner's Contract No. _____

Engineer **HDR Engineering, Inc.** _____

Engineer's Contract No. _____

THIS REQUEST BY: _____ cc to: _____
(Name of the Contractor's Representative)

REFERENCE: DIVISION ____ SECTION _____ PLAN SHEET NO. _____

ATTACHMENTS _____

INTERPRETATION BY: _____ Date: _____, 20____
(Name of the Engineer's Representative)

ATTACHMENTS _____

The General Conditions (GCs) specify that once the Engineer provides a response to a Contractor's RFI, that determination shall be final and binding on the Contractor unless the Contractor delivers to the Owner written notice of a change in the work within a certain period of time of receipt of that determination. See the GCs for further clarification.

cc to: _____

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SECTION 01 29 73
SCHEDULE OF VALUES (LUMP SUM PROJECTS)

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Administrative and procedural requirements for:
 - a. Schedule of Values.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. Building Code:
 - a. International Code Council (ICC):
 - 1) International Building Code and associated standards, including all amendments, referred to herein as Building Code.

1.3 SUBMITTALS

- A. As required in the General Conditions Part 2.03.A.3 Schedule of Values

1.4 SCHEDULE OF VALUES

- A. Where a Contract is awarded on a lump sum basis, file with the Engineer a balanced price segregation of the lump sum bid into items similar to the various subdivisions of the general and detailed specifications, the sum of which shall equal the lump sum bid.
 - 1. The cost of various materials shall be furnished upon request of the Engineer, and such data will then be used as a basis for making progress estimates.
 - 2. Breakdown costs, itemized by Specification Section and trade, and distribute cost to individual applicable units and structures.
 - 3. Where structures, units, equipment or other components are identified by a specific series or, identification number, utilize said designation throughout cost breakdown.
 - 4. Provide detailed breakdown for individual yard piping or conduit runs and identify approximate quantities involved to satisfaction of the Engineer.
 - 5. Provide separate breakdown for change order items requested.
- B. A reasonable allocation of the Contract Price to the component parts of the Work will be approved if component parts of the Work have values assigned to them that are well-balanced with respect to relative values for similar work established by published estimating guides.
 - 1. Unless otherwise agreed to at the Preconstruction Conference, Means Estimator Guide or other similar nationally recognized estimating guide shall be used for resolving differences between Engineer's and Contractor's opinions of allocation of values.
 - 2. Consent of Surety: If Contractor and Engineer cannot mutually agree on a Schedule of Values, Engineer will approve a Schedule of Values approved by the Surety providing the Performance Bond.
- C. Contractor's costs shall not govern the allocation of values when application of Contractor's costs to a component part of the Work results in any other component part or combination of component parts being under-valued in relation to conventional estimating guides.
- D. SCHEDULE OF VALUES shall be agreed upon prior to first Application for Payment.

1.5 APPLICATION FOR PAYMENT

- A. Provide a Summary Sheets and cost breakdown sheets equivalent to those of EJCDC document C-620, Contractor's Application for Payment forms.
- B. Provide an additional breakdown sheet, equivalent to the Stored Material Summary of EJCDC document C-620, showing the tabulation format for stored materials.
- C. Submit this sheet each month with Contractor's pay request breakdown.
- D. The detail and format of cost breakdown and stored materials tabulation sheet shall be fully approved by Engineer.

PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SPECIFICATION SECTION)

PART 3 - EXECUTION - (NOT APPLICABLE TO THIS SPECIFICATION SECTION)

END OF SECTION

SECTION 01 30 00
SPECIAL CONDITIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Administrative and procedural requirements for:
 - a. Project signs.
 - b. Temporary sanitary facilities
 - c. Contractor's Superintendent's Field Office.
 - d. Drawings and Contract Documents for Contractor use.
 - e. Project photographs.
 - f. Testing and Special Inspections.
 - g. Special considerations related to adjacent properties and facilities.
 - h. Historical and archaeological finds.
 - i. Administrative procedures.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. Building code:
 - a. International Code Council (ICC):
 - 1) International Building Code and associated standards, 2012 Edition including all amendments, referred to herein as Building Code.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 - 2. Project Sign Layout and mounting design.

1.4 PRECONSTRUCTION CONFERENCE

- A. See Section 01 31 19 - Project Meetings.

1.5 PROJECT SIGNS

- A. Within 10 days after receipt of Notice to Proceed, furnish, install, and maintain a Project Sign as defined herein. No other signs will be allowed on the project unless approved in writing by the Owner.
- B. Project Sign Materials:
 - 1. The Project Sign will be produced by an experienced professional sign company.
 - 2. The Project Sign shall be structurally adequate and suitable for exterior application. Project Sign panels shall be constructed using a 4 FT and 8 FT, 3/4 IN new A-B Grade, exterior type, APA MDO plywood both sides.
 - 3. The Project Sign paint shall be exterior quality, as specified in Division 09 or as a minimum, primer and finish coat: exterior, semi-gloss, enamel. Colors for the sign and structure, framing, sign surfaces, and graphics shall be as shown on the Drawings or as selected by the Engineer.

4. Prior to producing the sign, submit a layout of the sign to the Engineer for review and approval. The layout shall include content, lettering style and color and background colors.
- C. Information to be included on the Project Sign will include:
1. Project Name.
 2. Owner's Name.
 3. Engineer.
 4. Contractor.
 5. Construction Manager.
 6. Funding Agencies - if required by the funding agreement.
 7. Construction dollar amount - if required by the funding agency.
 8. Company and Agency Logos - if approved by the Owner.
- D. Installation of the Project Sign:
1. The Project Sign shall be constructed with new materials and kept clean throughout the project duration.
 - a. Install Project Sign as shown in the Drawings.
 2. The Project Sign shall be mounted to resist wind loads as required by authorities having jurisdiction but not less than wind velocity of 50 MPH.
 3. Prior to installing the sign, submit mounting design to the Engineer for review and approval.
 4. The Project Sign shall be erected level and plumb.
- E. Remove signs, framing, supports, and foundations to a depth of at least 2 FT upon completion of Project. Restore area to a condition equal to or better than before construction.

1.6 TEMPORARY SANITARY FACILITIES

- A. Provide temporary sanitary facilities for use of construction workers during construction, remodeling or demolition activities.
- B. Do not use existing toilet facilities in occupied areas or new toilet facilities in construction area without Owner's written consent.
- C. Provide facilities complying with local, State and Federal sanitary laws and regulations.
- D. Follow facility provider's minimum maintenance frequency or service more frequently to keep in clean and sanitary condition.
- E. Provide adequate supplies of toilet paper, cleaning supplies, and other required items.

1.7 CONTRACTOR'S SUPERINTENDENT'S FIELD OFFICE

- A. Establish at site of Project.
- B. Equipment: Telephone, telecopy, mailing address, and sanitary facilities.
- C. Ensure attendance at this office during the normal working day.
- D. At this office, maintain complete field file of Shop Drawings, posted Contract Drawings and Specifications, and other files of field operations including provisions for maintaining "As Recorded Drawings."
- E. Remove field office from site upon acceptance of the entire work by the Owner.

1.8 DRAWINGS AND CONTRACT DOCUMENTS FOR CONTRACTOR USE

- A. Refer to General Conditions.
- B. Pick up all "no-charge" documents within 10 days from date of Notice to Proceed.
- C. Additional documents after "no-charge" documents will be furnished to Contractor at cost.

1.9 PROJECT PHOTOGRAPHS

- A. At least once each month during construction of the Work, provide progress pictures as directed by Engineer.
 - 1. Pictures shall be digital and provided on disk with thumbnail index.
 - 2. Provide number of photographs as follows:
 - a. 24 ground level color photos per month.
 - 3. Photographically impose a site plan key map on each photograph in the upper right hand corner and show by arrow the subject and the direction from which the photograph was taken.
 - a. Date all photographs.

1.10 TESTING AND SPECIAL INSPECTIONS

- A. See Section 01 45 33 - Special Inspections and Testing Program.

1.11 SCHEDULE OF VALUES

- A. See Section 01 29 73 - Schedule of Values (Lump Sum Projects).

1.12 PROJECT MEETINGS

- A. See Section 01 31 19 - Project Meetings.

1.13 SPECIAL CONSIDERATIONS RELATED TO ADJACENT PROPERTIES AND FACILITIES

- A. Contractor shall be responsible for negotiations of any waivers or alternate arrangements required to enable transportation of materials to the site.
- B. Access, Traffic Control, and Parking:
 - 1. Maintain conditions of access road to site such that access is not hindered as the result of construction related deterioration.
 - 2. Do not permit driving across or transporting materials or equipment across areas outside the construction limits shown on the Drawings.
 - 3. Provide traffic control devices and personnel necessary to ensure a safe interface of construction traffic with business traffic to and from adjacent sites.
 - 4. Provide access routes for emergency vehicles at all times.
 - 5. Provide daily sweeping of hard-surface roadways to remove soils tracked onto roadway.
 - 6. Provide on-site parking for all staff to limit interference with adjacent properties and businesses.

1.14 HISTORICAL AND ARCHAEOLOGICAL

- A. If during the course of construction, evidence of deposits of historical or archeological interest is found, cease operations affecting the find and shall notify Owner.
 - 1. No further disturbance of the deposits shall ensue until the Contractor has been notified by Owner that Contractor may proceed.
 - 2. Owner will issue a notice to proceed after appropriate authorities have surveyed the find and made a determination to Owner.
 - 3. Compensation to the Contractor, if any, for lost time or changes in construction resulting from the find, shall be determined in accordance with changed or extra work provisions of the Contract Documents.
 - 4. The site has been previously investigated and has no known history of historical or archaeological finds.

1.15 ADMINISTRATIVE PROCEDURES

- A. Unless otherwise specified, or agreed to in the Pre-Construction Conference, use the following EJCDC standard forms for Work Change Directives, Change Orders, and Field Orders:
 - 1. C-940 Work Change Directive 2013.
 - 2. C-941 Change Order 2013.
 - 3. C-942 Field Order 2013.
- B. The following attached forms shall be used for Removal From Service Request:

1. Removal From Service Request

C. These forms are included as supplements to this section.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SUPPLEMENTAL INFORMATION

1. Removal From Service Request

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REMOVAL FROM SERVICE Request (RFS)

Project: Skagway WWTP Odor Control Improvements

Subject:

This form shall be used for requesting and documenting significant operations interruptions or requests from the Contractor to make modifications to existing infrastructure that is in operation typically. This form shall be submitted two weeks and approved before shutdown.

Building/Area Affected:

Systems/Equipment Affected:

Day of Shutdown _____ Time _____ Duration _____

Work to be Accomplished:

Foreman in Charge: _____ Crew size: _____

List Shutdown Activities with Start Time and Special Requirements

Problems that may be encountered and corrective action:

Skagway Operations

Contractor

Skagway Utility Mechanic

Owners Project Representative

Skagway Electrician

Engineer

END OF SUPPLEMENTAL INFORMATION

SECTION 01 31 19
PROJECT MEETINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Preconstruction, progress and other project meetings.
- B. Related Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.

1.2 PRECONSTRUCTION MEETING

- A. Meet with the Owner and Engineer for a pre-construction conference at a time mutually agreed upon after the contract is awarded, but before any work is performed,
- B. The Engineer will schedule a meeting of the Owner, Contractor, Contractor's Subcontractors, and their respective representatives.
 - 1. The purpose of the meeting will be to clarify construction contract administration procedures, to establish lines of authority and communication and identify duties and responsibilities of the parties.
- C. The Engineer will schedule the pre-construction conference after receipt of the Contractor's draft proposed schedule.
- D. The agenda for the meeting shall cover at least the following items:
 - 1. Use of site and special concerns regarding adjacent properties.
 - 2. Organization of the Contractor's forces and personnel, including all subcontractors, and materials suppliers.
 - 3. Channels and procedures for communication.
 - 4. Contractor's construction schedule, including sequence of critical work.
 - 5. Contract documents, including distribution of required copies and revisions.
 - 6. Processing of shop drawings and other data.
 - 7. Processing of Requests for Information (RFI), Construction Change Directives (CCD) and Change Orders and distribution of related forms.
 - 8. Rules and regulations applicable to the performance of the work, such as quality control, testing and startup.
 - 9. Contractor's site safety and security protocols.
 - 10. Procedures for quality control, housekeeping and related matters.
- E. The Engineer will compile meeting minutes from the transcribed record of the meeting and electronically distribute copies to all participants.
- F. Pre-construction conference submittals:
 - 1. The names and telephone numbers of Contractor's Superintendent and Office Manager.
 - 2. List of personnel authorized to sign change orders and receive progress payments.
 - 3. The name, address and telephone numbers of two or more persons employed by the Contractor who can be reached at any time of the day or night to handle emergency matters.
 - 4. A list of all subcontractors that will work on the project, a description of work they will perform, and a contact list for each subcontractor with phone numbers and address.
 - 5. A list of materials suppliers and products over \$50,000.
 - 6. A draft proposed Construction Schedule.
 - 7. Material Safety Data Sheets for all hazardous chemical products to be used by the Contractor on this project.
 - 8. Temporary Erosion and Sediment Controls Plan.

9. Traffic Control Plan.

1.3 PROGRESS MEETINGS

- A. Weekly progress meetings will be held via teleconference, unless otherwise arranged.
- B. Attendees will include the Owner, Engineer, Contractor, subcontractors, and suppliers' representatives as may be needed, other Contractors working at the site, and other interested or affected parties.
- C. The specific purpose of the weekly meetings is to coordinate the efforts of all concerned so that the project progresses without delay to completion, with the least inconvenience.
- D. Bring a three week look ahead schedule to each weekly meeting, including the following items:
 - 1. Work completed last week.
 - 2. Work anticipated for the next two weeks ("Look Ahead").
 - 3. Subcontractors on site the prior week.
 - 4. Subcontractors scheduled on site for the next two weeks.
 - 5. Contract document deficiencies or questions noted during prior week.
 - 6. Anything that could impede the progress of the work or affect the critical path on the project schedule.
 - 7. Corrective measures and procedures planned to regain planned schedule, cost or quality assurance, if necessary.
 - 8. Report of any accidents, and any site safety issues that need to be addressed.
- E. Other Agenda items to be discussed:
 - 1. Review and revise as necessary and approve minutes of previous meetings.
 - 2. Status of submittals of equipment and shop drawings.
 - 3. Identify problems that impede planned progress.
 - 4. Other current business.
- F. Revision of Minutes:
 - 1. Unless published minutes are challenged in writing prior to the next regularly scheduled progress meeting, they will be accepted as properly stating the activities and decisions of the meeting.
 - 2. Persons challenging published minutes shall reproduce and distribute copies of the challenge to all indicated recipients of the particular set of minutes.
 - 3. Challenge to minutes shall be settled as priority item of "old business" at the next regularly scheduled meeting.
- G. Minutes of Meeting:
 - 1. The Engineer will compile minutes of each project meeting and will furnish electronic copies to the Contractor.

1.4 OTHER MEETINGS

- A. Other meetings will be required to facilitate progress of the Work. These include, but are not limited to the following:
 - 1. Pre-Installation Conferences:
 - a. Coordinate and schedule with Engineer for each material, product or system specified.
 - 1) Conferences to be held prior to initiating installation, but not more than two (2) weeks before scheduled initiation of installation.
 - 2) Conferences may be combined if installation schedule of multiple components occurs within the same two (2) week interval.
 - 3) Review manufacturers recommendations and Contract Documents Specification Sections.
 - 2. Facility Startup Planning and Coordination Meeting. See Section 01 75 00.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 33 00
SUBMITTALS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Mechanics and administration of the submittal process for:
 - a. Shop Drawings.
 - b. Samples.
 - c. Informational submittals.
 - 2. General content requirements for Shop Drawings.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
 - 3. Construction Progress Schedule submittal requirements are specified in Specification Section 01 32 16.
 - 4. Operations and Maintenance Manual submittal requirements are specified in Specification Section 01 33 04.
 - 5. Technical Specification Sections identifying required submittals.

1.2 DEFINITIONS

- A. Shop Drawings:
 - 1. See General Conditions.
 - 2. Product data and samples are Shop Drawing information.
- B. Informational Submittals:
 - 1. Submittals other than Shop Drawings and samples required by the Contract Documents that do not require review and/or approval by the Engineer.
 - 2. Representative types of informational submittal items include but are not limited to:
 - a. HVAC test and balance reports.
 - b. Installed equipment and systems performance test reports.
 - c. Manufacturer's installation certification letters.
 - d. Instrumentation and control commissioning reports.
 - e. Warranties.
 - f. Service agreements.
 - g. Construction photographs.
 - h. Survey data.
 - i. Health and safety plans.
 - j. Work plans.
 - k. Delegated designs per performance specification requirements
 - 3. For-Information-Only submittals upon which the Engineer is not expected to conduct review or take responsive action may be so identified in the Contract Documents.

1.3 SUBMITTAL SCHEDULE

- A. Schedule of Shop Drawings:
 - 1. Submitted and approved within 20 days of receipt of Notice to Proceed.
 - 2. Account for multiple transmittals under any specification section where partial submittals will be transmitted.
- B. Shop Drawings: Submittal and approval prior to 20 percent completion of project.

- C. Informational Submittals:
 1. Reports and installation certifications submitted within seven (7) days of conducting testing, installation, or examination.
 2. Submittals showing compliance with required qualifications submitted twenty (20) days prior to any work beginning using the subject qualifications.
- D. The submittal schedule shall include the following columns as a minimum:

Submittal Section	Submittal Description	Planned Submittal Date	Submittal Need Date	Actual Submittal Date	Actual Return Date	Disposition

1.4 PREPARATION OF SUBMITTALS

- A. General:
 1. All submittals and all pages of all copies of a submittal shall be completely legible.
 2. Submittals which, in the Engineer’s sole opinion, are illegible will be returned without review.
 3. Minimize extraneous information for equipment and products not relevant to the submittal.
 4. Contractors or vendors written comments on the submittal drawings shall be in green
- B. Shop Drawings, Product Data, and Samples:
 1. Scope of any submittal and letter of transmittal:
 - a. Limited to one (1) Specification Section.
 - b. Submittals with more than one Specification section included will be rejected.
 - c. Do not submit under any Specification Section entitled (in part) "Basic Requirements" unless the product or material submitted is specified, in total, in a "Basic Requirements" Specification Section.
 2. Numbering letter of transmittal:
 - a. Include as prefix the Specification Section number followed by a series number, "-xx", beginning with "01 IN and increasing sequentially with each additional transmittal for that Specification Section.
 - b. If more than one (1) submittal under any Specification Section, assign consecutive series numbers to subsequent transmittal letters.
 3. Describing transmittal contents:
 - a. Provide listing of each component or item in submittal capable of receiving an independent review action.
 - b. Identify for each item:
 - 1) Manufacturer and Manufacturer's Drawing or data number.
 - 2) Contract Document tag number(s).
 - 3) Unique page numbers for each page of each separate item.
 - c. When submitting "or-equal" items that are not the products of named manufacturers, include the words "or-equal" in the item description.
 4. Contractor certification of review and approval:
 - a. Contractor's review and approval certification stamp shall be applied either to the letter of transmittal or a separate sheet preceding each independent item in the submittal.
 - 1) Stamp may be either a wet ink stamp or electronically embedded.
 - 2) Clearly identify the person who reviewed the submittal and the date it was reviewed.
 - 3) Shop Drawing submittal stamp shall read "(Contractor's Name) has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval as stipulated in the General Conditions."

- b. Submittals containing multiple independent items shall be prepared with each item listed on the letter of transmittal or on an index sheet for all items listing the discrete page numbers for each page of each item, which shall be stamped with the Contractor's review and approval stamp.
 - 1) Each independent item shall have a cover sheet with the transmittal number and item number recorded.
 - a) Provide clear space of 3 IN SQ for Engineer stamping.
 - 2) Individual pages or sheets of independent items shall be numbered in a manner that permits the entire contents of a particular item to be readily recognized and associated with Contractor's certification.
- 5. Resubmittals:
 - a. Number with original Specification Section and series number with a suffix letter starting with "A" on a (new) duplicate transmittal form.
 - b. Do not increase the scope of any prior transmittal.
 - c. Provide cover letter indicating how each "B", "C", or "D" Action from previous submittal was addressed and where the correction is found in the resubmittal.
 - d. Account for all components of prior transmittal.
 - 1) If items in prior transmittal received "A" or "B" Action code, list them and indicate "A" or "B" as appropriate.
 - a) Do not include submittal information for items listed with prior "A" or "B" Action in resubmittal.
 - 2) Indicate "Outstanding-To Be Resubmitted At a Later Date" for any prior "C" or "D" Action item not included in resubmittal.
 - a) Obtain Engineer's approval to exclude items.
- 6. For 8-1/2 x 11 IN, 8-1/2 x 14 IN, and 11 x 17 IN size sheets, provide [five (5)] copies of each submittal for Engineer plus the number required by the Contractor.
 - a. The number of copies required by the Contractor will be defined at the Preconstruction Conference, but shall not exceed three (3).
 - b. All other size sheets:
 - 1) Submit one (1) reproducible transparency or high resolution print and one (1) additional print of each Drawing until approval is obtained.
 - 2) Utilize mailing tube; do not fold.
 - 3) The Engineer will mark and return the reproducible to the Contractor for reproduction and distribution.
- 7. Do not use red color for marks on transmittals.
 - a. Duplicate all marks on all copies transmitted, and ensure marks are photocopy reproducible.
 - b. Engineer will use red marks or enclose marks in a cloud.
- 8. Transmittal contents:
 - a. Coordinate and identify Shop Drawing contents so that all items can be easily verified by the Engineer.
 - b. Provide submittal information or marks defining specific equipment or materials utilized on the Project.
 - 1) Generalized product information, not clearly defining specific equipment or materials to be provided, will be rejected.
 - c. Identify equipment or material project use, tag number, Drawing detail reference, weight, and other Project specific information.
 - d. Provide sufficient information together with technical cuts and technical data to allow an evaluation to be made to determine that the item submitted is in compliance with the Contract Documents.
 - e. Do not modify the manufacturer's documentation or data except as specified herein.
 - f. Submit items such as equipment brochures, cuts of fixtures, product data sheets or catalog sheets not exceeding 11 x 17 IN pages.
 - 1) Indicate exact item or model and all options proposed by arrow and leader.

- g. When a Shop Drawing submittal is called for in any Specification Section, include as appropriate, scaled details, sizes, dimensions, performance characteristics, capacities, test data, anchoring details, installation instructions, storage and handling instructions, color charts, layout Drawings, rough-in diagrams, wiring diagrams, controls, weights and other pertinent data in addition to information specifically stipulated in the Specification Section.
 - 1) Arrange data and performance information in format similar to that provided in Contract Documents.
 - 2) Provide, at minimum, the detail specified in the Contract Documents.
 - h. If proposed equipment or materials deviate from the Contract Drawings or Specifications in any way, clearly note the deviation and justify the said deviation in detail in a separate letter immediately following transmittal sheet. Any deviation from plans or specifications not depicted in the submittal or included but not clearly noted by the Contractor may not have been reviewed. Review by the Engineer shall not serve to relieve the Contractor of the contractual responsibility for any error or deviation from contract requirements.
9. Samples:
- a. Identification:
 - 1) Identify sample as to transmittal number, manufacturer, item, use, type, project designation, tag number, Specification Section or Drawing detail reference, color, range, texture, finish and other pertinent data.
 - 2) If identifying information cannot be marked directly on sample without defacing or adversely altering samples, provide a durable tag with identifying information securely attached to the sample.
 - b. Include application specific brochures, and installation instructions.
 - c. Provide Contractor's review and approval certification stamp or Contractor's Submittal Certification form as indication of Contractor's checking and verification of dimensions and coordination with interrelated work.
 - d. Resubmit revised samples of rejected items.
- C. Informational Submittals:
- 1. Prepare in the format and detail specified in Specification requiring the informational submittal.

1.5 TRANSMITTAL OF SUBMITTALS

- A. Shop Drawings and Samples:
- 1. Transmit all submittals to:

HDR Engineering, Inc.
2525 C Street
Suite # 500
Anchorage, AK 99503-2633
 - 2. Utilize two (2) copies of attached Exhibit A to transmit all Shop Drawings and samples.
 - 3. All submittals must be from Contractor.
 - a. Submittals will not be received from or returned to subcontractors.
- B. Informational Submittals:
- 1. Transmit under Contractor's standard letter of transmittal or letterhead.
 - 2. Submit in triplicate or as specified in individual Specification Section.
 - 3. Transmit to:

HDR Engineering, Inc.
2525 C Street
Suite # 500
Anchorage, AK 99503-2633

C. Electronic Transmission of Submittals:

1. Transmittals may be made electronically.
Via email: ryan.moyers@hdrinc.com
 - a. Protocols and processes will be determined at the Pre-Construction Conference.
2. Provide documents in Adobe Acrobat Portable Document Format (PDF), latest version.
3. Do not password protect or lock the PDF document.
4. Drawings or other graphics must be converted to PDF file format from the original drawing file format and made part of the PDF document.
 - a. Scanning of drawings is to be used only where actual file conversion is not possible and drawings must be scanned at a resolution of 300 dpi or greater.
 - b. Required signatures may be applied prior to scanning for transmittal.
5. Electronic drawings shall be formatted to be at full-scale (or half-scale when printed to 11x17).
 - a. Do not reduce drawings by more than 50 PCT in size.
 - b. Reduced drawings shall be clearly marked "HALF-SIZE" and shall scale accurately at that size.
6. Rotate sheets that are normally viewed in landscape mode so that when the PDF file is opened the sheet is in the appropriate position for viewing.
7. Create bookmarks in the bookmarks panel for the cover, the Table of Contents, and each major section of the document.
8. Using Adobe Acrobat Standard or Adobe Acrobat Professional, set the PDF document properties, initial view as follows:
 - a. Select File → Properties → Initial View.
 - b. Select the Navigation tab: Bookmarks Panel and Page.
 - c. Select the Page layout: Single Page.
 - d. Select the Magnification: Fit Page.
 - e. Select Open to page: 1.
 - f. Set the file to open to the cover page with bookmarks to the left, and the first bookmark linked to the cover page.
9. Set the PDF file "Fast Web View" option to open the first several pages of the document while the rest of the document continues to load.
 - a. To do this:
 - 1) Select Edit → Preferences → Documents → Save Settings.
 - 2) Check the Save As optimizes for Fast Web View box.
10. File naming conventions:
 - a. File names shall use a "ten dot three" convention (XXXXXX-YY-Z.PDF) where XXXXXX is the Specification Section number, YY is the Shop Drawing Root number and Z is an ID number used to designate the associated volume.
11. Labeling:
 - a. As a minimum, include the following labeling on all CD-ROM discs and jewel cases:
 - 1) Project Name.
 - 2) Equipment Name and Project Tag Number.
 - 3) Project Specification Section.
 - 4) Manufacturer Name.
 - 5) Vendor Name.
12. Binding:
 - a. Include labeled CD(s) in labeled jewel case(s).
 - 1) Bind jewel cases in standard three-ring binder Jewel Case Page(s), inserted at the front of the Final paper copy submittal.
 - 2) Jewel Case Page(s) to have means for securing Jewel Case(s) to prevent loss (e.g., flap and strap).

1.6 ENGINEER'S REVIEW ACTION

- A. Shop Drawings and Samples:
1. Items within transmittals will be reviewed for overall design intent and will receive one (1) of the following actions:
 - a. A - FURNISH AS SUBMITTED.
 - b. B - FURNISH AS NOTED (BY ENGINEER).
 - c. C - REVISE AND RESUBMIT.
 - d. D - REJECTED.
 - e. E - ENGINEER'S REVIEW NOT REQUIRED.
 2. Submittals received will be initially reviewed to ascertain inclusion of Contractor's approval stamp.
 - a. Submittals not stamped by the Contractor or stamped with a stamp containing language other than that specified herein will not be reviewed for technical content and will be returned rejected.
 3. In relying on the representation on the Contractor's review and approval stamp, Owner and Engineer reserve the right to review and process poorly organized and poorly described submittals as follows:
 - a. Submittals transmitted with a description identifying a single item and found to contain multiple independent items:
 - 1) Review and approval will be limited to the single item described on the transmittal letter.
 - 2) Other items identified in the submittal will:
 - a) Not be logged as received by the Engineer.
 - b) Be removed from the submittal package and returned without review and comment to the Contractor for coordination, description and stamping.
 - c) Be submitted by the Contractor as a new series number, not as a re-submittal number.
 - b. Engineer, at Engineer's discretion, may revise the transmittal letter item list and descriptions, and conduct review.
 - 1) Unless Contractor notifies Engineer in writing that the Engineer's revision of the transmittal letter item list and descriptions was in error, Contractor's review and approval stamp will be deemed to have applied to the entire contents of the submittal package.
 4. Submittals returned with Action "A" or "B" are considered ready for fabrication and installation.
 - a. If for any reason a submittal that has an "A" or "B" Action is resubmitted, it must be accompanied by a letter defining the changes that have been made and the reason for the resubmittal.
 - b. Destroy or conspicuously mark "SUPERSEDED" all documents having previously received "A" or "B" Action that are superseded by a resubmittal.
 5. Submittals with Action "A" or "B" combined with Action "C" (Revise and Resubmit) or "D" (Rejected) will be individually analyzed giving consideration as follows:
 - a. The portion of the submittal given "C" or "D" will not be distributed (unless previously agreed to otherwise at the Preconstruction Conference).
 - 1) One (1) copy or the one (1) transparency of the "C" or "D" Drawings will be marked up and returned to the Contractor.
 - a) Correct and resubmit items so marked.
 - b. Items marked "A" or "B" will be fully distributed.
 - c. If a portion of the items or system proposed are acceptable, however, the major part of the individual Drawings or documents are incomplete or require revision, the entire submittal may be given "C" or "D" Action.
 - 1) This is at the sole discretion of the Engineer.
 - 2) In this case, some Drawings may contain relatively few or no comments or the statement, "Resubmit to maintain a complete package."

- 3) Distribution to the Owner and field will not be made (unless previously agreed to otherwise).
6. Failure to include any specific information specified under the submittal paragraphs of the Specifications will result in the submittal being returned to the Contractor with "C" or "D" Action.
7. Calculations required in individual Specification Sections will be received for information purposes only, as evidence calculations have been stamped by the professional as defined in the specifications and for limited purpose of checking conformance with given performance and design criteria. The Engineer is not responsible for checking the accuracy of the calculations and the calculations will be returned stamped "E. Engineer's Review Not Required" to acknowledge receipt.
8. Furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than [three] submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.
9. Transmittals of submittals which the Engineer considers as "Not Required" submittal information, which is supplemental to but not essential to prior submitted information, or items of information in a transmittal which have been reviewed and received "A" or "B" action in a prior submittal, will be returned with action "E. Engineer's Review Not Required."
10. Samples may be retained for comparison purposes.
 - a. Remove samples when directed.
 - b. Include in bid all costs of furnishing and removing samples.
11. Approved samples submitted or constructed, constitute criteria for judging completed work.
 - a. Finished work or items not equal to samples will be rejected.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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EXHIBIT A Shop Drawing Transmittal No.

(Spec Section) (Series)

Project Name:		Date Received:
Project Owner:		Checked By:
Contractor:	HDR Engineering, Inc.	Log Page:
Address:	Address:	HDR No.:
		Spec Section:
		Drawing/Detail No.:
Attn:	Attn:	1st. Sub ReSub.
Date Transmitted:	Previous Transmittal Date:	

Item No.	No. Copies	Description	Manufacturer	Mfr/Vendor Dwg or Data No.	Action Taken*

Remarks:

* The Action designated above is in accordance with the following legend:

<p>A - Furnish as Submitted</p> <p>B - Furnish as Noted</p> <p>C - Revise and Submit</p> <ol style="list-style-type: none"> 1. Not enough information for review. 2. No reproducibles submitted. 3. Copies illegible. 4. Not enough copies submitted. 5. Wrong sequence number. 6. Wrong resubmittal number. 7. Wrong spec. section. 8. Wrong form used. 9. See comments. <p>D - Rejected</p>	<p>E - Engineer's review not required</p> <ol style="list-style-type: none"> 1. Submittal not required. 2. Supplemental Information. Submittal retained for informational purposes only. 3. Information reviewed and approved on prior submittal. 4. See comments. 5. Delegated Design - Submittal received as requested by the Contract Documents. The Engineer did not review the engineering or technical content of the submittal. <p>Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Any deviation from plans or specifications not depicted in the submittal or included but not clearly noted by the Contractor may not have been reviewed. Review by the Engineer shall not serve to relieve the Contractor of the contractual responsibility for any error or deviation from contract requirements.</p>
--	---

Comments:

By	Date

Distribution: Contractor | File | Field | Owner | Other |

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Contractor's Submittal Certification

Shop Drawing Transmittal No.: _____

Contract/Project Name: _____

Company Name: _____

has

1. reviewed and coordinated this Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
2. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
3. determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
4. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

This Submittal **does not** contain any variations from the requirements of the Contract Documents.

This Submittal **does** contain variations from the requirements of the Contract Documents. A separate description of said variations and a justification for them is provided in an attachment hereto identified as:

"Shop Drawing Transmittal No. _____ Variation and Justification Documentation"

Insert picture file or electronic signature of Authorized Representative

Authorized Representative

Date

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SECTION 01 33 04
OPERATION AND MAINTENANCE MANUALS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Administration of the submittal process for Operation and Maintenance Manuals.
 - 2. Content requirements for Operation and Maintenance Manuals.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
 - 3. General submittal requirements are specified in Specification Section 01 33 00 - Submittals.
 - 4. Technical Specification Sections identifying required Operation and Maintenance Manual submittals.

1.2 DEFINITIONS

- A. Equipment Operation and Maintenance Manuals:
 - 1. Contain the technical information required for proper installation, operation and maintenance of process, electrical and mechanical equipment and systems.
- B. Building Materials and Finishes Operation and Maintenance Manuals:
 - 1. Contain the information required for proper installation and maintenance of building materials and finishes.

1.3 SUBMITTALS

- A. List of all the Operation and Maintenance Manuals required by the Contract as identified in the Technical Specification Sections. These may be referred to as "Operation and Maintenance Data" submittals.
- B. Operation and Maintenance Manuals:
 - 1. Draft and final electronic copies.
 - 2. Final paper copies: One (1).

1.4 SUBMITTAL SCHEDULE

- A. List of Required Operation and Maintenance Manuals:
 - 1. Submit list with Specification Section number and title within 90 days after Notice to Proceed.
- B. Draft Operation and Maintenance Manuals:
 - 1. Submit approvable draft manuals in electronic format (PDF) within 30 days following approval of the respective Shop Drawing.
 - a. Include placeholders or fly sheet pages where information is not final or is missing from the draft manual.
 - 2. All Draft Operation and Maintenance Manuals shall be received by no later than 50 PCT project completion.
- C. Final Operation and Maintenance Manuals:
 - 1. Final approval of Operation and Maintenance Manuals in electronic format (PDF) must be obtained 45 days prior to equipment start-up.
 - 2. Provide paper copies and CD-ROMs of approved final Operation and Maintenance Manuals in electronic format (PDF), a minimum of 30 days prior to equipment start-up.

3. Issue addenda to Final Approved Operation and Maintenance Manual to include:
 - a. Equipment data that requires collection after start-up, for example but not limited to HVAC balancing reports, electrical switchgear, automatic transfer switch and circuit breaker settings.
 - b. Equipment field testing data.
 - c. Equipment start-up reports.

1.5 PREPARATION OF SUBMITTALS

A. General:

1. All pages of the Operation and Maintenance Manual submittal shall be legible.
 - a. Submittals which, in the Engineer's sole opinion, are illegible will be rejected without review.
2. Identify each equipment item in a manner consistent with names and identification numbers used in the Contract Documents, not the manufacturer's catalog numbers.
3. Neatly type any data not furnished in printed form.
4. Operation and Maintenance Manuals are provided for Owner's use, to be reproduced and distributed as training and reference materials within Owner's organization.
 - a. This requirement is:
 - 1) Applicable to both paper copy and electronic files.
 - 2) Applicable to materials containing copyright notice as well as those with no copyright notice.
5. Notify supplier and/or manufacturer of the intended use of Operations and Maintenance Manuals provided under the Contract.

B. Operation and Maintenance Manual Format and Delivery:

1. Draft electronic submittals:
 - a. Provide manual in Adobe Acrobat Portable Document Format (PDF), latest version.
 - b. Create one (1) PDF file for each equipment Operation and Maintenance Manual.
 - c. Do not password protect or lock the PDF document.
 - d. Scanned images of paper documents are not acceptable. Create the Operation and Maintenance Manual PDF file from the original source document.
 - e. Drawings or other graphics must be converted to PDF file format from the original drawing file format and made part of the PDF document.
 - f. Scanning of drawings is to be used only where actual file conversion is not possible and drawings must be scanned at a resolution of 300 dpi or greater.
 - g. Rotate sheets that are normally viewed in landscape mode so that when the PDF file is opened the sheet is in the appropriate position for viewing.
 - h. Create bookmarks in the bookmarks panel for the Operation and Maintenance Manual cover, the Table of Contents and each major section of the Table of Contents.
 - i. Using Adobe Acrobat Standard or Adobe Acrobat Professional, set the PDF document properties, initial view as follows:
 - 1) Select File → Properties → Initial View.
 - 2) Select the Navigation tab: Bookmarks Panel and Page.
 - 3) Select the Page layout: Single Page Continuous.
 - 4) Select the Magnification: Fit Page.
 - 5) Select Open to page: 1.
 - 6) Set the file to open to the cover page of the manual with bookmarks to the left, and the first bookmark linked to the cover page.
 - 7) Window Options: Check the "Resize window to initial page" box.
 - j. Set the PDF file "Fast Web View" option to open the first several pages of the document while the rest of the document continues to load.
 - 1) To do this:
 - a) Select Edit → Preferences → Documents → Save Settings.
 - b) Check the "Save As optimizes for Fast Web View" box.

- k. PDF file naming convention:
 - 1) Use the Specification Section number, the manufacturer's name and the equipment description, separated by underscores.
 - 2) Example: 46 51 21_Sanitaire_Coarse_Bubble_Diffusers.pdf.
 - 3) Do not put spaces in the file name.
 - 2. Final electronic submittals:
 - a. Submit two (2) copies in PDF file format on two (2) CD-ROM discs (one (1) copy per CD-ROM), each secured in a jewel case.
 - b. CD-ROM Labeling:
 - 1) Provide the following printed labeling on all CD-ROM discs:
 - a) Project name.
 - b) Specification Section.
 - c) Equipment names and summary of tag(s) covered.
 - d) Manufacturer name.
 - e) Date (month, year).
 - c. CD-ROM Jewel Case Holder:
 - 1) Insert jewel cases containing labeled CD-ROM discs in three-ring binder holder (C-Line Products, www.c-lineproducts.com stock number CLI-61968 or equivalent) at the front of each final paper copy.
 - 3. Final paper copy submittals:
 - a. Quantity: Provide two (2) copies.
 - b. Paper: 8.5 x 11 IN or 11 x 17 IN bright white, 20 LB paper with standard three-hole punching.
 - c. 3-Ring Binder:
 - 1) Provide D-ring binder with clear vinyl sleeves (i.e. view binder) on front and spine.
 - 2) Insert binder title sheet with the following information under the front and spine sleeves:
 - a) Project name.
 - b) Specification Section.
 - c) Equipment names and summary of tag(s) covered.
 - d) Manufacturer name.
 - e) Date (month, year).
 - 3) Provide plastic sheet lifters prior to first page and following last page.
 - d. Drawings:
 - 1) Provide all drawings at 11 x 17 IN size, triple folded and three-hole punched for insertion into manual.
 - 2) Where reduction is not practical to ensure readability, fold larger drawings separately and place in three-hole punched vinyl envelopes inserted into the binder.
 - 3) Identify vinyl envelopes with drawing numbers.
 - e. Use plastic coated dividers to tab each section of each manual in accordance with the Table of Contents.
- C. Equipment Operation and Maintenance Manual Content:
- 1. Provide a cover page as the first page of each manual with the following information:
 - a. Manufacturer(s) Name and Contact Information.
 - b. Vendor's Name and Contact Information.
 - c. Date (month, year).
 - d. Project Owner and Project Name.
 - e. Specification Section.
 - f. Project Equipment Tag Numbers.
 - g. Model Numbers.
 - h. Engineer's Name.
 - i. Contractor's Name.
 - 2. Provide a Table of Contents for each manual.

3. Provide Equipment Record sheets as follows:
 - a. Printed copies of the Equipment Record (Exhibits B1, B2 and B3), as the first tab following the Table of Contents.
 - b. Exhibits B1-B3 are available as Fillable PDF Form documents from the Engineer.
 - c. Each section of the Equipment Record must be completed in detail; simply referencing the related equipment Operation and Maintenance Manual sections for nameplate, maintenance, spare parts or lubricant information is not acceptable.
 - d. For equipment involving separate components (for example, a motor and gearbox), a fully completed Equipment Record is required for each component.
 - e. Submittals that do not include the Equipment Record(s) will be rejected without further content review.
 4. Provide a printed copy of the Manufacturer's Field Services report as required by Specification Section 01 75 00 following the Equipment Record sheets.
 5. Provide the following detailed information, as applicable:
 - a. Use equipment tag numbers from the Contract Documents to identify equipment and system components.
 - b. Equipment function, normal and limiting operating characteristics.
 - c. Instructions for assembly, disassembly, installation, alignment, adjustment, and inspection.
 - d. Operating instructions for start-up, normal operation, control, shutdown, and emergency conditions.
 - e. Lubrication and maintenance instructions.
 - f. Troubleshooting guide.
 - g. Mark each sheet to clearly identify specific products and component parts and data applicable to the installation for the Project; delete or cross out information that does not specifically apply to the Project.
 - h. Parts lists:
 - 1) A parts list and identification number of each component part of the equipment.
 - 2) Exploded view or plan and section views of the equipment with a detailed parts callout matching the parts list.
 - 3) A list of recommended spare parts.
 - 4) List of spare parts provided as specified in the associated Specification Section.
 - 5) A list of any special storage precautions which may be required for all spare parts.
 - i. General arrangement, cross-section, and assembly drawings.
 - j. Electrical diagrams, including elementary diagrams, wiring diagrams, connection diagrams, and interconnection diagrams.
 - k. Test data and performance curves.
 - l. As-constructed fabrication or layout drawings and wiring diagrams.
 - m. Copy of the equipment manufacturer's warranty meeting the requirements of the Contract.
 - n. Copy of any service contracts provided for the specific piece of equipment as part of the Contract.
 6. Additional information as required in the associated equipment or system Specification Section.
- D. Building Materials and Finishes Operation and Maintenance Manual Content:
1. Provide a cover page as the first page of each manual with the following information:
 - a. Manufacturer(s) Name and Contact Information.
 - b. Vendor's Name and Contact Information.
 - c. Date (month, year).
 - d. Project Owner and Project Name.
 - e. Specification Section.
 - f. Model Numbers.
 - g. Engineer's Name.
 - h. Contractor's Name.
 2. Provide a Table of Contents for each manual.

3. Building products, applied materials and finishes:
 - a. Include product data, with catalog number, size, composition and color and texture designations.
 - b. Provide information for ordering custom manufactured products.
 4. Necessary precautions:
 - a. Include product MSDS for each approved product.
 - b. Include any precautionary application and storage guidelines.
 5. Instructions for care and maintenance:
 - a. Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods and recommended schedule for cleaning and maintenance.
 6. Moisture protection and weather exposed products:
 - a. Include product data listing, applicable reference standards, chemical composition, and details of installation.
 - b. Provide recommendations for inspections, maintenance and repair.
 7. Additional requirements as specified in individual product specifications.
- E. National Fire Protection Association 70 (National Electrical Code) Documentation:
1. Assemble documented calculations of Arc-Fault Current, Equipment Available Fault Current and Short Circuit Current Rating (SCCR) provided as part of equipment submittals into one O&M manual volume.

1.6 TRANSMITTAL OF SUBMITTALS

- A. Operation and Maintenance Manuals.
1. Transmit all submittals to:
 - a. The address specified in Specification Section 01 33 00 - SUBMITTALS.
 2. Transmittal form: Use Operation and Maintenance Manual Transmittal, Exhibit A.
 3. Transmittal numbering:
 - a. Number each submittal with the Specification Section number followed by a series number beginning with "-01 IN and increasing sequentially with each additional transmittal, followed by "-OM" (for example: 43 23 14-01-OM).
 4. Submit draft and final Operation and Maintenance Manual in electronic format (PDF) to Engineer, until manual is approved.

1.7 ENGINEER'S REVIEW ACTION

- A. Draft Electronic (PDF) Submittals:
1. Engineer will review and indicate one of the following review actions:
 - a. A - ACCEPTABLE
 - b. B - FURNISH AS NOTED
 - c. C - REVISE AND RESUBMIT
 - d. D - REJECTED
 2. Submittals marked as Acceptable or Furnish As Noted will be retained; however, the transmittal form will be returned with a request for the final paper and electronic documents to be submitted.
 3. Copies of submittals marked as Revise and Resubmit or Rejected will be returned with the transmittal form marked to indicate deficient areas.
 4. Resubmit until approved.
- B. Final Paper Copy Submittals:
1. Engineer will review and indicate one (1) of the following review actions:
 - a. A - ACCEPTABLE
 - b. D - REJECTED
 2. Submittals marked as Acceptable will be retained with the transmittal form returned as noted.

3. Submittals marked as Rejected will be returned with the transmittal form marked to indicate deficient areas.
4. Resubmit until approved.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION



**EXHIBIT A Operation and Maintenance Manual
Transmittal _____ - _____ - OM
(Spec Section) (Series)**

Project Name:		Date Received:
Project Owner:		Checked By:
Contractor:	Owner:	Log Page:
Address:	Address:	HDR No.:
Attn:	Attn:	1st. Sub. ReSub.

Date Transmitted:	Previous Transmittal Date:			
No. Copies	Description of Item	Manufacturer	Dwg. or Data No.	Action Taken*

Remarks:

To:	From: <i>HDR Engineering, Inc.</i>
Date:	

- * The Action designated above is in accordance with the following legend:
- | | |
|---|--|
| <p>A - Acceptable, provide one (1) additional paper copy and two (2) electronic copies on CD-ROM for final review.</p> <p>B - Furnish as Noted - Not Used</p> <p>C - Revise and Resubmit
This Operation and Maintenance Manual Submittal is deficient in the following area:</p> <ol style="list-style-type: none"> 1. Equipment Records. 2. Functional description. 3. Assembly, disassembly, installation, alignment, adjustment & checkout instructions. 4. Operating instructions. | <ol style="list-style-type: none"> 5. Lubrication & maintenance instructions. 6. Troubleshooting guide. 7. Parts list and ordering instructions. 8. Organization (binder, binder titles, index & tabbing). 9. Wiring diagrams & schematics specific to installation. 10. Outline, cross section & assembly diagrams. 11. Test data & performance curves. 12. Tag or equipment identification numbers. 13. Inclusion of all components & subcomponents. 14. Other - see comments. <p>D - Rejected - Not Used</p> |
|---|--|

Comments:

	By		Date
Distribution:	Contractor	File	Field
			Owner
			Other

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Equipment Data and Spare Parts Summary

Project Name	Specification Section:
Equipment Name	Year Installed:

Project Equipment Tag No(s).

Equipment Manufacturer	Project/Order No.
Address	Phone
Fax	Web Site
	E-mail

Local Vendor/Service Center	Phone
Address	
Fax	Web Site
	E-mail

MECHANICAL NAMEPLATE DATA

Equip.					Serial No.
Make					Model No.
ID No.	Frame No.	HP	RPM	Cap.	
Size	TDH	Imp. Sz.	CFM	PSI	
Other:					

ELECTRICAL NAMEPLATE DATA

Equip.								Serial No.
Make								Model No.
ID No.	Frame No.	HP	V.	Amp.	HZ	PH	RPM	SF
Duty	Code	Ins. Cl.	Type	NEMA	C Amb.	Temp. Rise	Rating	
Other:								

SPARE PARTS PROVIDED PER CONTRACT

Part No.	Part Name	Quantity

RECOMMENDED SPARE PARTS

Part No.	Part Name	Quantity

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Recommended Maintenance Summary

Equipment Description	Project Equip. Tag No(s).
-----------------------	---------------------------

RECOMMENDED BREAK-IN MAINTENANCE (FIRST OIL CHANGES, ETC.)	INITIAL COMPLETION * FOLLOWING START-UP							
	D	W	M	Q	S	A	RT	Hours

* D = Daily W = Weekly M = Monthly Q = Quarterly S = Semiannual A = Annual Hours = Run Time I
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Lubrication Summary

Equipment Description	Project Equip. Tag No(s).
-----------------------	---------------------------

Lubricant Point						
Lubricant Type	Manufacturer		Product	AGMA #	SAE #	ISO
	1					
	2					
	3					
	4					
	5					

Lubricant Point						
Lubricant Type	Manufacturer		Product	AGMA #	SAE #	ISO
	1					
	2					
	3					
	4					
	5					

Lubricant Point						
Lubricant Type	Manufacturer		Product	AGMA #	SAE #	ISO
	1					
	2					
	3					
	4					
	5					

Lubricant Point						
Lubricant Type	Manufacturer		Product	AGMA #	SAE #	ISO
	1					
	2					
	3					
	4					
	5					

Lubricant Point						
Lubricant Type	Manufacturer		Product	AGMA #	SAE #	ISO
	1					
	2					
	3					
	4					
	5					

Lubricant Point						
Lubricant Type	Manufacturer		Product	AGMA #	SAE #	ISO
	1					
	2					
	3					
	4					
	5					

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SECTION 01 35 05

ENVIRONMENTAL PROTECTION AND SPECIAL CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Minimizing the pollution of air, water, or land; control of noise, the disposal of solid waste materials, and protection of deposits of historical or archaeological interest.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.

1.2 SUBMITTALS

- A. Shop Drawings:
 - 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 - 2. Prior to the start of any construction activities submit:
 - a. A detailed proposal of all methods of control and preventive measures to be utilized for environmental protection.
 - b. A drawing of the work area, haul routes, storage areas, access routes and current land conditions including trees and vegetation.
 - c. A copy of the NPDES permit for storm water discharges from construction activities.
 - d. A copy of the approved pollution prevention plan.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Employ and utilize environmental protection methods, obtain all necessary permits, and fully observe all local, state, and federal regulations.
- B. Land Protection:
 - 1. Except for any work or storage area and access routes specifically assigned for the use of the Contractor, the land areas outside the limits of construction shall be preserved in their present condition.
 - a. Confine construction activities to areas defined for work within the Contract Documents.
 - 2. Manage and control all borrow areas, work or storage areas, access routes and embankments to prevent sediment from entering nearby water or land adjacent to the work site.
 - 3. Restore all disturbed areas including borrow and haul areas and establish permanent type of locally adaptable vegetative cover.
 - 4. Unless earthwork is immediately paved or surfaced, protect all side slopes and backslopes immediately upon completion of final grading.
 - 5. Plan and execute earthwork in a manner to minimize duration of exposure of unprotected soils.
 - 6. Except for areas designated by the Contract Documents to be cleared and grubbed, do not deface, injure or destroy trees and vegetation, nor remove, cut, or disturb them without approval of the Engineer.
 - a. Any damage caused by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition at no additional cost to the Owner.

C. Surface Water Protection:

1. Utilize, as necessary, erosion control methods to protect side and backslopes, minimize and the discharge of sediment to the surface water leaving the construction site as soon as rough grading is complete.
 - a. These controls shall be maintained until the site is ready for final grading and landscaping or until they are no longer warranted and concurrence is received from the Engineer.
 - b. Physically retard the rate and volume of run-on and runoff by:
 - 1) Implementing structural practices such as diversion swales, terraces, straw bales, silt fences, berms, storm drain inlet protection, rockered outlet protection, sediment traps and temporary basins.
 - 2) Implementing vegetative practices such as temporary seeding, permanent seeding, mulching, sod stabilization, vegetative buffers, hydroseeding, anchored erosion control blankets, sodding, vegetated swales or a combination of these methods.
 - 3) Providing Construction sites with graveled or rockered access entrance and exit drives and parking areas to reduce the tracking of sediment onto public or private roads.
2. Discharges from the construction site shall not contain pollutants at concentrations that produce objectionable films, colors, turbidity, deposits or noxious odors in the receiving stream or waterway.

D. Solid Waste Disposal:

1. Collect solid waste on a daily basis.
2. Provide disposal of degradable solid waste to an approved solid waste disposal site.
3. Provide disposal of nondegradable solid waste to an approved solid waste disposal site or in an alternate manner approved by Engineer and regulatory agencies.
4. No building materials wastes or unused building materials shall be buried, dumped, or disposed of on the site.

E. Fuel and Chemical Handling:

1. Store and dispose of chemical wastes in a manner approved by regulatory agencies.
2. Take special measures to prevent chemicals, fuels, oils, greases, herbicides, and insecticides from entering drainage ways.
3. Do not allow water used in onsite material processing, concrete curing, cleanup, and other waste waters to enter a drainage way(s) or stream.
4. Provide containment around fueling and chemical storage areas to ensure that spills in these areas do not reach waters of the state.

F. Control of Dust:

1. The control of dust shall mean that no construction activity shall take place without applying all such reasonable measures as may be required to prevent particulate matter from becoming airborne so that it remains visible beyond the limits of construction.
 - a. Reasonable measures may include paving, frequent road cleaning, planting vegetative groundcover, application of water or application of chemical dust suppressants.
 - b. The use of chemical agents such as calcium chloride must be approved by the State of Alaska DOT.
2. Utilize methods and practices of construction to eliminate dust in full observance of agency regulations.
3. The Engineer will determine the effectiveness of the dust control program and may request the Contractor to provide additional measures, at no additional cost to Owner.

G. Burning:

1. Do not burn material on the site.
2. If the Contractor elects to dispose of waste materials by burning, make arrangements for an off-site burning area and conform to all agency regulations.

H. Control of Noise:

1. Control noise by fitting equipment with appropriate mufflers.

- I. Completion of Work:
 - 1. Upon completion of work, leave area in a clean, natural looking condition.
 - 2. Ensure all signs of temporary construction and activities incidental to construction of required permanent work are removed.

- J. Historical Protection:
 - 1. If during the course of construction, evidence of deposits of historical or archaeological interests is found, cease work affecting find and notify Engineer.
 - a. Do not disturb deposits until written notice from Engineer is given to proceed.
 - 2. The Contractor will be compensated for lost time or changes in construction to avoid the find based upon normal change order procedures.

END OF SECTION

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SECTION 01 42 13
STANDARD ABBREVIATIONS AND SYMBOLS

PART 1 - GENERAL

1.1 UNITS OF MEASUREMENT

A. Units of measurement abbreviations are defined on the drawings.

1.2 TERMINOLOGY

- A. Abbreviations associated with terminology are defined in the Drawings, with the following exceptions:
1. Typical equipment abbreviations are listed in 01 61 03 – Equipment: Basic Requirements.
 2. Piping system abbreviations are listed in 40 05 00 – Pipe and Pipe Fittings: Basic Requirements.

1.3 ORGANIZATIONS AND STANDARDS

A. Organizations associated with industry reference standards are defined in each Specification Section.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 45 33
SPECIAL INSPECTIONS AND TESTING PROGRAM

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Contractor responsibilities for special inspection and testing.
 2. Special Inspection program and reporting requirements.
 3. Attachment A to this Specification Section includes the Submittal of Special Inspections.
 4. Attachment B to this Specification Section includes Special Inspector qualifications, reporting requirements, and material specific inspections and tests.
 - a. This information is for the Contractor reference only and is not part of the Contract Documents.
 - b. It is included to assist the Contractor in understanding the Owner-provided Services so that those services may be factored into the Contractor's pricing and schedule.
 - c. The Service Provider(s) responsible for the Owner-provided Services will be selected after Contract award.
- B. Purpose:
1. This Document was developed to address the requirements of the 2015 International Building Code IBC, section 1704.1, including:
 - a. One or more special inspectors will be hired by the Owner or the Owner's Agent to provide inspections during constructions on the types of work listed under Section 1704.
 2. A Statement of Special Inspections will be submitted to the Building Code Official as a condition for permit issuance. This statement is included as Attachment A to this Specification. Attachment B includes a complete list of materials and work requiring special inspections, the inspections to be performed and a list of the minimum qualifications of the individuals, approved agencies or firms intended to be retained for conducting such inspections.
- C. Related Specification Sections include but are not necessarily limited to:
1. Division 00 - Procurement and Contracting Requirements.
 2. Division 01 - General Requirements.

1.2 DEFINITIONS

- A. Special Inspector: Representative of the Owner approved inspection agency designated for that portion of the work.
- B. Testing Agency: Approved agency, not affiliated or hired by the Contractor, which is responsible for the materials testing requirements of the project including but not limited to concrete cylinder breaks, soils testing, and masonry materials testing.
- C. Statement of Special Inspections: Document provided to the Building Code Official outlining special inspections and tests to be done on the project and frequency of required test.
- D. Soils Engineer or Geotechnical Engineer: For the purposes of Special Inspection "Soils Engineer," "Geotechnical Engineering," and "Special Inspector" shall be interchangeable as pertains to the Division 31 specifications.
- E. NICET: National Institute for Certification in Engineering Technologies.

1.3 CONTRACTOR'S RESPONSIBILITIES

- A. Cooperate with testing agency personnel, special inspector, and agents of the Building Code Official and provide access to the work.

1. Providing access to the work shall include all labor and facilities to perform inspections and tests as listed in the specifications for the duration of the inspections or tests involved.
 2. Provide means to obtain and handle samples taken on site.
- B. Attend a pre-construction meeting to coordinate and clarify inspection and testing procedures, requirements.
- C. Notify special inspector and/or testing agency of work to be inspected/tested minimum of 24 HRS prior.
- D. Work for which special inspections are required shall remain accessible and exposed for the purposes of special inspections until completion of required special inspections.
- E. Any portion of work that is not in conformance shall be corrected and re-inspected. Such portions of the work shall not be covered or concealed until authorized by Owner's Representative.
- F. Work to be inspected should be complete at time of inspector's arrival on-site.
- G. Payment for Special Inspection services will be in accordance with the following:
1. Payment described below is for the Testing Agency and Special Inspector costs and does not include the Contractor's costs listed in Paragraph 1.3 A.
 2. After Contractor notification, inspector arrives at site and performs inspection within the timeframe defined in Item 4 below.
 - a. Inspection reveals work is satisfactory.
 - b. Owner pays all costs associated with this inspection.
 3. After Contractor notification, inspector arrives at site and performs inspection within the timeframe defined in Item 4 below.
 - a. Inspection reveals work is deficient.
 - b. Contractor corrects deficiencies within timeframe defined in Item 4) below.
 - c. Work is re-inspected and work is satisfactory.
 - d. Owner pays all costs associated with this inspection.
 4. After Contractor notification, inspector arrives at site and work is not ready for inspection when inspector arrives.
 - a. Inspector will remain on-site for a maximum of 2 HRS awaiting the completion of the work.
 - b. If work is not ready for inspection at the end of this period, inspector will be dismissed until Contractor requests re-inspection.
 - c. All costs associated with this inspection trip will be charged to the Contractor.
 5. After Contractor notification, inspector arrives at site and performs inspection within the timeframe defined above.
 - a. Inspection reveals work is deficient.
 - b. Contractor attempts to correct deficiencies within 2 HR timeframe and calls for re-inspection.
 - c. Work is re-inspected and found to still be deficient.
 - d. Inspector will be dismissed.
 - e. All costs associated with this inspection trip will be charged to the Contractor.
 6. Owner will pay for "passing" soils on the Project. Costs of corrective actions and cost of failed test areas requiring retesting are the sole responsibility of the Contractor. For additional specific payment requirements for soils see the respective Division 31 Section.
- H. Special Inspection is intended to be an independent quality assurance. Special Inspections shall not relieve the Contractor of any quality assurance, quality control, workmanship, or warranty responsibilities. Contractor's own personnel shall review all work to be inspected for conformance with Contract Documents prior to calling for inspection.

1.4 REPORTING DUTIES AND AUTHORITY

- A. A pre-construction meeting to coordinate and clarify inspection, testing, and procedural requirements will be held per Section 01 30 00.

1. The meeting is to be attended by:
 - a. Owner.
 - b. Engineer.
 - c. Building Code Official or designee.
 - d. Testing Agency and Special Inspectors.
 - e. General Contractor.
 - f. Appropriate Sub-contractor(s).
- B. Special Inspector shall report all deficient work to the Contractor as soon as possible.
 1. Deficient work that has been covered up or concealed prior to re-inspection shall be reported to the Engineer and the Building Code Official.
- C. Special Inspector does not have authority to stop work or modify the requirements of the Contract Documents.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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**ATTACHMENT A TO SECTION 01 45 33
SUBMITTAL OF SPECIAL INSPECTIONS**

Statement Date: 9/1/19

Project Name: Skagway Wastewater Treatment Plant Odor Contro

Project Address: Skagway, AK

Owner: Municipality of Skagway, AK

Registered Design Professional in Responsible Charge (DPRC): Douglas Prindle, PE

The Statement of Special Inspections (Statement) is submitted as a condition for permit issuance in accordance with the Special Inspection requirements of the Building Code. The Special Inspection program is outlined in Specification Section 01 45 33 and Attachments A and B. A detailed explanation of the requirements for Special Inspections and Testing can be found in specification Section 01 45 33 of the Project Manual in conjunction with the Technical Specifications for each material.

Bi-weekly Special Inspection reports will be submitted to the DPRC and the Building Official. Discovered discrepancies will be brought to the immediate attention of the Contractor for correction. If the discrepancies are not corrected, the discrepancies will be brought to the attention of the DPRC and the Building Official. Only documents that are prepared and signed or sealed by the Special Inspectors (SI) are valid.

The SI is responsible for verifying all information on each document prior to signing or sealing and directly forwarding it to the DPRC and Building Official. The SI is responsible for verifying all inspectors under his supervision maintain current certifications during the course of the project. At the conclusion of each individual Special Inspection type, the SI will complete a Final Report.

The Special Inspection program does not relieve the Contractor or any other entity of any contractual duties, including quality control, quality assurance, or safety. The Contractor is solely responsible for construction means, methods, and job site safety. Failure to adhere to the SI program as outlined herein may result in a stop work notice being issued by the Building Official.

Respectfully submitted,
Design Professional in Responsible Charge,

Douglas Prindle, PE

Type or Print Name

Alaska License # 12630

Expires: 12/31/19

Signature

Date

END OF ATTACHMENT A

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ATTACHMENT B TO SECTION 01 45 33
SPECIAL INSPECTIONS, INSPECTOR QUALIFICATIONS AND REPORTING
REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Specification Sections include but are not necessarily limited to:
1. Division 00 - Procurement and Contracting Requirements.
 2. Division 01 - General Requirements.
 3. Section 03 05 05 - Concrete Testing and Inspection.
 4. Section 05 50 00 - Metal Fabrications.

1.2 QUALIFICATIONS

- A. Qualifications stated here are the minimum recommended by the Engineer. If the Building Code Official has more stringent qualifications, the more stringent qualifications will take precedence.
- B. All Special Inspections and Testing to be done under the direction of a Professional Engineer or Registered Architect registered in the State of Alaska herein referred to as Registered Professional for Special Inspections (RPSI).
- C. Soil, concrete, masonry, mortar, grout, steel and aluminum related testing.
1. The Testing Agency shall have a minimum of 10 years experience in the testing of these materials.
 2. The Testing Agency's technician(s) conducting this testing:
 - a. Shall have a minimum of five (5) years experience in the testing of concrete, steel and aluminum as appropriate.
 3. Concrete related work:
 - a. International Code Council certification for Reinforced Concrete and American Concrete Institute Concrete Field Testing Technician – Grade 1.
- D. Special Structural Inspections:
1. Professional Engineers or Architects, licensed in the State of Alaska, may perform special inspections in accordance with their license qualifications.
 2. Other individuals, working under the direct supervision of a licensed engineer and meeting the following qualifications, may perform special inspections.
 3. Concrete related work:
 - a. International Code Council certification for Reinforced Concrete Special Inspector or American Concrete Institute Concrete Construction Special Inspector.
 - b. Alternatively, may be an Engineer Intern under the direct supervision of a Licensed Professional Engineer.
 4. Steel and aluminum related work:
 - a. Frame and material verification IBC Table 1704.3, Items 3 and 6:
 - b. Welding:
 - 1) American Welding Society as a Certified Welding Inspector; or
 - 2) International Code Council Structural Steel and Welding Certification and American Welding Society Qualified and one (1) year of related experience; or
 - 3) NDT Level II or II Certificate (for non-destructive testing only).
 - c. High strength bolting:
 - 1) International Code Council Structural Steel and Welding Certification and one (1) year related experience.
 - 2) Alternatively, may be an Engineer Intern with appropriate training.
 5. Other equivalent certifications will not be acceptable unless approved by the Engineer.

1.3 REPORTING DUTIES AND AUTHORITY

- A. Reporting requirements for special inspector per IBC 2015 for Building System Related Work.
 - 1. Comply with requirements of IBC Section 1704.1.2.
 - 2. Provide written documentation of all inspections and testing.
 - a. Include exact location of work.
 - b. If testing of specimens is included, include detailed information on storage and curing of specimens prior to testing.
 - 3. Furnish inspection and test reports to the Contractor, the Engineer's Project Manager and the Owner's on-site representative.
 - a. Indicate that work inspected was done in conformance with approved construction documents.
 - b. Immediately report any discrepancies to the Contractor for correction.
 - c. If the discrepancies are not corrected in a timely fashion, notify the Engineer's Project Manager and Owner's on-site representative.
 - 4. Issue an electronic report summarizing all inspections, corrective action notifications and resolution of discrepancies and non-conforming work every two (2) weeks (14 calendar days).
 - a. Copy will be available to:
 - 1) Engineer's Project Manager.
 - 2) Owner.
 - 3) The Building Code Official.
 - 4) General Contractor.
 - 5. At the end of the Project, the RPSI shall compile all test reports for each inspected material and for each Special Inspector and summarize into a single PDF and submit to the Engineer and Building Code Official.
 - a. Final summary report to be signed and sealed by a Registered Professional for Special Inspections stating:
 - 1) The required Special Inspections have been performed.
 - 2) All discrepancies have been resolved except as specifically stated in the summary report.
- B. Special Inspector shall report all deficient work to the Contractor as soon as possible.
 - 1. Deficient work that has been covered up or concealed prior to re-inspection shall be reported to the Engineer and the Building Code Official.
- C. Special Inspector does not have authority to stop work or modify the requirements of the Contract Documents.

1.4 MATERIAL SPECIFIC SPECIAL INSPECTIONS AND TESTS

- A. Material specific requirements for special inspection and testing are listed in the technical specifications listed below. Special inspection and testing requirements will be located in each appropriate technical specification under "SOURCE QUALITY CONTROL", "FIELD QUALITY CONTROL" and/or "QUALITY ASSURANCE" as appropriate for each material.

1.5 CONCRETE

- A. Special Inspection and testing will be provided per IBC Table 1704.4. Inspection is required for material verification, reinforcing steel, embedded bolts, concrete tests, concrete placement and curing.
- B. Inspection and testing requirements are listed separately in Specification Section 03 05 05 and are indicated as the work to be done by the Special Inspector or Testing Agency.

1.6 STEEL, STAINLESS STEEL, AND ALUMINUM

- A. Special Inspection will be provided for structural steel and aluminum per IBC Section 1704.2, 1704.3 and Table 1704.3. Inspection is required for material verification, high-strength bolting, welding and other work noted on the Contract Documents.

- B. Inspection/testing requirements are listed separately in Section 05 50 00 and are indicated as the work to be done by the Special Inspector. Inspection requirements listed are applicable to aluminum, stainless steel, and structural steel.

PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS ATTACHMENT)

PART 3 - EXECUTION - (NOT APPLICABLE TO THIS ATTACHMENT)

END OF ATTACHMENT B

SECTION 01 61 03
EQUIPMENT - BASIC REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Requirements of this Specification Section apply to all equipment provided on the Project including those found in other Divisions even if not specifically referenced in individual "Equipment" Articles of those Specification Sections.
- B. Related Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
 - 3. Section 01 81 10 - Wind and Seismic Design Criteria
 - 4. Section 03 09 00 - Concrete
 - 5. Section 03 15 19 - Anchorage to Concrete
 - 6. Section 05 50 00 - Metal Fabrications.
 - 7. Section 07 92 00 - Joint Sealants.
 - 8. Section 10 14 00 - Identification Devices.
 - 9. Section 40 05 00 - Pipe and Pipe Fittings: Basic Requirements.
 - 10. Section 40 91 10 - Primary Meters and Transmitters.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American Bearing Manufacturers Association (ABMA).
 - 2. American Gear Manufacturers Association (AGMA).
 - 3. ASTM International (ASTM):
 - a. F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
 - 4. International Electrotechnical Commission (IEC).
 - 5. Institute of Electrical and Electronics Engineers, Inc. (IEEE).
 - 6. International Organization for Standardization (ISO):
 - a. 1940, Mechanical Vibration - Balance Quality Requirements for Rotors in a Constant (Rigid) State - Part 1: Specification and Verification of Balance Tolerances.
 - b. 21940-11, Mechanical Vibration - Rotor Balancing - Part 11: Procedures and Tolerances for Rotors with Rigid Behavior.
 - 7. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - b. ICS 6, Enclosures for Industrial Control and System.
 - c. MG 1, Motors and Generators.
 - 8. InterNational Electrical Testing Association (NETA):
 - a. ATS, Acceptance Testing Specification for Electrical Power Distribution Equipment and Systems.
 - 9. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code (NEC):
 - 10. National Institute for Certification in Engineering Technologies (NICET).
 - 11. National Institute of Standards and Technology (NIST).
 - 12. Occupational Safety and Health Administration (OSHA):
 - a. 29 CFR 1910, Occupational Safety and Health Standards, referred to herein as OSHA Standards.
 - 13. Underwriters Laboratories, Inc. (UL).
 - a. 508, Standard for Safety Industrial Control Equipment.
 - b. 508A, Standard for Safety Industrial Control Panels.

- c. 698A, Standard for Industrial Control Panels Relating to Hazardous (Classified) Locations.
- 14. Vibration Institute.
- B. Natural frequency analysis firm:
 - 1. An independent firm, whose sole or principal part of its business is the calculation of and analysis of natural frequencies of rotating equipment.
 - 2. Minimum of 10 years experience.
 - 3. Employs a registered professional engineer who has experience in finite element analysis, rotordynamic analysis and experimental modal analysis.
 - a. Minimum five (5) years combined field testing and data analysis experience.
 - b. Qualified Vibration Category III certification from the Vibration Institute.
- C. Electrical Equipment and Connections Testing Program:
 - 1. Testing firm:
 - a. An independent firm performing, as the sole or principal part of its business for a minimum of 10 years, the inspection, testing, calibration, and adjusting of systems.
 - b. Must have an established monitoring and testing equipment calibration program with accuracy traceable in an unbroken chain, according to NIST.
 - 2. Field personnel:
 - a. Minimum of one (1) year field experience covering all phases of electrical equipment inspection, testing, and calibration.
 - b. Relay test technician having previous experience with testing and calibration of relays of the same manufacturer and type used on project and proficient in setting and testing the types of protection elements used.
 - c. Supervisor certified by NETA or NICET.
 - 3. Analysis personnel:
 - a. Minimum three (3) years combined field testing and data analysis experience.
 - b. Supervisor certified by NETA or NICET.
- D. Miscellaneous:
 - 1. A single manufacturer of a "product" shall be selected and utilized uniformly throughout Project even if:
 - a. More than one (1) manufacturer is listed for a given "product" in Specifications.
 - b. No manufacturer is listed.
 - 2. Equipment, electrical assemblies, related electrical wiring, instrumentation, controls, and system components shall fully comply with specific NEC requirements related to area classification and to NEMA 250 and NEMA ICS 6 designations shown on Electrical Power Drawings and defined in the Electrical specifications.
 - 3. Variable speed equipment applications: The driven equipment manufacturer shall have single source responsibility for coordination of the equipment and VFD system and verify their compatibility.

1.3 DEFINITIONS

- A. Product: Manufactured materials and equipment.
- B. Major Equipment Supports - Supports for Equipment:
 - 1. Located on or suspended from elevated slabs with supported equipment weighing 2000 LBS or greater, or;
 - 2. Located on or suspended from roofs with supported equipment weighing 500 LBS or greater, or;
 - 3. Located on slab-on-grade or earth with supported equipment weighing 5000 LBS or more.
- C. Equipment:
 - 1. One (1) or more assemblies capable of performing a complete function.
 - 2. Mechanical, electrical, instrumentation or other devices requiring an electrical, pneumatic, electronic or hydraulic connection.

3. Not limited to items specifically referenced in "Equipment" articles within individual Specifications.
- D. Installer or Applicator:
1. Installer or applicator is the person actually installing or applying the product in the field at the Project site.
 2. Installer and applicator are synonymous.

1.4 SUBMITTALS

- A. Shop Drawings:
1. General for all equipment:
 - a. See Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 - b. Data sheets that include manufacturer's name and complete product model number.
 - 1) Clearly identify all optional accessories that are included.
 - c. Acknowledgement that products submitted comply with the requirements of the standards referenced.
 - d. Manufacturer's delivery, storage, handling, and installation instructions.
 - e. Equipment identification utilizing numbering system and name utilized in Drawings.
 - f. Equipment installation details:
 - 1) Location of anchorage.
 - 2) Type, size, and materials of construction of anchorage.
 - 3) Anchorage setting templates.
 - 4) Manufacturer's installation instructions.
 - g. Equipment area classification rating.
 - h. Shipping and operating weight.
 - i. Equipment physical characteristics:
 - 1) Dimensions (both horizontal and vertical).
 - 2) Materials of construction and construction details.
 - j. Equipment factory primer and paint data.
 - k. Manufacturer's recommended spare parts list.
 - l. Equipment lining and coatings.
 - m. Equipment utility requirements include air, natural gas, electricity, and water.
 2. Mechanical and process equipment:
 - a. Operating characteristics:
 - 1) Technical information including applicable performance curves showing specified equipment capacity, rangeability, and efficiencies.
 - 2) Brake horsepower requirements.
 - 3) Copies of equipment data plates.
 - b. Piping and duct connection size, type and location.
 - c. Equipment bearing life certification.
 - d. Equipment foundation data:
 - 1) Equipment center of gravity.
 - 2) Criteria for designing vibration, special or unbalanced forces resulting from equipment operation.
 3. Electric motor:
 - a. Motor manufacturer and model number.
 - b. Complete motor nameplate data.
 - c. Weight.
 - d. NEMA design type.
 - e. Enclosure type.
 - f. Frame size.
 - g. Winding insulation class and temperature rise.
 - h. Starts per hour.
 - i. Performance data:
 - 1) Guaranteed minimum efficiencies at 100 PCT, 75 PCT, and 50 PCT of full load

- 2) Guaranteed minimum power factor at 100 PCT, 75 PCT, and 50 PCT of full load.
 - 3) Locked rotor and full load current at rated terminal voltage and minimum permissible or specified terminal voltage.
 - 4) Starting, full load, and breakdown torque at rated terminal voltage and minimum permissible or specified terminal voltage.
 - j. Bearing data and lubrication system.
 - k. Natural frequency calculations for:
 - 1) Completed assembly including but not limited to the equipment base, rotating piece of equipment, and the rotating piece of equipment driver.
 - 2) Individual piece of rotating equipment.
 - 3) Equipment driver and connected gear reducer, if applicable.
 - l. Thermal protection system including recommended alarm and trip settings for winding and bearing RTD's.
 - m. Fabrication and/or layout drawings:
 - 1) Dimensioned outlined drawing.
 - 2) Connection diagrams including accessories (strip heaters, thermal protection, etc.).
 - n. Certifications:
 - 1) When utilized with a reduced voltage starter, certify that motor and driven equipment are compatible.
 - 2) When utilized with a variable frequency controller, certify motor is inverter duty and the controller and motor are compatible.
 - a) Include minimum speed at which the motor may be operated for the driven machinery.
 - o. Electrical gear:
 - 1) Unless specified in a narrow-scope Specification Section, provide the following:
 - a) Equipment ratings: Voltage, continuous current, kVa, watts, short circuit with stand, etc., as applicable.
 - 2) Control panels:
 - a) Panel construction.
 - b) Point-to-point ladder diagrams.
 - c) Scaled panel face and subpanel layout.
 - d) Technical product data on panel components.
 - e) Panel and subpanel dimensions and weights.
 - f) Panel access openings.
 - g) Nameplate schedule.
 - h) Panel anchorage.
 - i) Short Circuit Current Rating (SCCR) nameplate marking per NFPA 70. Include any required calculations.
4. Systems schematics and data:
 - a. Provide system schematics where required in system specifications.
 - 1) Acknowledge all system components being supplied as part of the system.
 - 2) Utilize equipment, instrument and valving tag numbers defined in the Contract Documents for all components.
 - 3) Provide technical data for each system component showing compliance with the Contract Document requirements.
 - 4) For piping components, identify all utility connections, vents and drains which will be included as part of the system.
 5. Qualifications for:
 - a. Natural frequency analysis firm and personnel.
 - b. Electrical equipment and connections testing firm and personnel.
 6. Equipment Monitoring and Testing plans, in accordance with PART 3 of this Specification Section:
 - a. Natural frequency analysis and calculations.
 - b. Electrical equipment and connection testing.

B. Factory Test Reports

1. Natural frequency bump test reports where required for rotating equipment.
 - a. Minimum characteristics of impact hammer.
 - 1) Frequency Range 1 kHz
 - 2) Range (5v output) 5,000 Lbf (22,200 N)
 - 3) Hammer Sensitivity (5pprox.) 1 mV/lbf (0.23 mV/N)
 - 4) Resonant Frequency 12 kHz
 2. Motor, equipment and final assembled equipment including motor.
 - a. Determine natural frequency of assembled motor prior to shipping to OEM or job site.
 - 1) Individual motor fastened to an "infinitely rigid" mass at the same bolt circle as the final assembled equipment.
 - b. Determine natural frequency of the fan.
 - 1) Fan fastened to an "infinitely rigid" mass at the same bolt circle as the final assembled equipment.
 - c. Determine natural frequency of the fan/motor assembly.
 - 1) Fan/motor assembly fastened to an "infinitely rigid" mass at the same bolt circle as the final field assembled equipment.
 - d. For this use, the "infinitely rigid" mass shall be at least 10 times the weight of the equipment being tested.
 3. Submit natural frequency report(s) for approval prior to shipment.
 4. Equipment performance tests.
 - a. As listed in individual equipment specifications.
- C. Contract Closeout Information:
1. Operation and Maintenance Data:
 - a. See Section 01 33 04 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
- D. Informational Submittals:
1. Sample form letter for equipment field certification.
 2. Certification that equipment has been installed properly, has been initially started up, has been calibrated and/or adjusted as required, and is ready for operation.
 3. Certification for major equipment supports that equipment foundation design loads shown on the Drawings or specified have been compared to actual loads exhibited by equipment provided for this Project and that said design loadings are equal to or greater than the loads produced by the equipment provided.
 4. Field noise testing reports if such testing is specified in narrow-scope Specification Sections.
 5. Notification, at least one (1) week in advance, that motor testing will be conducted at factory.
 6. Certification from equipment manufacturer that all manufacturer-supplied control panels that interface in any way with other controls or panels have been submitted to and coordinated with the supplier/installer of those interfacing systems.
 7. Motor test reports.
 8. Certification prior to Project closeout that electrical panel drawings for manufacturer-supplied control panels truly represent panel wiring including any field-made modifications.
 9. Preliminary field quality control testing format to be used as a basis for final field quality control reporting.
 10. Testing and monitoring reports in accordance with PART 3 of this Specification Section.
 11. Certification that driven equipment and VFD are compatible.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
1. Motors:

- a. Baldor.
- b. General Electric.
- c. Hyundai Heavy Industries.
- d. Marathon Electric.
- e. Rockwell - Reliance.
- f. Siemens.
- g. TECO-Westinghouse.
- h. Toshiba U.S.
- i. U.S. Motors, Nidec Motor Corporation.
- j. WEG.

B. Submit request for substitution in accordance with Section 01 25 13.

2.2 MANUFACTURED UNITS

A. Electric Motors:

1. Where used in conjunction with adjustable speed AC or DC drives, provide motors that are fully compatible with the speed controllers.
2. Design for frequent starting duty equivalent to duty service required by driven equipment.
3. Design for full voltage starting.
4. Design bearing life based upon actual operating load conditions imposed by driven equipment.
5. Size for altitude of Project.
6. Furnish with stainless steel nameplates which include all data required by NEC Article 430.
7. Use of manufacturer's standard motor will be permitted on integrally constructed motor driven equipment specified by model number in which a redesign of the complete unit would be required in order to provide a motor with features specified.
8. AC electric motors less than 1/3 HP:
 - a. Single phase, 60 Hz, designed for the supply voltage shown on the Drawings.
 - b. Permanently lubricated sealed bearings conforming to ABMA standards.
 - c. Built-in manual reset thermal protector or integrally mounted manual motor starter with thermal overload element with stainless steel enclosure.
9. AC electric motors 1/3 to 1 HP:
 - a. Single or 3 PH, 60 Hz, designed for the supply voltage shown on the Drawings.
 - b. Permanently lubricated sealed bearings conforming to ABMA standards.
 - 1) For single phase motors, provide built-in manual reset thermal protector or integrally mounted manual motor starter with thermal overload element.
10. AC electric motors 1-1/2 to 10 HP:
 - a. Single or 3 PH, 60 Hz, designed for the supply voltage shown on the Drawings.
 - b. Permanently lubricated sealed bearings conforming to ABMA standards.
 - c. For vertical motors provide 15 year, average-life thrust bearings conforming to ABMA standards.
11. Severe duty motor to have the following minimum features:
 - a. All cast iron construction.
 - b. Gasketed conduit box.
 - c. Epoxy finish for corrosion protection.
 - d. Hydrosopic varnish on windings for corrosion protection.
 - e. Drain plug and breather.

B. NEMA Design Squirrel Cage Induction Motors:

1. Provide motors designed and applied in compliance with NEMA and IEEE for the specific duty imposed by the driven equipment.
2. Motors to meet NEMA MG 1 (NEMA Premium) efficiencies.
3. Do not provide motors having a locked rotor kVA per HP exceeding the NEMA standard for the assigned NEMA code letter.
4. For use on variable frequency type adjustable speed drives, provide:
 - a. Induction motors that are in compliance with NEMA MG 1, Part 31.

- b. Nameplate identification meeting NEMA MG 1 Part 31 requirements.
 - c. Insulated drive end bearing on all motors.
 - d. Insulated non-drive end bearings, at a minimum, on all motors with horizontal shaft 100 HP and larger.
 - e. An insulated bearing carrier on the non-drive end for vertical shaft motors 100 HP and larger.
 - f. Shaft grounding ring on all motors:
 - 1) Factory installed, maintenance free, circumferential, bearing protection ring with conductive microfiber shaft contacting material.
 - 2) Electro Static Technology AEGIS SGR Bearing Protection Ring or approved equal.
 - g. Have the following minimum turndown ratio without the use of additional cooling, such as a blower, to provide continuous supply of cooling air over the motor.
 - 1) Variable torque: 10:1.
 - 2) Constant torque: 6:1.
5. Design motor insulation in accordance with NEMA standards for Class F insulation with Class B temperature rise above a 40 DEGC ambient.
 6. Design motors for continuous duty.
 7. Size motors having a 1.0 service factor so that nameplate HP is a minimum of 15 PCT greater than the maximum HP requirements of the driven equipment over its entire operating range.
 - a. As an alternative, furnish motors with a 1.15 service factor and size so that nameplate HP is at least equal to the maximum HP requirements of the driven equipment over its entire operating range.
 8. Motor enclosure and winding insulation application:
 - a. The following shall apply unless modified by specific Specification Sections:

MOTOR LOCATION	MOTOR ENCLOSURE / WINDING INSULATION
Wet outdoor Areas	TEFC, Extra Dip and Bake for Moisture
Class I, Division 1 Areas	Explosion Proof, Approved for Class I Division 1 Locations
Class I, Division 2 Areas	Explosion Proof, Approved for Division 1 Locations or TEFC with maximum external frame temperature compatible with the gas in the area, Extra Dip and Bake for moisture

NOTE: Provide TENV motors in the smaller horsepower ratings where TEFC is not available.

9. Provide oversize conduit box complete with clamp type grounding terminals inside the conduit box.
 10. Balance motors to ISO G2.5 level.
 - a. Submit prior to shipping to OEM or job site.
- C. V-Belt Drive:
1. Provide each V-belt drive with sliding base or other suitable tension adjustment.
 2. Provide V-belt drives with a service factor of at least 1.6 at maximum speed.
 3. Provide staticproof belts.
- D. Vibration Isolators:
1. Provide all equipment subject to vibration with restrained spring type vibration isolators or pads according to the manufacturer's written recommendation.
- E. Space Heaters:
1. Silicone rubber strip type, 120 V rated.
 2. Provided on:
 - a. All motors 10 HP and larger mounted outdoors.
 - b. Indoor motors in humid environments as indicated.

2.3 COMPONENTS

A. Gear Drives and Drive Components:

1. Size drive equipment capable of supporting full load including losses in speed reducers and power transmission.
2. Provide nominal input horsepower rating of each gear or speed reducer at least equal to nameplate horsepower of drive motor.
3. Design drive units for 24 HR continuous service, constructed so oil leakage around shafts is precluded.
4. Utilize gears, gear lubrication systems, gear drives, speed reducers, speed increasers and flexible couplings meeting applicable standards of AGMA.
5. Gear reducers:
 - a. Provide gear reducer totally enclosed and oil lubricated.
 - b. Utilize antifriction bearings throughout.
 - c. Provide worm gear reducers having a service factor of at least 1.20.
 - d. Furnish other helical, spiral bevel, and combination bevel-helical gear reducers with a service factor of at least 1.50.

2.4 ACCESSORIES

A. Guards:

1. Provide each piece of equipment having exposed moving parts with full length, easily removable guards, meeting OSHA requirements.
2. Interior applications:
 - a. Construct from expanded galvanized steel rolled to conform to shaft or coupling surface.
 - b. Utilize non-flattened type 16 GA galvanized steel with nominal 1/2 IN spacing.
 - c. Connect to equipment frame with hot-dip galvanized bolts and wing nuts.
3. Exterior applications:
 - a. Construct from 16 GA stainless steel or aluminum.
 - b. Construct to preclude entrance of rain, snow, or moisture.
 - c. Roll to conform to shaft or coupling surface.
 - d. Connect to equipment frame with stainless steel bolts and wing nuts.

B. Anchorage:

1. Cast-in-place anchorage:
 - a. Provide ASTM F593, Type 316 stainless steel anchorage for all equipment.
 - b. Configuration and number of anchor bolts shall be per manufacturer's recommendations.
 - c. Provide two (2) nuts for each bolt.
2. Drilled anchorage:
 - a. Adhesive anchors per Section 03 15 19.
 - b. Epoxy grout per Section 03 09 00.
 - c. Threaded rods same as cast-in-place.

C. Data Plate:

1. Attach a stainless steel data plate to each piece of rotary or reciprocating equipment.
2. Permanently stamp information on data plate including manufacturer's name, equipment operating parameters, serial number and speed.

D. Gages:

1. Provide gages in accordance with Section 40 91 10.
2. Provide at the following locations:
 - a. Inlet and outlet of all reciprocating, centrifugal and positive displacement mechanical and process equipment.
 - b. At locations identified on Drawings.
3. Utilize tapping sleeves for mounting per Section 40 05 00.

E. Lifting Eye Bolts or Lugs:

1. Provide on all equipment 50 LBS or greater.
2. Provide on other equipment or products as specified in the narrow-scope Specification Sections.

2.5 FABRICATION

- A. Design, fabricate, and assemble equipment in accordance with modern engineering and shop practices.
- B. Manufacture individual parts to standard sizes and gages so that repair parts, furnished at any time, can be installed in field.
- C. Furnish like parts of duplicate units to be interchangeable.
- D. Ensure that equipment has not been in service at any time prior to delivery, except as required by tests.
- E. Furnish equipment which requires periodic internal inspection or adjustment with access panels which will not require disassembly of guards, dismantling of piping or equipment or similar major efforts.
 1. Quick opening but sound, securable access ports or windows shall be provided for inspection of chains, belts, or similar items.
- F. Provide common, lipped base plate mounting for equipment and equipment motor where said mounting is a manufacturer's standard option.
 1. Provide drain connection for 3/4 IN PVC tubing.
- G. Machine the mounting feet of rotating equipment.
- H. Fabricate equipment which will be subject to Corrosive Environment in such a way as to avoid back to back placement of surfaces that can not be properly prepared and painted.
 1. When such back to back fabrication can not be avoided, provide continuous welds to seal such surfaces from contact with corrosive environment.
 2. Where continuous welds are not practical, after painting seal the back to back surfaces from the environment in accordance with Section 07 92 00.
- I. Natural frequency/critical speed:
 1. All rotating parts accurately machined and in as near perfect rotational balance as practicable.
 2. Excessive vibration is sufficient cause for equipment rejection.
 3. Ratio of all rotative speeds to natural frequency/critical speed of a unit or components: Greater than 1.2.
- J. Control Panels Engineered and Provided with the Equipment by the Manufacturer:
 1. Manufacturer's standard design for components and control logic unless specific requirements are specified in the specific equipment Specification Section.
 2. NEMA or IEC rated components are acceptable, whichever is used in the manufacturer's standard engineered design, unless specific requirements are required in the specific equipment Specification Section.
 3. Affix entire assembly with a UL 508A or UL 698A label "Listed Enclosed Industrial Control Panel" prior to delivery.
 - a. Control panels without an affixed UL 508A or UL 698A label shall be rejected.
 4. Provide equipment or control panels with Short Circuit Current Rating (SCCR) labeling as required by NFPA 70 and other applicable codes.
 - a. Determine the SCCR rating by one of the following methods:
 - 1) Method 1: SCCR rating meets or exceeds the available fault current of the source equipment when indicated on the Drawings.
 - 2) Method 2: SCCR rating meets or exceeds the source equipment's Amp Interrupting Current (AIC) rating as indicated on the Drawings.
 - 3) Method 3: SCCR rating meets or exceeds the calculated available short circuit current at the control panel.

- b. The source equipment is the switchboard, panelboard, motor control center or similar equipment where the control panel circuit originates.
- c. For Method 3, provide calculations justifying the SCCR rating. Utilize source equipment available fault current or AIC rating as indicated on the Drawings.

2.6 SHOP OR FACTORY PAINT FINISHES

A. Electrical Equipment:

- 1. Provide factory-applied paint coating system(s) for all electrical equipment components.

2.7 SOURCE QUALITY CONTROL

A. Motor Tests:

- 1. Test motors in accordance with NEMA and IEEE standards.
- 2. Provide routine test for all motors.
- 3. The Owner reserves the right to select and have tested, either routine or complete, any motor included in the project.
 - a. The Owner will pay all costs, including shipping and handling, for all motors successfully passing the tests.
 - b. Pay all costs, including shipping and handling, for all motors failing the tests.
 - c. If two (2) successive motors of the same manufacturer fail testing, the Owner has the right to reject all motors from that manufacturer.

B. Balance:

- 1. Unless specified otherwise, for all equipment 10 HP or greater, all rotating elements in motors, pumps, blowers, and centrifugal compressors shall be fully assembled, including coupling hubs, before being statically and dynamically balanced. Balance all rotating elements to the following criteria, per ISO 21940-11:

$$U_{per} = \frac{G \times 6.015 \times W / 2}{N}$$

Where:

U_{per} = Permissible residual unbalance for each correction plane in ounce-inches (OZ-IN). See ISO 21940-11 for acceptable values.

G = ISO Balance Quality Grade Number, per ISO 21940-11

W = Rotor weight in pounds

N = Maximum continuous operating RPM

- a. For all odor control exhaust fans, balancing reports, demonstrating compliance with this requirement, shall be submitted as product data.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install equipment as shown on Drawings and in accordance with manufacturer's directions.
- B. Utilize templates for anchorage placement for slab-mounted equipment.
- C. For equipment having drainage requirements such as seal water, provide 3/4 IN PVC or clear plastic tubing from equipment base to nearest floor or equipment drain.
 - 1. Route clear of major traffic areas and as approved by Engineer.
- D. DO NOT construct foundations until major equipment supports are approved.
- E. Extend all non-accessible grease fittings using stainless steel tubing to a location which allows easy access of fittings from closest operating floor level.
- F. Equipment Base:
 - 1. Construct level in both directions.

2. Take particular care at anchor bolt locations so these areas are flat and level.
- G. Machine Base:
1. Mount machine base of rotating equipment on equipment base.
 - a. Level in both directions, using a machinist level, according to machined surfaces on base.
 2. Level machine base on equipment base and align couplings between driver and driven unit using stainless steel blocks and shims.
 - a. Blocks and shims milled flat and coplanar of both faces.
 - b. Maximum of 3 shims under each foot.
 - c. Size blocks and shims to provide solid support at each mounting bolt location.
 - 1) Provide area size of blocks and shims approximately 1-1/2 times area support surface at each mounting bolt point.
 - d. Provide blocks and shims at each mounting bolt.
 - 1) Furnish blocks and shims that are square shape with "U" cut out to allow blocks and shims to be centered on mounting bolts.
 - e. After all leveling and alignment has been completed and before grouting, tighten mounting bolts to proper torque value.
- H. Rotating equipment Couplings:
1. Align in the annular and parallel positions.
 - a. For equipment rotating at 1200 RPM or less, align both annular and parallel within 0.001 IN tolerance for couplings 4 IN size and smaller.
 - b. Couplings larger than 4 IN size: Increase tolerance 0.0005 IN per inches of coupling diameter, i.e., allow 6 IN coupling 0.002 IN tolerance, and allow a 10 IN coupling 0.004 IN tolerance.
 - c. For equipment rotating at speeds greater than 1200 RPM allow both annular and parallel positions within a tolerance rate of 0.00025 IN per inch coupling diameter.
 2. If equipment is delivered as a mounted unit from factory, verify factory alignment on site after installation and realigned if necessary.
 3. Check surfaces for runout before attempting to trim or align units.
- I. Grouting:
1. After machine base has been shimmed, leveled onto equipment base, couplings aligned and mounting bolts tightened to correct torque value, place a dam or formwork around base to contain grouting between equipment base and equipment support pad.
 - a. Extend dam or formwork to cover leveling shims and blocks.
 - b. Do not use nuts below the machine base to level the unit.
 2. Saturate top of roughened concrete subbase with water before grouting.
 - a. Add grout until entire space under machine base is filled to the top of the base underside.
 - b. Puddle grout by working a stiff wire through the grout and vent holes to work grout in place and release any entrained air in the grout or base cavity.
 3. When the grout has sufficiently hardened, remove dam or formwork and finish the exposed grout surface to fine, smooth surface.
 - a. Cover exposed grout surfaces with wet burlap and keep covering sufficiently wet to prevent too rapid evaporation of water from the grout.
 - b. When the grout has fully hardened (after a minimum of seven (7) days) tighten all anchor bolts to engage equipment base to grout, shims, and equipment support pad.
 - c. Recheck driver-driven unit for proper alignment.

3.2 INSTALLATION CHECKS

- A. For all equipment specifically required in detailed specifications, secure services of experienced, competent, and authorized representative(s) of equipment manufacturer to visit site of work and inspect, check, adjust and approve equipment installation.
1. In each case, representative(s) shall be present during placement and start-up of equipment and as often as necessary to resolve any operational issues which may arise.

- B. Secure from equipment manufacturer's representative(s) a written report certifying that equipment:
 - 1. Has been properly installed and lubricated.
 - 2. Is in accurate alignment.
 - 3. Is free from any undue stress imposed by connecting piping or anchor bolts.
 - 4. Has been operated under full load conditions and that it operated satisfactorily.
 - a. Secure and deliver a field written report to Owner immediately prior to leaving jobsite.
- C. No separate payment shall be made for installation checks.
 - 1. All or any time expended during installation check does not qualify as Operation and Maintenance training or instruction time when specified.

3.3 IDENTIFICATION OF EQUIPMENT AND HAZARD WARNING SIGNS

- A. Identify equipment and install hazard warning signs in accordance with Section 10 14 00.

3.4 FIELD PAINTING AND PROTECTIVE COATINGS

- A. For field painting and protective coatings to repair factory coated material, comply with manufacturer's standards.

3.5 WIRING CONNECTIONS AND TERMINATION

- A. Clean wires before installing lugs and connectors.
- B. Coat connection with oxidation eliminating compound for aluminum wire.
- C. Terminate motor circuit conductors with copper lugs bolted to motor leads.
- D. Tape stripped ends of conductors and associated connectors with electrical tape.
 - 1. Wrapping thickness shall be 150 PCT of the conductor insulation thickness.
- E. Connections to carry full ampacity of conductors without temperature rise.
- F. Terminate spare conductors with electrical tape.

3.6 FIELD QUALITY CONTROL

- A. General:
 - 1. Furnish equipment manufacturer's field quality control services and testing as specified in the individual equipment Specification Sections.
 - 2. Execute pre-demonstration requirements in accordance with Section 01 75 00.
 - 3. Perform and report on all tests required by the equipment manufacturer's Operation and Maintenance Manual.
 - 4. Provide testing of electrical equipment and connections in accordance with the Electrical specifications.
 - 5. Equip testing and analysis personnel with all appropriate project related reference material required to perform tests, analyze results, and provide documentation including, but not limited to:
 - a. Contract Drawings and Specifications.
 - b. Related construction change documentation.
 - c. Approved Shop Drawings.
 - d. Approved Operation and Maintenance Manuals.
 - e. Other pertinent information as required.
- B. Equipment Monitoring and Testing Plans:
 - 1. Approved in accordance with Shop Drawing submittal schedule.
 - 2. Included as a minimum:
 - a. Qualifications of firm, field personnel, and analysis personnel doing the Work.
 - b. List and description of testing and analysis equipment to be utilized.
 - c. List of all equipment to be testing, including:
 - 1) Name and tag numbers identified in the Contract Documents.
 - 2) Manufacturer's serial numbers.

- 3) Other pertinent manufacturer identification,
- C. Instruments Used in Equipment and Connections Quality Control Testing:
1. Minimum calibration frequency:
 - a. Field analog instruments: Not more than 6 months.
 - b. Field digital instruments: Not more than 12 months.
 - c. Laboratory instruments: Not more than 12 months.
 - d. If instrument manufacturer's calibration requirements are more stringent, those requirements shall govern.
 2. Carry current calibration status and labels on all testing instruments.
 3. See individual testing programs for additional instrumentation compliance requirements.
- D. Testing and Monitoring Program Documentation:
1. Provide reports with tabbed sections for each piece of equipment tested.
 2. Include all testing results associated with each piece of equipment under that equipment's tabbed section.
 - a. Include legible copies of all forms used to record field test information.
 3. Prior to start of testing, submit one (1) copy of preliminary report format for Engineer review and comment
 - a. Include data gathering and sample test report forms that will be utilized.
 4. In the final report, include as a minimum, the following information for all equipment tested:
 - a. Equipment identification, including:
 - 1) Name and tag numbers identified in the Contract Documents.
 - 2) Manufacturer's serial numbers.
 - 3) Other pertinent manufacturer identification,
 - b. Date and time of each test.
 - c. Ambient conditions including temperature, humidity, and precipitation.
 - d. Visual inspection report.
 - e. Description of test and referenced standards, if any, followed while conducting tests.
 - f. Results of initial and all retesting.
 - g. Acceptance criteria.
 - h. "As found" and "as left" conditions.
 - i. Corrective action, if required, taken to meet acceptance.
 - j. Verification of corrective action signed by the Contractor, equipment supplier, and Owner's representative.
 - k. Instrument calibration dates of all instruments used in testing.
 5. Provide three (3) bound final reports prior to Project final completion.
- E. Electrical Equipment and Connections Testing Program:
1. Perform testing on Electrical equipment and connections in accordance with the Electrical specification requirements.
 2. Testing of motors:
 - a. Ensure motor has been lubricated.
 - b. Bump motor to check for correct rotation.
 3. Repair or replace equipment shown to be out of range of the acceptable tolerance until the equipment meets or exceeds acceptability standards.
- F. Other Testing:
1. Perform tests and inspections not specifically listed but required to assure equipment is safe to energize and operate.
 2. Subbase that supports the equipment base and that is made in the form of a cast iron or steel structure that has supporting beams, legs, and cross members that are cast, welded, or bolted shall be tested for a natural frequency of vibration after equipment is mounted.
 - a. The ratio of the natural frequency of the structure to the frequency of the disturbing force shall not be between 0.5 and 1.5.

3.7 DEMONSTRATION

A. Demonstrate equipment in accordance with Section 01 75 00.

END OF SECTION

SECTION 01 65 50
PRODUCT DELIVERY, STORAGE, AND HANDLING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Scheduling of product delivery.
 - 2. Packaging of products for delivery.
 - 3. Protection of products against damage from:
 - a. Handling.
 - b. Exposure to elements or harsh environments.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
- C. Payment:
 - 1. No payment will be made to Contractor for equipment or materials not properly stored and insured or without approved Shop Drawings.
 - a. Previous payments for items will be deducted from subsequent progress estimate(s) if proper storage procedures are not observed.

1.2 DELIVERY

- A. Scheduling: Schedule delivery of products or equipment as required to allow timely installation and to avoid prolonged storage.
- B. Packaging: Deliver products or equipment in manufacturer's original unbroken cartons or other containers designed and constructed to protect the contents from physical or environmental damage.
- C. Identification: Clearly and fully mark and identify as to manufacturer, item, and installation location.
- D. Protection and Handling: Provide manufacturer's instructions for storage and handling.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PROTECTION, STORAGE AND HANDLING

- A. Manufacturer's Instruction:
 - 1. Protect all products or equipment in accordance with manufacturer's written directions.
 - a. Store products or equipment in location to avoid physical damage to items while in storage.
 - b. Handle products or equipment in accordance with manufacturer's recommendations and instructions.
 - 2. Protect equipment from exposure to elements and keep thoroughly dry.
 - 3. When space heaters are provided in equipment, connect and operate heaters during storage until equipment is placed in service.

3.2 STORAGE FACILITIES

- A. Temporary Storage Building:
 - 1. Provide a weatherproof temporary storage building specifically for the purpose of providing for protection of products and equipment.
 - a. Size building to accommodate anticipated storage items
 - 2. Equip building with lockable doors and lighting, and provide electrical service for equipment space heaters and heating or ventilation as necessary to provide storage environments acceptable to specified manufacturers.
 - 3. Provide methods of storage of products and equipment off the ground.
 - 4. Provide this structure within 60 days after Notice to Proceed.
 - a. Locate building on-site where shown on the Drawings or in location approved by Engineer.
 - b. Remove building from site prior to startup and demonstration period.

3.3 FIELD QUALITY CONTROL

- A. Inspect Deliveries:
 - 1. Inspect all products or equipment delivered to the site prior to unloading.
 - a. Reject all products or equipment that are damaged, used, or in any other way unsatisfactory for use on Project.
- B. Monitor Storage Area: Monitor storage area to ensure suitable temperature and moisture conditions are maintained as required by manufacturer or as appropriate for particular items.

END OF SECTION

SECTION 01 71 14
MOBILIZATION AND DEMOBILIZATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Project mobilization and demobilization.
- B. Related Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.

1.2 GENERAL

- A. Mobilization work shall consist of preparatory work and operations necessary to be ready to perform the Work required under the Contract, and for other work and operations which must be performed, or costs incurred prior to the beginning of the Work.
- B. Demobilization work shall consist of all activities and costs for transportation of personnel, equipment, and supplies necessary to demobilize the contractor from the site.
- C. Mobilization and Demobilization shall not include mobilization or demobilization for specific items of work for which payment is provided elsewhere in the Contract.
- D. When the Contract or proposed Schedule of Values includes a separate item for mobilization or demobilization, payment will include full compensation for the furnishings of all labor, materials, tools, equipment, administrative costs, and incidentals for mobilization or demobilization.
- E. If additional mobilization and demobilization activities and costs are required during the performance of the Contract as a result of the changed, deleted, or added items of work for which the Contractor is entitled to an adjustment in Contract price, compensation for such costs shall be included in the price adjustment for the item of Work changed or added.

1.3 ITEMS INCLUDED

- A. Mobilization costs shall be limited to the following items:
 - 1. Obtaining bonds and insurance.
 - 2. Obtaining required permits and licenses.
 - 3. Developing Project Work Schedule.
 - 4. Attending Preconstruction Conference.
 - 5. Processing Permits.
 - 6. Furnishing and installing signs.
 - 7. Any work that is necessary to provide access to the site, including, but not limited to, grading and clearing.
 - 8. Installing temporary construction power wiring.
 - 9. Necessary assembly and testing required prior to start of the Work.
 - 10. Establishment of all and other facilities necessary for the Work, including utilities and specified field offices.
 - 11. Providing for and establishing Contractor's work and storage yard.
 - 12. Movement of personnel, major equipment, supplies, and incidentals to the site.
 - 13. Cost incurred prior to the start of the Work which must be performed, such as a down payment on a long lead item.
- B. Demobilization costs shall be limited to the following items:
 - 1. Disassembly, removal and site cleanup/repair of offices, buildings, and other facilities assembled on the site for the Contract.

2. Costs for final site cleanup, packaging of miscellaneous items for return to the yard and other project closeout related expenses.
 3. Cost for final payment documents, and provision of Acknowledgement Certification Request, Bond, and Certificate of Completion.
- C. The Owner will pay all costs for the Mobilization and Demobilization of all of the Contractor's personnel, equipment, supplies, and incidentals at the contract lump sum price as follows:
1. The Owner will pay no greater than 5 PCT of the original Contract Amount as a separate pay item for mobilization.
 2. The Owner will pay no greater than 1/2 PCT of the original Contract Amount as a separate pay item for demobilization.
 3. Owner will pay 50 PCT of the Mobilization lump sum price when 5 PCT of the original Contract Amount is earned.
 4. Owner will pay the remaining 50 PCT of the Mobilization lump sum price when 10 PCT of the original Contract Amount is earned.
 5. Owner will pay 100 PCT of the Demobilization lump sum price when all closeout activities and documents are completed.
 6. Furnish cost data and documentation to justify this portion of the bid if Owner believes that the percentages in this paragraph do not bear a reasonable relation to the cost of the work in this contract.
 7. Failure to justify such price to the satisfaction of the Owner will result in payment as determined by the Owner, of:
 - a. Actual mobilization costs at completion of mobilization.
 - b. Actual demobilization costs at completion of demobilization; and.
 - c. The remainder of this item in the final payment under this contract.
 8. The Owner's determination of the actual costs in this paragraph is not subject to appeal.
 9. This schedule of mobilization progress payments will not limit or preclude progress payments otherwise provided by the Contract.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 73 20
OPENINGS AND PENETRATIONS IN CONSTRUCTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Methods of installing and sealing openings and penetrations in construction.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
 - 3. Section 05 50 00 - Miscellaneous Metals.
 - 4. Section 07 92 00 - Joint Sealants.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. ASTM International (ASTM):
 - a. A36, Standard Specification for Carbon Structural Steel.
 - b. A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - c. A269, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - d. A312, Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
 - e. A351, Standard Specification for Castings, Austenitic, for Pressure-Containing Parts.
 - f. A554, Standard Specification for Welded Stainless Steel Mechanical Tubing.
 - g. A653, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - h. A666, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 - i. A995, Castings, Austenitic-Ferritic (Duplex) Stainless Steel, for Pressure-Containing Parts.
 - 2. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code (NEC):
 - 1) Article 501, Class 1 Locations.
 - b. 90A, Standard for Installation of Air Conditioning and Ventilating Systems.
 - c. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).

1.3 DEFINITIONS

- A. Corrosive Areas: For the purpose of this specification section, all areas of the project are defined as corrosive:
- B. Hazardous Areas: Areas shown in the Contract Documents as having Class I or Class II area classifications.
- C. Washdown Areas: Areas having floor drains or hose bibbs.

1.4 SUBMITTALS

- A. Shop Drawings:
 - 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 - 2. For each structure provide dimensioned or scaled (minimum 1/8 IN = 1 FT) plan view drawings containing the following information:
 - a. Vertical and horizontal location of all required openings and penetrations.

- b. Size of all openings and penetrations.
 - c. Opening type.
 - d. Seal type.
3. Manufacturer's installation instructions for standard manufactured products.

1.5 PROJECT SITE CONDITIONS

- A. For purposes of this Project, water table level is at grade.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Pipe Sleeves:
- 1. Areas listed as Corrosive Areas in PART 1:
 - a. Stainless steel, Type 316L.
 - b. Penetrations 24 IN DIA or less: ASTM A269, ASTM A312 or ASTM A554, Schedule 40.
 - c. Penetrations larger than 24 IN DIA: Stainless steel, ASTM A666, Minimum 1/4 IN thickness.
- B. Backing Rod and Sealant: See Specification Section 07 92 00.
- C. Sheet Metal:
- 1. Areas listed as Corrosive Areas in PART 1: Stainless steel: ASTM A240, Type 316L.
 - 2. All other areas: Galvanized steel: ASTM A653, G90.
 - 3. Minimum 12 GA.

PART 3 - EXECUTION

3.1 INSTALLATION AND APPLICATION

- A. Seal openings and penetrations in non-fire-resistance-rated construction in accordance with Specification Section 07 92 00.
- B. Obtain prior approval from Engineer when any opening larger than 100 SQIN must be made in existing or newly completed construction.
- C. Perform HVAC penetrations in accordance with NFPA 90A.
- D. Perform electrical penetrations in accordance with NFPA 70, Article 501.
- E. When mechanical or electrical work cannot be installed as structure is being erected, provide and arrange for building-in of boxes, sleeves, insets, fixtures or devices necessary to permit installation later.
- 1. Lay out chases, holes or other openings which must be provided in masonry, concrete or other work.
- F. Size sleeves, blockouts and cutouts which will receive sealant seal such that free area to receive sealant is minimized and seal integrity may be obtained.
- G. For insulated piping and ducts, size sleeves, blockouts and cutouts large enough to accommodate full thickness of insulation.
- H. Where pipes, conduits or ducts pass through grating, provide banding at the entire perimeter of the opening.
- 1. Metal grating:
 - a. Provide banding at perimeter with 1/4 IN plate of the same material as the grating.
- I. Where pipes, conduits or ducts are removed where passing through grating:
- 1. Metal grating:

- a. Provide banding at perimeter and cover opening with 1/4 IN plate of the same material as the grating.
- J. Do not cut into or core drill any beams, joists, or columns.
- K. Do not install recesses in beams, joists, columns, or slabs.
- L. Field Cutting and Coring:
 - 1. Saw or core drill with non-impact type equipment.
 - 2. Mark opening and drill small 3/4 IN or less holes through structure following opening outline.
 - 3. Sawcut opening outline on both surfaces.
 - a. Knock out within sawcuts using impact type equipment.
 - b. Do not chip or spall face of surface to remain intact.
 - c. Do not allow any overcut with saw kerf.
- M. Precast-Prestressed Concrete Construction:
 - 1. Do not cut openings or core drill vertically or horizontally through stems of members.
 - 2. Do not locate or install sleeves or recess sleeves vertically or horizontally through or in stems of members.
 - 3. Cast openings and sleeves into flanges of units.
 - 4. Cast openings larger than 6 IN in diameter or 6 IN maximum dimension in units at time of manufacture.
 - 5. Cast openings smaller than 6 IN in diameter or 6 IN maximum dimensions in flanges of units at time of manufacture or field cut.
- N. Where alterations are necessary or where new and old work join, restore adjacent surfaces to their condition existing prior to start of work.
- O. For interior wall applications where backer rod and sealant are specified, provide backer rod and sealant at each side of wall.
- P. Use full depth expanding foam sealant for seal applications where single or multiple pipes, conduits, etc., pass through a single sleeve.
- Q. Do not make duct or conduit penetrations below high water levels when entering or leaving tankage, wet wells, or other water holding structures.
- R. Backer Rod and Sealant:
 - 1. Install in accordance with Specification Section 07 92 00.
 - 2. Provide backer rod and sealant for modular mechanical seal applications.
 - a. Apply on top side of slab penetrations and on interior, dry side wall penetrations.

3.2 SCHEDULES

- A. General Schedule of Penetrations through Floors, Roofs, Foundation Base Slabs, Foundation Walls, Foundation Footings, Partitions and Walls for Ductwork, Piping, and Conduit:
 - 1. Provide the following opening and penetration types:
 - a. Type E - Saw cut or line-drill opening. Place new concrete with integrally cast pipe, duct or conduit spools.
 - b. Type G - Saw cut or line-drill and remove area 1 IN larger than outside dimensions of duct, pipe or conduit.
 - c. Type H - Core drill.
 - d. Type J- Grating Banding for any field cut openings.
 - 2. Provide seals of material and method described as follows.
 - a. Category 2 - Flash around pipe/duct with 1/8 IN thick SST trim compressed over a 1/16 IN neoprene gasket between trim piece, pipe/duct, and siding. Trim piece shall lap over both pipe/duct and metal siding by a minimum of 1 IN. Attach trim to metal siding with 1 IN long SST sheet metal screws at 3 IN intervals. Seal around all sides of trim piece with sealant.
 - b. Category 4 - Backer rod and sealant.

- c. Category 7 - Full depth compressible sealant and finish sealant or full depth expanding foam sealant depending on application.
 - d. Category 8 - Banding for all grating openings and banding and cover plate of similar materials for abandoned openings.
3. Furnish openings and sealing materials through existing floors, grating, roofs, partitions and walls in accordance with Schedule B, Openings and Penetrations for Existing Construction.

**SCHEDULE B. OPENINGS AND PENETRATIONS SCHEDULE
FOR EXISTING CONSTRUCTION**

APPLICATIONS	DUCTS		CONDUIT	
	OPENING TYPE	SEAL CATEGORY	OPENING TYPE	SEAL CATEGORY
Through walls where one side is a hazardous area	E	Not Req	E H ⁽²⁾	Not Req 7
Through exterior wall above grade (metal siding)	G	2	G H	2 7
Through interior walls and slabs not covered by the above applications	G	4	G ^{(1) (3)} H ⁽²⁾	4 4
Grating openings and penetrations	J	8	J	8

- (1) Multiple piping 3 IN and smaller or multiple conduits.
(2) Single pipe 3 IN and smaller or single conduit.
(3) Single pipe or conduit larger than 3 IN.

END OF SECTION

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SECTION 01 73 29
DEMOLITION, CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Demolition, cutting and patching of existing construction where shown on Drawings, or as required to accommodate new work shown or specified.
 - 2. Removal and protection of items identified to be saved or reused.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
 - 3. Section 03 09 00 – Concrete.
 - 4. Section 05 50 00—Metal Fabrications.

1.2 SUBMITTALS

- A. Shop Drawings:
 - 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 - 2. Provide documentation of demolition and removal. Indicate limits and sequencing to be used. Show and identify any items to be kept for Owner reuse or retention.
 - 3. Provide schedule of demolition activities including overall schedule, planned utility interruptions, interruptions of Owner/Using Agency services and traffic control if required.
 - 4. Indicating manufacturer and type of:
 - a. Proposed non-shrink grout.
 - b. Epoxy bonding adhesive.
 - c. Proposed materials and methods to be used for matching and repairing existing construction.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. General:
 - 1. Salvage items, designated for Owner's salvage, as a functional unit.
 - 2. Clean, list and tag for storage.
 - 3. Protect from damage and deliver to location designated.
 - 4. Salvage each item with auxiliary or associated equipment required for operation.

1.4 PROJECT CONDITIONS

- A. Perform preliminary investigations as required to ascertain extent of work.

1.5 SEQUENCING AND SCHEDULING

- A. Coordinate and reschedule work as required to preclude interference with other operations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following products and manufacturers are acceptable:
 - 1. Epoxy bonding adhesive:
 - a. Euco No.452 MV by Euclid Chemical Co.
 - b. Sikadur 32, Hi-Mod by Sika Corporation.
 - 2. Epoxy patch:

- a. Depth of patch:
 - 1) Greater than 3/4 IN: Five Star MP Epoxy Patch.
 - 2) Between 1/8 IN and 3/4 IN: Five Star Fluid Epoxy.
- B. Submit request for substitution in accordance with Specification Section 01 25 13.

2.2 MATERIALS

- A. Temporary Partitions:
 - 1. Plywood: 1/2 IN minimum for interior or exterior use.
 - 2. Paneling: 1/4 IN minimum for interior use.
- B. Non-shrink Grout:
 - 1. See Section 03 09 00.
- C. Epoxy Bonding Adhesive:
 - 1. Two component, moisture insensitive adhesive manufactured for the purpose of bonding fresh concrete to hardened concrete.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Provide and maintain temporary partitions as required in public areas.
 - 1. Construct partitions of braced plywood in exterior areas.
 - 2. Adequately braced paneling may be used in interior areas.
- B. Provide and maintain covered passageways where necessary to ensure safe passage of persons in or near areas of work.
- C. Provide and maintain substantial barricades and safety lights as required.
- D. Provide and maintain temporary dustproof partitions where indicated or necessary.
 - 1. Prevent infiltration of dust into occupied areas.
- E. Provide and maintain temporary weather protection as necessary.
- F. Provide adequate temporary bracing to maintain safety, stability and to resist all loads to which the structure may be subjected.

3.2 DEMOLITION

- A. Cutting and Removal:
 - 1. Remove existing work indicated to be removed, or as necessary for installation of new work.
 - 2. Neatly cut and remove materials, and prepare all openings to receive new work.
 - 3. Remove masonry or concrete in small sections.
- B. Modification of Existing Concrete:
 - 1. Where indicated, remove existing concrete and finish remaining surfaces as specified in Specification Section 03 09 00.
 - a. Make openings by sawing through the existing concrete.
 - 1) Core drill with 6 IN DIA core at the corners of rectangular openings to avoid overcutting at corners.
 - b. Break out concrete after initial saw cuts in the event concrete thickness prevents cutting through.
 - c. Where saw cutting is not possible, make openings by drilling holes around perimeter of opening and then chipping out the concrete.
 - 1) Holes shall be sufficient in number to prevent damage to remaining concrete.
 - 2. Oversize required openings in existing concrete 1 IN on all sides and build back to required opening size by means of grout epoxy bonded to the existing concrete.

3. Where oversized openings cannot be made, remove the concrete to the required opening size and cut back exposed reinforcing 2 IN from face of concrete and fill resulting holes with bonding agent and non-shrink grout.
 - a. At liquid containing structures, coat entire surface with cementitious waterproofing mortar.
 4. Protect remaining concrete from damage.
 - a. If existing concrete to remain becomes damaged, cease demolition and make corrections as required to avoid further damage.
 - b. Notify Engineer immediately of any damage to remaining concrete.
- C. Removal of Existing Anchor Bolts or Other Protruding Elements:
1. Remove all protruding elements.
 2. Remove to a depth of 1/4 IN from finished surface.
 3. Fill void with epoxy patch.
- D. Matching and Patching:
1. Walls, ceilings, floors or partitions:
 - a. Repair abutting walls, ceilings, floors or partitions disturbed by removal.
 - b. Match and patch existing construction disturbed during installation of new work.
 2. Methods and materials:
 - a. Similar in appearance, and equal in quality to adjacent areas for areas or surfaces being repaired.
 - b. Subject to review of Owner.
 3. Reinforcing steel that is cut and exposed:
 - a. Remove to a depth of 2 IN.
 - b. Fill void with epoxy patch.
- E. Salvaged Items:
1. Thoroughly dry and clean all metal surfaces.
 2. Prime all bare metal in accordance with Specification Section 05 50 00.
 3. Clean and lubricate motors and other moving parts.
 4. Brace motors attached to flexible mountings until reinstallation.
 5. Dispose of items or materials not designated for Owner's salvage or reuse.
 - a. Promptly remove from site.
 6. Do not store or sell Contractor salvaged items or materials on-site.
 7. Carefully remove items to be salvaged and reused or to be delivered to Owner's storage.
 - a. Store and protect items indicated on Drawings or those which have been marked by Owner to be salvaged or to be reused in Work.
 - b. Replace any item damaged through carelessness in removal, storage, or handling with new items of same type.
 - c. Do not reuse materials or equipment not specifically indicated or specified to be reused.
 8. Preparation of equipment for storage:
 - a. Identify each component with markings or tags to show its position in the assembly and the assembly of which it belongs.
 - b. Place small parts of wooden boxes and clearly mark contents on the outside.
 - c. Remove oil from oil-lubricated bearings and gear boxes and replace with storage oil.
 - d. Grease grease-lubricated bearings.
 - e. Replace any breather plug with solid plug.
 - f. Megger test motor windings: Attach report of the test results to the unit and furnish one (1) copy to the Engineer.
 - g. Attach unit to suitable crate bottom.
 - h. Enclose unit in polyethylene film and seal all seams and the film to the base of the unit with tape.
 - i. Construct crate of wooden slats around top and sides of unit.
 - j. Attach permanent instruction tag to outside of crate stating "This unit has been prepared for storage--replace oil, vent plugs, and lubricant in accordance with manufacturer's instructions before start-up."

F. Clean Up: Transport debris and legally dispose of off-site.

3.3 SCHEDULE

A. If not listed below, existing removed materials not designated to be salvaged become property of Contractor and shall be removed from premises:

Item	Comment
All valves larger than 2-inch diameter	Consult Owner for packaging and storage requirements.

END OF SECTION

SECTION 01 74 13
CLEANING

PART 1 - GENERAL

1.1 FIRE PROTECTION

- A. Store volatile waste in listed disposal containers.
- B. Maintain site and building so no condition provides a fire hazard.
- C. Remove combustible debris from building at end of each shift and from site daily.
- D. Sources of ignition and smoking are prohibited in flammable and combustible storage areas.
- E. Do not burn on-site.

1.2 POLLUTION CONTROL

- A. Conduct cleanup and disposal operations to comply with codes, rules, regulations, ordinances, and anti-pollution laws.
- B. Do not burn or dispose of combustible debris, rubbish and waste material on site.
- C. Do not discharge volatile, harmful, or dangerous materials into storm or sanitary drains or sewer systems.
- D. Prevent accumulation of wastes that create hazardous conditions.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS

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

2.2 CLEANING MATERIALS

- A. Use only those cleaning materials which will not create hazards to health or property, are non-toxic to both humans and aquatic life, and will not damage surfaces, and comply with the following:

PART 3 - EXECUTION

3.1 GENERAL

- A. Clean items installed under this Contract.
 - 1. Leave free of stains, dirt, dust, damage, or defects.
 - 2. Include washing, sweeping, polishing of wall surfaces, floors, windows, hardware, mirrors, lighting fixtures, equipment, etc.

3.2 DURING CONSTRUCTION

- A. Provide on-site listed disposal containers for collection of waste materials, debris, and rubbish.
 - 1. Dispose of off-site once a week at an approved solid waste disposal site.
 - 2. Cover container to prevent blowing by wind.
- B. Keep work areas clean so as not to hinder health, safety or convenience of personnel in existing facility operations.

- C. Interior cleaning:
 - 1. Clean and vacuum interior space prior to start of painting, and continue cleaning as-needed until substantial completion.
 - 2. Schedule cleaning operations so contaminants do not fall on wet painted surfaces.
 - 3. Clean and protect Work in progress and adjoining materials in place, during handling and installation.
 - 4. Clean lunch/break area after each use.
- D. Exterior cleaning:
 - 1. Wet down dusty materials and rubbish to prevent blowing dust during entire construction period.
 - 2. If use of water is prohibited by law, seek an alternate method to prevent blowing dust.
 - 3. Perform cleaning operations as required during construction to prevent accumulations of dust, soil, and debris.
 - 4. Keep weeds and other vegetation trimmed to 3 IN maximum height.
 - 5. Remove snow and ice from access to buildings.

3.3 FINAL CLEANING

- A. At Substantial Completion, perform final cleaning of Work and existing areas wherever any area are left less than clean by construction operations.
 - 1. Complete cleaning operations before requesting review for Substantial Completion.
- B. Use experienced professional cleaners for final cleaning.
- C. Repair and touch-up marred areas.
- D. Broom clean and remove stains from paved surfaces; rake clean other surfaces of grounds.
- E. Ventilation systems:
 - 1. Clean permanent filters and replace disposable filters if units were operated during construction.
 - 2. Clean ducts, blowers, and coils in air conditioning units operated during construction.
- F. Remove grease, dust, dirt, stains, labels, fingerprints, mastic, adhesive, and foreign materials from interior and exterior surfaces, and fixtures, hardware, and equipment.
- G. Wash and shine glazing, mirrors, stainless steel, etc., including existing windows in area of construction.
- H. Wipe all lighting fixture reflectors, lenses, lamps and trims clean.
 - 1. Replace all burned out lamps.
- I. Polish glossy surfaces to a clear shine.
- J. Remove temporary protection and facilities installed for protection of the Work during construction.

3.4 FIELD QUALITY CONTROL

- A. Prior to Owner occupancy, Contractor and Owner shall conduct an inspection of interior and exterior surfaces and Work areas to verify Project is clean to Owner's satisfaction.

END OF SECTION

SECTION 01 75 00
SYSTEM START-UP

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Procedures and actions, required of the Contractor, which are necessary to achieve and demonstrate Substantial Completion.
 - 2. Requirements for Substantial Completion Submittals.
- B. Related Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
 - 3. Section 01 61 03 - Equipment: Basic Requirements.
 - 4. Section 40 90 00 - Instrumentation for Process Control: Basic Requirements.

1.2 DEFINITIONS

- A. Project Classified System (PCS): A defined part of the Project, consisting of an arrangement of items, such as equipment, structures, components, piping, wiring, materials, or incidentals, so related or connected to form an identifiable, unified, functional, operational, safe, and independent system.
- B. Pre-Demonstration Period: The period of time, of unspecified duration after initial construction and installation activities during which Contractor, with assistance from manufacturer's representatives, performs in the following sequence:
 - 1. Finishing type construction work to ensure the each PCS has reached a state of Substantial Completion.
 - 2. Equipment start-up.
 - 3. Personnel training.
- C. Demonstration Period: A period of time, of specified duration, following the Pre-Demonstration Period, during which the Contractor initiates process flow through the Project Classified System and starts up and operates the Project Classified System, without exceeding specified downtime limitations, to prove the functional integrity of the mechanical and electrical equipment and components and the control interfaces of the respective equipment and components comprising the Project Classified System as evidence of Substantial Completion.
- D. Substantial Completion: See the General Conditions.

1.3 SUBMITTALS

- A. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
- B. Submit in the chronological order listed below prior to the completion of the Pre-Demonstration Period.
 - 1. Master operation and maintenance training schedule:
 - a. Submit 30 days (minimum) prior to first training session for Owner's personnel.
 - b. Schedule to include:
 - 1) Target date and time for Owner witnessing of each system initial start-up.
 - 2) Target date and time for Operation and Maintenance training for each system, both field and classroom.
 - 3) Target date for initiation of Demonstration Period.
 - c. Submit for review and approval by Owner.
 - d. Include holidays observed by Owner.

- e. Attend a schedule planning and coordination meeting 60 calendar days prior to first anticipated training session.
 - 1) Provide a status report and schedule-to-complete for requirements prerequisite to manufacturer's training.
 - 2) Identify initial target dates for individual manufacturer's training sessions.
- f. Owner reserves the right to insist on a minimum seven (7) days' notice of rescheduled training session not conducted on master schedule target date for any reason.
- g. Schedule to be resubmitted until approved.
- 2. Substantial Completion Submittal:
 - a. File Contractor's Notice of Substantial Completion and Request for Inspection.
 - b. Approved Operation and Maintenance manuals received by Engineer minimum 30 days prior to scheduled training.
 - c. Written request for Owner to witness each system pre-demonstration start-up.
 - 1) Request to be received by Owner minimum one (1) week before scheduled training of Owner's personnel on that system.
 - d. Equipment installation and pre-demonstration start-up certifications.
 - e. Letter verifying completion of all pre-demonstration start-up activities including receipt of all specified items from manufacturers or suppliers as final item prior to initiation of Demonstration Period.

1.4 SEQUENCING AND SCHEDULING

- A. Project Classified Systems (PCS's) established as follows:
 - 1. PCS #1: Building #1 Odor Control Unit System consisting of the following:
 - a. UV Odor Control Unit OCU-101.
 - b. Treated Air Exhaust Fan EF-101.
 - c. Grease Filter GF-100
 - d. Balancing per Section 44 31 83.
 - e. And all incidentals necessary for complete system, including, but not limited to, the ductwork, dampers, drains and associated equipment shown on Drawing 00Y-10.
- B. Schedule of Events:
 - 1. Start-up of PCS #1 may occur at the discretion of the Contractor.

1.5 COST OF START-UP

- A. Contractor to pay all costs associated with Facility start-up.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

- A. Facility Start-up Divided into Two Periods:
 - 1. Pre-Demonstration Period including:
 - a. Completion of construction work to bring Project to a state of Substantial Completion.
 - b. Start-up of Equipment.
 - c. Training of Personnel.
 - d. Completion of the filing of all required submittals.
 - e. Filing of Contractor's Notice of Substantial Completion and Request for Inspection.
 - 2. Demonstration Period including:
 - a. Demonstration of functional integrity of facility or PCS.

3.2 PRE-DEMONSTRATION PERIOD

- A. Completion of Construction Work:
 - 1. Complete the work to bring the PCS to a state of substantial completion.

- B. Equipment Start-up:
1. Requirements for individual items of equipment are included in the Technical Specification Sections.
 2. Prepare the equipment so it will operate properly and safely and be ready to demonstrate functional integrity during the Demonstration Period.
 3. Perform Equipment Start-up to extent possible without introducing product flow (defined as foul air for odor control treatment).
 4. Introduce product flow to complete Equipment Start-up for the following equipment:
 - a. OCU-101 and EF-101.
 5. Procedures include but are not necessarily limited to the following:
 - a. Test or check and correct deficiencies of:
 - 1) Power, control, and monitoring circuits for continuity prior to connection to power source.
 - 2) Voltage of all circuits.
 - 3) Phase sequence.
 - 4) Cleanliness of connecting piping systems.
 - 5) Alignment of connected machinery.
 - 6) Vacuum and pressure of all closed systems.
 - 7) Lubrication.
 - 8) Valve orientation and position status for manual operating mode.
 - 9) Instrumentation and control signal generation, transmission, reception, and response.
 - a) See Specification Section 40 90 00.
 - 10) Tagging and identification systems.
 - 11) All equipment: Proper connections, alignment, calibration and adjustment.
 - b. Calibrate all safety equipment.
 - c. Manually rotate or move moving parts to assure freedom of movement.
 - d. "Bump" start electric motors to verify proper rotation.
 - e. Perform other tests, checks, and activities required to make the equipment ready for Demonstration Period.
 - f. Documentation:
 - 1) Prepare a log showing each equipment item subject to this paragraph and listing what is to be accomplished during Equipment Start-up.
 - 2) Provide a place for the Contractor to record date and person accomplishing required work.
 - 3) Submit completed document before requesting inspection for Substantial Completion certification.
 6. Obtain certifications, without restrictions or qualifications, and deliver to Engineer:
 - a. Manufacturer's equipment installation check letters (sometimes referred to as Manufacturer's Field Services report).
 - b. Instrumentation Supplier's Instrumentation Installation Certificate.
- C. Personnel Training:
1. See individual equipment specification sections.
 2. Conduct all personnel training after completion of Equipment Start-up for the equipment for which training is being conducted.
 - a. Personnel training on individual equipment or systems will not be considered completed unless:
 - 1) All pre-training deliverables are received and approved before commencement of training on the individual equipment or system.
 - 2) No system malfunctions occur during training.
 - 3) All provisions of field and classroom training specifications are met.
 - b. Training not in compliance with the above will be performed again in its entirety by the manufacturer at no additional cost to Owner.
 3. Field and classroom training requirements:
 - a. Hold classroom training on-site.

- b. Notify each manufacturer specified for on-site training that the Owner reserves the right to video record any or all training sessions.
 - 1) Organize each training session in a format compatible with video recording.
 - c. Training instructor qualification: Factory trained and familiar with giving both classroom and "hands-on" instructions.
 - d. Training instructors:
 - 1) Be at classes on time.
 - 2) Session beginning and ending times to be coordinated with the Owner and indicated on the master schedule.
 - 3) Normal time lengths for class periods can vary, but brief rest breaks should be scheduled and taken.
 - e. Organize training sessions into maintenance verses operation topics and identify on schedule.
 - f. Plan for minimum class attendance of 2 people at each session and provide sufficient classroom materials, samples, and handouts for those in attendance.
 - g. Instructors to have a typed agenda and well prepared instructional material.
 - 1) The use of visual aids, e.g., films, pictures, and slides is recommended for use during the classroom training programs.
 - 2) Deliver agendas to the Engineer a minimum of seven (7) days prior to the classroom training.
 - 3) Provide equipment required for presentation of films, slides, and other visual aids.
 - h. In the on-site training sessions, cover the information required in the Operation and Maintenance Manuals submitted according to Specification Section 01 33 04 and the following areas as applicable to PCS's.
 - 1) Operation of equipment.
 - 2) Lubrication of equipment.
 - 3) Maintenance and repair of equipment.
 - 4) Troubleshooting of equipment.
 - 5) Preventive maintenance procedures.
 - 6) Adjustments to equipment.
 - 7) Inventory of spare parts.
 - 8) Optimizing equipment performance.
 - 9) Capabilities.
 - 10) Operational safety.
 - 11) Emergency situation response.
 - 12) Takedown procedures (disassembly and assembly).
 - i. Address above Paragraphs 1), 2), 8), 9), 10), and 11) in the operation sessions. Address above Paragraphs 3), 4), 5), 6), 7), and 12) in the maintenance sessions.
 - j. Maintain a log of classroom training provided including: Instructors, topics, dates, time, and attendance.
- D. Complete the filing of all required submittals:
- 1. Shop Drawings.
 - 2. Operation and Maintenance Manuals.
 - 3. Training material.
- E. Filing of Contractor's Notice of Substantial Completion and Request for Inspection of Project or PCS:
- 1. File the notice when the following have been completed:
 - a. Construction work (brought to state of Substantial Completion).
 - b. Equipment Start-up.
 - c. Personnel Training.
 - d. Submittal of required documents.
 - 2. Engineer will review required submittals for completeness within 5 calendar days of Contractor's notice. If complete, Engineer will complete inspection of the Work, within 10 calendar days of Contractor's notice.

3. Engineer will inform Contractor in writing of the status of the Work reviewed, within 14 calendar days of Contractor's notice.
 - a. Work determined not meeting state of Substantial Completion:
 - 1) Contractor: Correct deficiencies noted or submit plan of action for correction within 5 days of Engineer's determination.
 - 2) Engineer: Re-inspect work within 5 days of Contractor's notice of correction of deficiencies.
 - 3) Re-inspection costs incurred by Engineer will be billed to Owner who will deduct them from final payment due Contractor.
 - b. Work determined to be in state of tentative Substantial Completion: Engineer to prepare tentative "Engineer's Certificate of Substantial Completion."
 - c. Engineer's Certificate of Substantial Completion:
 - 1) Certificate tentatively issued subject to successful Demonstration of functional integrity.
 - 2) Issued for Project as a whole or for one or more PCS.
 - 3) Issued subject to completion or correction of items cited in the certificate (punch list).
 - 4) Issued with responsibilities of Owner and Contractor cited.
 - 5) Executed by Engineer.
 - 6) Accepted by Owner.
 - 7) Accepted by Contractor.
 - d. Upon successful completion of Demonstration Period, Engineer will endorse certificate attesting to the successful demonstration, and citing the hour and date of ending the successful Demonstration Period of functional integrity as the effective date of Substantial Completion.

3.3 DEMONSTRATION PERIOD

- A. General:
 1. Complete balancing of system per Section 44 31 83 prior to beginning Demonstration Period.
 2. Demonstrate the functional integrity of the mechanical, electrical, and control interfaces of the respective equipment and components comprising the PCS as evidence of Substantial Completion.
 3. Duration of Demonstration Period: 120 consecutive hours.
 4. If, during the Demonstration Period, the aggregate amount of time used for repair, alteration, or unscheduled adjustments to any equipment or systems that renders the affected equipment or system inoperative exceed 10 percent of the Demonstration Period, the demonstration of functional integrity will be deemed to have failed.
 - a. In the event of failure, a new Demonstration Period will recommence after correction of the cause of failure.
 - b. The new Demonstration Period shall have the same requirements and duration as the Demonstration Period previously conducted.
 5. Conduct the demonstration of functional integrity under full operational conditions.
 6. Owner will provide operational personnel to provide process decisions affecting plant performance.
 - a. Owner's assistance will be available only for process decisions.
 - b. Contractor will perform all other functions including but not limited to equipment operation and maintenance until successful completion of the Demonstration Period.
 7. Owner reserves the right to simulate operational variables, equipment failures, routine maintenance scenarios, etc., to verify the functional integrity of automatic and manual backup systems and alternate operating modes.
 8. Time of beginning and ending any Demonstration Period shall be agreed upon by Contractor, Owner, and Engineer in advance of initiating Demonstration Period.

9. Throughout the Demonstration Period, provide knowledgeable personnel to answer Owner's questions, provide final field instruction on select systems and to respond to any system problems or failures which may occur.
 - a. Provide final field instruction on the following systems:
 - 1) OCU-101
 - 2) EF-101
 - b. For the above systems, provide a total of 8 HRS instruction, divided evenly among the systems.
10. Provide all labor, supervision, utilities, chemicals, maintenance, equipment, vehicles or any other item necessary to operate and demonstrate all systems being demonstrated.

END OF SECTION

SECTION 01 81 10
WIND AND SEISMIC DESIGN CRITERIA

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section is intended to be used for all aspects of this project. When there are conflicts between this Section and other wind and seismic design criteria given in the Contract Documents, the more stringent loading shall control unless clarified in writing during the Bid phase. Obtain clarification of all conflicts in writing prior to construction.
- B. Section Includes:
 - 1. The wind and seismic design criteria for this project including all items directly specified in the Contract Documents as well as all items that are specified to be designed by the Contractor and submitted for approval. Items include but are not necessarily limited to the following:
 - a. Anchorage of mechanical and electrical equipment.
 - b. Anchorage of pipe support structures.
 - c. Design and anchorage of tanks and vessels fabricated off site and shipped to Project site.
 - d. Packaged equipment systems.
 - e. Other structures or items as specified or indicated in the Contract Documents.
- C. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American Society of Civil Engineers (ASCE):
 - a. 7-10, Minimum Design Loads for Buildings and Other Structures.
 - 2. International Code Council (ICC):
 - 1) International Building Code and associated standards, 2015 Edition including all amendments, referred to herein as Building Code.
 - 3. When referenced standards conflict the most stringent shall apply unless specifically indicated otherwise in the Contract Documents or unless approved otherwise in writing by the Engineer.
- B. Qualifications:
 - 1. Engineer for Contractor designed items: Professional Engineer licensed in the State of Alaska.

1.3 GENERAL DESIGN CRITERIA

- A. This paragraph is applicable to both wind and seismic design criteria.
- B. Design in accordance with the requirements of the Building Code and all applicable referenced standards.
- C. Risk Category: III
- D. Design in accordance with the Building Code load combinations for service level or factored level at Contractor's option.
 - 1. Mechanical and electrical equipment loads will be considered dead loads.

1.4 SEISMIC DESIGN CRITERIA

- A. Seismic Design Load Criteria:
 - 1. Design spectral acceleration at short period: $S_{DS} = 0.564$.
 - 2. Design spectral acceleration at 1-second period: $S_{D1} = 0.361$.
 - 3. Importance Factor: $I_e = 1.25$.
 - 4. Seismic Design Category: D.
 - 5. Component or system amplification factor, (a_p) and Component response modification factor, (R_p): In accordance with ASCE 7-10, Tables_13.5-1 and 13.6-1.
 - 6. Component importance factor:
 - a. All components: $I_p = 1.50$.
- B. Seismic forces must be resisted by direct load transfer through fasteners to all seismic resisting elements. Do not use connections that use friction to transfer seismic forces.

1.5 WIND DESIGN CRITERIA

- A. Wind design load criteria:
 - 1. Basic wind speed: 130 MPH.
 - 2. Exposure category: C.
 - 3. Topographic factor: $K_{zt} = 1.0$.
 - 4. Wind importance factor: $I_w = \text{Not Applicable}$.
 - 5. Building Description for wind design is Enclosed
- B. Wind forces must be resisted by direct load transfer through fasteners to wind resisting elements. Do not use connections that use friction to transfer wind forces.

1.6 SUBMITTALS

- A. Informational Submittals:
 - 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 - 2. Structural Calculations:
 - a. Submit calculations for each Contractor designed item under the Specification Section number for that item.
 - b. Indicate compliance with specific referenced documents of the Building Code.
 - c. Provide basis of design and lateral analysis as required to derive all loads and to show system stability including compatibility of deflections and compatibility with allowable soil parameters as applicable.
 - d. Indicate design load to each connection.
 - e. Provide a complete lateral load resisting system that transfers all wind and seismic loads through a load path to ground.
 - f. Sealed by a professional engineer licensed in the State of Alaska.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION



DIVISION 03
CONCRETE



SECTION 03 05 05
CONCRETE TESTING AND INSPECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Contractor requirements for testing of concrete and grout.
 - 2. Definition of Owner provided testing.
 - 3. Acceptance criteria for concrete.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
 - 3. Section 03 09 00 - Concrete.

1.2 RESPONSIBILITY AND PAYMENT

- A. Owner will hire an independent Testing Agency/Service Provider to perform the following testing and inspection and provide test results to the Engineer and Contractor.
 - 1. Testing and inspection of concrete and grout produced for incorporation into the work during the construction of the Project for compliance with the Contract Documents.
 - 2. Additional testing or retesting of materials occasioned by their failure, by test or inspection, to meet requirements of the Contract Documents.
 - 3. Strength testing on concrete required by the Engineer or Special Inspector when the water-cement ratio exceeds the water-cement ratio of the typical test cylinders.
 - 4. In-place testing of concrete as may be required by Engineer when strength of structure is considered potentially deficient.
 - 5. Other testing services needed or required by Contractor such as field curing of test specimens and testing of additional specimens for determining when forms, form shoring or reshoring may be removed.
 - 6. Owner will pay for services defined in Paragraph 1.2A.1.
 - 7. See Specification Section 01 30 00.
- B. Hire a qualified testing agency to perform the following testing and provide test results to the Engineer.
 - 1. Testing of materials and mixes proposed by the Contractor for compliance with the Contract Documents and retesting in the event of changes.
 - 2. Additional testing and inspection required because of changes in materials or proportions requested by Contractor.
 - 3. Pay for services defined in Paragraphs 1.2B.1. and 1.2B.2.
 - 4. Reimburse Owner for testing services defined in Paragraphs 1.2A.2., 1.2A.3., 1.2A.4. and 1.2A.5.
 - 5. See Specification Section 01 30 00.
- C. Duties and Authorities of Testing Agency/Service Provider:
 - 1. Any Testing Agency/Service Provider or agencies and their representatives retained by Contractor or Owner for any reason are not authorized to revoke, alter, relax, enlarge, or release any requirement of Contract Documents, nor to reject, approve or accept any portion of the Work.
 - 2. Testing Agency/Service Provider shall inform the Contractor and Engineer regarding acceptability of or deficiencies in the work including materials furnished and work performed by Contractor that fails to fulfill requirements of the Contract Documents.
 - 3. Testing Agency to submit test reports and inspection reports to Engineer and Contractor immediately after they are performed.

- a. All test reports to include exact location in the work at which batch represented by a test was deposited.
 - b. Reports of strength tests to include detailed information on storage and curing of specimens prior to testing.
4. Owner retains the responsibility for ultimate rejection or approval of any portion of the Work.

1.3 QUALITY ASSURANCE

- A. Referenced Standards:
1. American Concrete Institute (ACI):
 - a. 318, Building Code Requirements for Structural Concrete.
 2. ASTM International (ASTM):
 - a. ASTM Cement and Concrete Reference Laboratory (CCRL).
 - b. C31, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - c. C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - d. C42, Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
 - e. C94, Standard Specification for Ready-Mixed Concrete.
 - f. C138, Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
 - g. C143, Standard Test Method for Slump of Hydraulic-Cement Concrete.
 - h. C172, Standard Practice for Sampling Freshly Mixed Concrete.
 - i. C173, Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
 - j. C231, Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
 - k. C1019, Standard Test Method for Sampling and Testing Grout.
 - l. C1218, Standard Test Method for Water-Soluble Chloride in Mortar and Concrete.
 - m. E329, Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
- B. Qualifications:
1. Contractor's Testing Agency:
 - a. Meeting requirements of ASTM E329 and ASTM C94.
 - b. Provide evidence of recent inspection by CCRL of NBS, and correction of deficiencies noted.
- C. Use of Testing Agency and approval by Engineer of proposed concrete mix design shall in no way relieve Contractor of responsibility to furnish materials and construction in full compliance with Contract Documents.

1.4 DEFINITIONS

- A. Testing Agency/Service Provider: An independent professional testing/inspection firm or service hired by Contractor or by Owner to perform testing, inspection or analysis services as directed, and as provided in the Contract Documents.

1.5 SUBMITTALS

- A. Shop Drawings:
1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 2. Product technical data including:
 - a. Concrete materials and concrete mix designs proposed for use.
 - 1) Include results of all testing performed to qualify materials and to establish mix designs.
 - 2) Place no concrete until approval of mix designs has been received in writing.

- 3) Submittal for each concrete mix design to include:
 - a) Sieve analysis and source of fine and coarse aggregates.
 - b) Test for aggregate organic impurities.
 - c) Proportioning of all materials.
 - d) Type of cement with mill certificate for the cement.
 - e) Brand, quantity and class of fly ash proposed for use along with other submittal data as required for fly ash by Specification Section 03 09 00.
 - f) Slump.
 - g) Brand, type and quantity of air entrainment and any other proposed admixtures.
 - h) Shrinkage test results.
 - i) Total water soluble chloride ion concentration in hardened concrete from all ingredients determined per ASTM C1218.
 - j) 28-day compression test results and any other data required by Specification Section 03 09 00 to establish concrete mix design.
3. Certifications:
 - a. Testing Agency qualifications.

PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SPECIFICATION SECTION)

PART 3 - EXECUTION

3.1 TESTING SERVICES TO BE PERFORMED SERVICE PROVIDER/TESTING AGENCY

- A. The following concrete testing will be performed by the Service Provider/Testing Agency:
 1. Concrete strength testing:
 - a. Secure concrete samples in accordance with ASTM C172.
 - 1) Obtain each sample from a different batch of concrete on a random basis, avoiding selection of test batch other than by a number selected at random before commencement of concrete placement.
 - b. For each strength test, mold and cure cylinders from each sample in accordance with ASTM C31.
 - 1) Record any deviations from requirements on test report.
 - 2) Cylinder size: Per ASTM C31.
 - a) 4 IN cylinders shall not be used for concrete mixes with maximum aggregate size larger than 1 IN.
 - b) Use the same size cylinder for all tests for each concrete mix.
 - 3) Quantity:
 - a) 6 IN DIA by 12 IN high: Four (4) cylinders.
 - b) 4 IN DIA by 8 IN high: Six (6) cylinders.
 - c. Field cure one (1) cylinder for the seven (7) day test.
 - 1) Laboratory cure the remaining.
 - d. Test cylinders in accordance with ASTM C39.
 - 1) 6 IN DIA cylinders:
 - a) Test two (2) cylinders at 28 days for strength test result and the one (1) field cured sample at seven (7) days for information.
 - b) Hold remaining cylinder in reserve.
 - 2) 4 IN DIA cylinders:
 - a) Test three (3) cylinders at 28 days for strength test result and the one (1) field cured cylinder at seven (7) days for information.
 - b) Hold remaining cylinders in reserve.
 - e. Strength test result:
 - 1) Average of strengths of two (2) 6 IN DIA cylinders or three (3) 4 IN DIA cylinders from the same sample tested at 28 days.

- 2) If one (1) cylinder in a test manifests evidence of improper sampling, molding, handling, curing, or testing, discard and test reserve cylinder(s); average strength of remaining cylinders shall be considered strength test result.
- 3) Should all cylinders in any test show any of above defects, discard entire test.
- f. Frequency of tests:
 - 1) Concrete sand cement grout: One (1) strength test for each 4 HR period of grout placement or fraction thereof.
 - a) Test grout in accordance with ASTM C1019.
 - 2) All concrete:
 - a) One (1) strength test to be taken not less than once a day, nor less than once for each 60 CY or fraction thereof placed in any one (1) day.
 - b) Once for each 5000 SQ FT of slab or wall surface area placed each day
 - c) If total volume of concrete on Project is such that frequency of testing required in above paragraph will provide less than five (5) strength tests for each concrete mix, tests shall then be made from at least five (5) randomly selected batches or from each batch if fewer than five (5) batches are provided.
2. Slump testing:
 - a. Determine slump of concrete sample for each strength test.
 - 1) Determine slump in accordance with ASTM C143.
 - b. If consistency of concrete appears to vary, the Engineer or Owner's Representative shall be authorized to require a slump test for each concrete truck.
 - 1) This practice shall continue until three consecutive batches are determined to be consistent and meet the slump requirements specified.
3. Air content testing: Determine air content of concrete sample for each strength test in accordance with either ASTM C231, ASTM C173, or ASTM C138.
4. Temperature testing: Determine temperature of concrete sample for each strength test.
5. In-place concrete testing (if required).

3.2 SPECIAL INSPECTIONS

- A. See Section 01 45 33.
 1. Special Inspections listed are for the Contractor reference only and is not part of the Contract Documents.
 2. It is included to assist the Contractor in understanding the Owner-provided Services so that those services may be factored into the Contractor's pricing and schedule.
- B. Formwork Special Inspections:
 1. Shape, location, and dimensions.
 - a. Inspect in accordance with dimensions and details on Drawings.
 - b. Frequency: Inspect prior to each concrete pour.
- C. Reinforcing Special Inspections:
 1. Reinforcing size, spacing, lap length and concrete cover.
 - a. Inspect in accordance with Drawings and Specification.
 - b. Frequency: Inspect prior to each concrete pour.
 2. Reinforcing adhesive anchoring system:
 - a. Inspect in accordance with ICC-ES report.
 - b. Frequency:
 - 1) Inspect all adhesive anchors for the first 4 HRS of installation.
 - 2) Inspect approximately 25 percent of adhesive anchors thereafter.
 - 3) Additional inspection will be required for different installer or if the quality of installation appears to vary.
- D. Mixing, Placing, Jointing, and Curing Special Inspections:
 1. Perform concrete tests per the requirements of this Specification Section.
 2. Verification of proper mix design.
 - a. Frequency: Periodically, prior to each concrete pour.
 3. Proper concrete placement techniques.

- a. Inspect per requirements of Section 03 09 00.
- b. Frequency: During each concrete pour.
- 4. Proper curing temperature and techniques.
 - a. Inspect per requirements of Section 03 09 00.
 - b. Frequency: Periodically, but not less than every third day.
- 5. Joints:
 - a. Inspect joints for proper joint type, dimensions, reinforcing, dowel alignment, surface preparation and location.
 - b. Frequency: Prior to each concrete pour.
- 6. Waterstops:
 - a. Visually inspect waterstops for proper location, continuity, installation to prevent displacement, cleanliness and damage to waterstop.
 - b. Frequency:
 - 1) Prior to each concrete pour.
- E. Anchorage to Concrete Special Inspection:
 - 1. Post installed anchors as required by the Building Code, ICC-ES Evaluation Reports, and as specified by the Engineer.
 - a. Frequency: Per ICC-ES Report.
 - 2. Cast-in-place concrete anchors, including anchor size, embedment, material and location.
 - a. Frequency: Prior to each concrete pour.

3.3 SAMPLING ASSISTANCE AND NOTIFICATION FOR OWNER

- A. To facilitate testing and inspection, perform the following:
 - 1. Furnish any necessary labor to assist Testing Agency in obtaining and handling samples at site.
 - 2. Provide and maintain for sole use of Testing Agency adequate facilities for safe storage and proper curing of test specimens on site for first 24 HRS as required by ASTM C31.
 - 3. Take samples at point of placement into concrete member.
- B. Notify Engineer and Owner's Testing Agency sufficiently in advance of operations (minimum of 24 HRS) to allow for assignment of personnel and for scheduled completion of quality tests.

3.4 ACCEPTANCE

- A. Completed concrete work which meets applicable requirements will be accepted without qualification.
- B. Completed concrete work which fails to meet one or more requirements but which has been repaired to bring it into compliance will be accepted without qualification.
- C. Completed concrete work which fails to meet one or more requirements and which cannot be brought into compliance may be accepted or rejected as provided in these Contract Documents.
 - 1. In this event, modifications may be required to assure that concrete work complies with requirements.
 - 2. Modifications, as directed by Engineer, to be made at no additional cost to Owner.
- D. Dimensional Tolerances:
 - 1. Formed surfaces resulting in concrete outlines smaller than permitted by tolerances shall be considered potentially deficient in strength and subject to modifications required by Engineer.
 - 2. Formed surfaces resulting in concrete outlines larger than permitted by tolerances may be rejected and excess material subject to removal.
 - a. If removal of excess material is permitted, accomplish in such a manner as to maintain strength of section and to meet all other applicable requirements of function and appearance.
 - 3. Concrete members cast in wrong location may be rejected if strength, appearance or function of structure is adversely affected or misplaced items interfere with other construction.

4. Inaccurately formed concrete surfaces exceeding limits of tolerances and which are exposed to view, may be rejected.
 - a. Repair or remove and replace if required.
 5. Finished slabs exceeding tolerances may be required to be repaired provided that strength or appearance is not adversely affected.
 - a. High spots may be removed with a grinder, low spots filled with a patching compound, or other remedial measures performed as permitted or required.
- E. Appearance:
1. Concrete surfaces exposed to view with defects which, in opinion of Engineer, adversely affect appearance as required by specified finish shall be repaired by approved methods.
 2. Concrete not exposed to view is not subject to rejection for defective appearance unless, in the opinion of the Engineer, the defects impair the long-term strength or function of the member.
- F. High Water-Cement Ratio:
1. Concrete with water in excess of the specified maximum water-cement ratio will be rejected.
 2. Remove and replace concrete with high water-cement ratio or make other corrections as directed by Engineer.
- G. Strength of Structure:
1. Strength of structure in place will be considered potentially deficient if it fails to comply with any requirements which control strength of structure, including but not necessarily limited to following:
 - a. Low concrete strength:
 - 1) Test results for standard molded and cured test cylinders to be evaluated separately for each mix design.
 - a) Such evaluation shall be valid only if tests have been conducted in accordance with specified quality standards.
 - b) For evaluation of potential strength and uniformity, each mix design shall be represented by at least three (3) strength tests.
 - c) A strength test shall be the average of two (2) 6 IN diameter cylinders or three (3) 4 IN diameter cylinders from the same sample tested at 28 days.
 - 2) Acceptance:
 - a) Strength level of each specified compressive strength shall be considered satisfactory if both of the following requirements are met:
 - (1) Average of all sets of three (3) consecutive strength tests equal or exceed the required specified 28 day compressive strength.
 - (2) No individual strength test falls below the required specified 28 day compressive strength by more than 500 PSI.
 - b. Reinforcing steel size, configuration, quantity, strength, position, or arrangement at variance with requirements in Specification Section 03 09 00 or requirements of the Contract Drawings or approved Shop Drawings.
 - c. Concrete which differs from required dimensions or location in such a manner as to reduce strength.
 - d. Curing time and procedure not meeting requirements of this Specification Section.
 - e. Inadequate protection of concrete from extremes of temperature during early stages of hardening and strength development.
 - f. Mechanical injury, construction fires, accidents or premature removal of formwork likely to result in deficient strength.
 - g. Concrete defects such as voids, honeycomb, cold joints, spalling, cracking, etc., likely to result in deficient strength or durability.
 2. Structural analysis and/or additional testing may be required when strength of structure is considered potentially deficient.
 3. In-place testing of concrete may be required when strength of concrete in place is considered potentially deficient.

- a. Testing by impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer to determine relative strengths at various locations in the structure or for selecting areas to be cored.
 - 1) Such tests shall not be used as a basis for acceptance or rejection.
- b. Core tests:
 - 1) Where required, test cores will be obtained in accordance with ASTM C42.
 - a) If concrete in structure will be dry under service conditions, air dry cores (temperature 60 to 80 DEGF, relative humidity less than 60 PCT) for seven (7) days before test then test dry.
 - b) If concrete in structure will be wet or subjected to high moisture atmosphere under service conditions, test cores after immersion in water for at least 40 HRS and test wet.
 - c) Testing wet or dry to be determined by Engineer.
 - 2) Three (3) representative cores may be taken from each member or area of concrete in place that is considered potentially deficient.
 - a) Location of cores shall be determined by Engineer so as least to impair strength of structure.
 - b) If, before testing, one (1) or more of cores shows evidence of having been damaged subsequent to or during removal from structure, damaged core shall be replaced.
 - 3) Concrete in area represented by a core test will be considered adequate if average strength of three (3) cores is equal to at least 85 PCT of specified strength and no single core is less than 75 PCT of specified strength.
 - 4) Fill core holes with non-shrink grout and finish to match surrounding surface when exposed in a finished area.
- 4. If core tests are inconclusive or impractical to obtain or if structural analysis does not confirm safety of structure, load tests may be required and their results evaluated in accordance with ACI 318, Chapter 20.
- 5. Correct or replace concrete work judged inadequate by structural analysis or by results of core tests or load tests with additional construction, as directed by Engineer, at Contractor's expense.
- 6. Contractor to pay all costs incurred in providing additional testing and/or structural analysis required.

END OF SECTION

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SECTION 03 09 00
CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Cast-in-place concrete and grout.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American Concrete Institute (ACI):
 - a. 117, Specification for Tolerances for Concrete Construction and Materials.
 - b. 211.1, Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
 - c. 212.3R, Chemical Admixtures for Concrete.
 - d. 304R, Guide for Measuring, Mixing, Transporting, and Placing Concrete.
 - e. 304.2R, Placing Concrete by Pumping Methods.
 - f. 305.1, Hot Weather Concreting.
 - g. 306.1, Cold Weather Concreting.
 - h. 318, Building Code Requirements for Structural Concrete.
 - i. 347, Guide to Formwork for Concrete.
 - j. CT-13, Concrete Terminology.
 - 2. ASTM International (ASTM):
 - a. A82, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
 - b. A185, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - c. A615, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
 - d. A1064, Standard Specification for Steel Wire and Welded Wire Replacement, Plain and Deformed, for Concrete.
 - e. C31, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - f. C33, Standard Specification for Concrete Aggregates.
 - g. C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - h. C94/C94M, Standard Specification for Ready-Mixed Concrete.
 - i. C138, Standard Method of Test for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
 - j. C143, Standard Test Method for Slump of Hydraulic Cement Concrete.
 - k. C150, Standard Specification for Portland Cement.
 - l. C172, Standard Practice for Sampling Freshly Mixed Concrete.
 - m. C173, Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
 - n. C231, Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
 - o. C260, Standard Specification for Air-Entraining Admixtures for Concrete.
 - p. C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - q. C494, Standard Specification for Chemical Admixtures for Concrete.

- r. C618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
 - s. C1293, Standard Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction.
 - t. C1315, Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
 - u. D882, Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
 - v. D994, Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
 - w. D1056, Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
 - x. D1709, Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.
 - y. D1751, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
 - z. E96, Standard Test Methods for Water Vapor Transmission of Materials.
 - aa. E329, Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.
3. Corps of Engineers (COE):
 - a. CRD-C621, Standard Specification for Packaged, Dry, Hydraulic-Cement Grout (Nonshrink).
 4. National Ready Mixed Concrete Association (NRMCA).
 5. National Sanitation Foundation (NSF):
 - a. 61, Drinking Water System Components - Health Effects.
- B. Quality Control:
1. Concrete testing agency:
 - a. Contractor to employ and pay for services of a testing laboratory to:
 - 1) Perform materials evaluation.
 - 2) Design concrete mixes.
 - b. Concrete testing agency to meet requirements of ASTM E329.
 2. Do not begin concrete production until proposed concrete mix design has been approved by Engineer.
 - a. Approval of concrete mix design by Engineer does not relieve Contractor of his responsibility to provide concrete that meets the requirements of this Specification.
 3. Adjust concrete mix designs when material characteristics, job conditions, weather, strength test results or other circumstances warrant.
 - a. Do not use revised concrete mixes until submitted to and approved by Engineer.
 4. Perform structural calculations as required to prove that all portions of the structure in combination with remaining forming and shoring system has sufficient strength to safely support its own weight plus the loads placed thereon.
- C. Qualifications:
1. Ready mixed concrete batch plant certified by NRMCA.
 2. Formwork, shoring and reshoring for slabs and beams except where cast on ground to be designed by a professional engineer currently registered in the state where the Project is located.

1.3 DEFINITIONS

- A. Per ACI CT-13 except as modified herein:
1. Concrete fill: Non-structural concrete.
 2. Concrete Testing Agency: Testing agency employed to perform materials evaluation, design of concrete mixes or testing of concrete placed during construction.
 3. Exposed concrete: Exposed to view after construction is complete.
 4. Indicated: Indicated by Contract Documents.
 5. Nonexposed concrete: Not exposed to view after construction is complete.

6. Required: Required by Contract Documents.
7. Specified strength: Specified compressive strength at 28 days.
8. Submitted: Submitted to Engineer.

1.4 SUBMITTALS

- A. Shop Drawings:
1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 2. Concrete mix designs proposed for use.
 - a. Concrete mix design submittal to include the following information:
 - 1) Sieve analysis and source of fine and coarse aggregates.
 - 2) Test for aggregate organic impurities.
 - 3) Test for deleterious aggregate per ASTM C1293.
 - 4) Proportioning of all materials.
 - 5) Type of cement with mill certificate for cement.
 - 6) Type of fly ash with certificate of conformance to specification requirements.
 - 7) Slump.
 - 8) Air content.
 - 9) Brand, type, ASTM designation, and quantity of each admixture proposed for use.
 - 10) 28-day cylinder compressive test results of trial mixes per ACI 318 and as indicated herein.
 3. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's installation instructions.
 - c. Manufacturers and types:
 - 1) Joint fillers.
 - 2) Curing agents.
 - 3) Chemical sealer.
 - 4) Bonding and patching mortar.
 - 5) Construction joint bonding adhesive.
 - 6) Nonshrink grout with cure/seal compound.
 4. Reinforcing steel:
 - a. Show grade, sizes, number, configuration, spacing, location and all fabrication and placement details.
 - b. In sufficient detail to permit installation of reinforcing without having to make reference to Contract Drawings.
 - c. Obtain approval of Shop Drawings by Engineer before fabrication.
 - d. Mill certificates.
 5. Scaled (minimum 1/8 IN per foot) drawings showing proposed locations of construction joints, control joints, expansion joints (as applicable) and joint dimensions.
 6. Strength test results of in place concrete including slump, air content and concrete temperature.
 7. Certifications:
 - a. Certification of standard deviation value in psi for ready mix plant supplying the concrete.
 - b. Certification that the material and sources submitted in the mix design will be used in the concrete for this project.
 8. Test reports:
 - a. Cement mill reports for all cement to be supplied.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Storage of Material:
1. Cement and pozzolan:
 - a. Store in moistureproof, weathertight enclosures.
 - b. Do not use if caked or lumpy.

2. Aggregate:
 - a. Store to prevent segregation and contamination with other sizes or foreign materials.
 - b. Obtain samples for testing from aggregates at point of batching.
 - c. Do not use frozen or partially frozen aggregates.
 - d. Do not use bottom 6 IN of stockpiles in contact with ground.
 - e. Allow sand to drain until moisture content is uniform prior to use.
 3. Admixtures:
 - a. Protect from contamination, evaporation, freezing, or damage.
 - b. Maintain within temperature range recommended by manufacturer.
 - c. Completely mix solutions and suspensions prior to use.
 4. Reinforcing steel: Support and store all rebars above ground.
- B. Delivery:
1. Concrete:
 - a. Prepare a delivery ticket for each load for ready-mixed concrete.
 - b. Truck operator shall hand ticket to Owner's Representative at the time of delivery.
 - c. Ticket to show:
 - 1) Mix identification mark.
 - 2) Quantity delivered.
 - 3) Amount of each material in batch.
 - 4) Outdoor temp in the shade.
 - 5) Time at which cement was added.
 - 6) Numerical sequence of the delivery.
 - 7) Amount of water added.
 2. Reinforcing steel:
 - a. Ship to jobsite with attached plastic or metal tags with permanent mark numbers.
 - b. Mark numbers to match Shop Drawing mark number.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following products and manufacturers are acceptable:
1. Nonshrink, nonmetallic grout:
 - a. Sika "SikaGrout 212."
 - b. Euclid Chemical "NS Grout."
 - c. BASF Admixtures, Inc. "Masterflow 713."
 2. Expansion joint fillers:
 - a. Permaglaze Co.
 - b. Rubatex Corp.
 - c. Williams Products, Inc.
 3. Form coating:
 - a. Richmond "Rich Cote."
 - b. Industrial Lubricants "Nox-Crete Form Coating."
 - c. Euclid Chemical "Kurez DR VOX."
 4. Cementitious concrete coating:
 - a. Aquafin International.
 - b. BASF Building Systems.
 - c. Euclid Chemical Company.
 5. Chemical sealer:
 - a. L&M Construction Chemicals, Inc.
 - b. Euclid Chemical Company.
 - c. Dayton Superior.
- B. Submit request for substitution in accordance with Specification Section 01 25 13.

2.2 MATERIALS

- A. Portland Cement: Conform to ASTM C150 Type II.
- B. Fly Ash:
 - 1. ASTM C618, Class F or Class C.
 - 2. Nonstaining.
 - a. Hardened concrete containing fly ash to be uniform light gray color.
 - 3. Maximum loss on ignition: 4 PCT.
 - 4. Compatible with other concrete ingredients.
 - 5. Obtain proposed fly ash from a source approved by the State Highway Department in the state where the Project is located for use in concrete for bridges.
- C. Admixtures:
 - 1. Air entraining admixtures: ASTM C260.
 - 2. Water reducing, retarding, and accelerating admixtures:
 - a. ASTM C494 Type A through E.
 - b. Conform to provisions of ACI 212.3R.
 - c. Do not use retarding or accelerating admixtures unless specifically approved in writing by Engineer and at no cost to Owner.
 - d. Follow manufacturer's instructions.
 - e. Use chloride free admixtures only.
 - 3. High range water reducers (superplasticizers): Conform to ASTM C494, Types F or G.
 - 4. Do not use calcium chloride.
 - 5. Pozzolanic admixtures: ASTM C618.
 - 6. Provide admixtures of same type, manufacturer and quantity as used in establishing required concrete proportions in the mix design.
- D. Water: Potable, clean, free of oils, acids and organic matter.
- E. Aggregates:
 - 1. Normal weight concrete: ASTM C33, except as modified below.
 - 2. Fine aggregate:
 - a. Clean natural sand.
 - b. No manufactured or artificial sand.
 - 3. Coarse aggregate:
 - a. Crushed rock, natural gravel, or other inert granular material.
 - b. Maximum amount of clay or shale particles: 1 PCT.
 - 4. Gradation of coarse aggregate:
 - a. Lean concrete and concrete topping: Size #7.
 - b. All other concrete: Size #57 or #67.
- F. Concrete Grout:
 - 1. Nonshrink, nonmetallic grout:
 - a. Nonmetallic, noncorrosive, nonstaining, premixed with only water to be added.
 - b. Grout to produce a positive but controlled expansion.
 - c. Mass expansion not to be created by gas liberation.
 - d. Minimum compressive strength of nonshrink grout at 28 days: 6500 PSI.
 - e. In accordance with COE CRD-C621.
 - 2. Epoxy grout:
 - a. 3-component epoxy resin system.
 - 1) Two liquid epoxy components.
 - 2) One inert aggregate filler component.
 - b. Each component packaged separately for mixing at jobsite.
- G. Reinforcing Steel:
 - 1. Reinforcing bars: ASTM A615, Grade 60.
 - 2. Welded wire reinforcement:
 - a. ASTM A185 or ASTM A1064.

- b. Minimum yield strength: 60,000 PSI.
 - 3. Column spirals: ASTM A82 or ASTM A1064.
- H. Forms:
 - 1. Prefabricated or job built.
 - 2. Wood forms:
 - a. 5/8 or 3/4 IN 5-ply structural plywood of concrete form grade.
 - b. Built-in-place or prefabricated type panel.
 - 3. Metal forms:
 - a. Metal forms may be used except for aluminum in contact with concrete.
 - b. Forms to be tight to prevent leakage, free of rust and straight without dents to provide members of uniform thickness.
 - 4. Chamfer strips: Clear white pine, surface against concrete planed.
- I. Form Ties:
 - 1. Commercially fabricated for use in form construction.
 - a. Field fabricated ties are unacceptable.
 - 2. Constructed so that ends or end fasteners can be removed without causing spalling at surfaces of the concrete.
 - 3. 3/4 IN minimum to 1 IN maximum diameter cones on both ends.
 - 4. Cone size:
 - a. 3/4 IN minimum to 2 1/2 IN maximum diameter cones on both ends.
 - b. Depth of cone not to exceed the concrete reinforcing cover.
 - 5. Form release: Nonstaining and shall not prevent bonding of future finishes to concrete surface.
- J. Chairs, Runners, Bolsters, Spacers, and Hangers:
 - 1. Stainless steel, epoxy coated, or plastic coated metal.
 - a. Plastic coated: Rebar support tips in contact with the forms only.
- K. Chemical Floor Sealer:
 - 1. Colorless low VOC water-based solution containing acrylic copolymers.
 - a. ASTM C1315, Class B, minimum 30 PCT solids.
 - 2. L&M Construction Chemicals Inc. Dress & Seal WB 30.
- L. Cementitious Concrete Coating:
 - 1. Polymer modified Portland cement based coating for concrete and masonry.
 - a. Waterproof.
 - b. Resistant to both positive and negative hydrostatic pressure.
 - c. Breathable.
 - 2. BASF "Masterseal 581 Thoroseal".
 - a. Color:
 - 1) Interior surfaces: Standard gray.
 - 2) Exterior surfaces: Custom color to match concrete surface.
 - 3) Texture: Fine.
- M. Membrane Curing Compound:
 - 1. ASTM C309, Type 1D, Class A or B.
 - 2. Fugitive dye shall dissipate over time and exposure.
 - 3. Curing compound shall not prevent bonding of any future coverings, coatings or finishes.
- N. Expansion Joint Filler:
 - 1. In contact with water or sewage:
 - a. Closed cell neoprene.
 - b. ASTM D1056, Class SC (oil resistant and medium swell) of 2 to 5 PSI compression deflection (Grade SCE41).
 - 2. Exterior driveways, curbs and sidewalks:
 - a. Asphalt expansion joint filler.
 - b. ASTM D994.

3. Other use:
 - a. Fiber expansion joint filler.
 - b. ASTM D1751.

2.3 CONCRETE MIXES

A. General:

1. All concrete to be ready mixed concrete conforming to ASTM C94/C94M.
2. Provide concrete of specified quality capable of being placed without segregation and, when cured, of developing all properties required.
3. All concrete to be normal weight concrete.
4. Provide pozzolan content for all cast-in-place construction.

B. Strength:

1. Provide specified strength and type of concrete for each use in structure(s) as follows:

TYPE	WEIGHT	SPECIFIED STRENGTH*
All other general use concrete	Normal weight	4000 PSI

* Minimum 28-day compressive strength.

C. Air Entrainment:

1. Provide air entrainment in all concrete resulting in a total air content percent by volume as follows:

MAX AGGREGATE SIZE	TOTAL AIR CONTENT PERCENT
1 IN or 3/4 IN	6 ±1-1/2
<3/4 IN	6-1/2 ±1-1/2

2. Air content to be measured in accordance with ASTM C231, ASTM C173, or ASTM C138.

D. Slump - 4 IN maximum, 1 IN minimum:

1. Measured at point of discharge of the concrete into the concrete construction member.
2. 8 IN maximum after addition of superplasticizer (if used).
3. Concrete of lower than minimum slump may be used provided it can be properly placed and consolidated.
4. Pumped concrete:
 - a. Provide additional water at batch plant to allow for slump loss due to pumping.
 - b. Provide only enough additional water so that slump of concrete at discharge end of pump hose does not exceed maximum slump specified and the maximum specified water-cement ratio is not exceeded.
5. Slump may be adjusted in the field through the use of water reducers.
 - a. Coordinate dosage and mixing requirements with concrete supplier.
6. Determine slump per ASTM C143.

E. Selection of Proportions:

1. General:
 - a. Proportion ingredients to:
 - 1) Produce proper workability, durability, strength, and other required properties.
 - 2) Prevent segregation and collection of excessive free water on surface.
2. Minimum cement contents and maximum water cement ratios for concrete to be as follows:

SPECIFIED STRENGTH	MINIMUM CEMENT, MAXIMUM AGGREGATE SIZE			MAXIMUM WATER CEMENT RATIO BY WEIGHT
	1/2 IN	3/4 IN	1 IN	

4000	564	564	564	0.45
4500	611	611	--	0.42

3. Fly ash:
 - a. For cast-in-place concrete only, a maximum of 25 PCT by weight of Portland cement content per cubic yard may be replaced with fly ash at rate of 1 LB fly ash for 1 LB of cement.
 - b. When fly ash is used, the water to cementitious materials ratio shall not exceed the maximum value specified herein.
4. Concrete mix proportioning methods for normal weight concrete:
 - a. Proportion mixture to provide desired characteristics using one of methods described below:
 - 1) Method 1 (Trial Mix):
 - a) Per ACI 318, Chapter 5, except as modified herein.
 - b) Air content within range specified above.
 - c) Record and report temperature of trial mixes.
 - d) Proportion trial mixes per ACI 211.1.
 - 2) Method 2 (Field Experience):
 - a) Per ACI 318, Chapter 5, except as modified herein:
 - b) Field test records must be acceptable to Engineer to use this method.
 - c) Test records shall represent materials, proportions and conditions similar to those specified.
5. Required average strength to exceed the specified 28-day compressive strength by the amount determined or calculated in accordance with the requirements of Chapter 5 of ACI 318 using the standard deviation of the proposed concrete production facility.

PART 3 - EXECUTION

3.1 FORMING AND PLACING CONCRETE

- A. Formwork:
 1. Contractor is responsible for design and erection of formwork.
 2. Construct formwork so that concrete members and structures are of correct size, shape, alignment, elevation and position.
 - a. Allowable tolerances: As recommended in ACI 347.
 3. Provide slabs and beams of minimum indicated depth when sloping foundation base slabs or elevated floor slabs to drains.
 - a. For slabs on grade, slope top of subgrade to provide floor slabs of minimum uniform indicated depth.
 - b. Do not place floor drains through beams.
 4. Openings:
 - a. Provide openings in formwork to accommodate work of other trades.
 - b. Accurately place and securely support items built into forms.
 5. Chamfer strips: Place 3/4 IN chamfer strips in forms to produce 3/4 IN wide beveled edges on permanently exposed corners of members.
 6. Clean and adjust forms prior to concrete placement.
 7. Tighten forms to prevent mortar leakage.
 8. Coat form surfaces with form release agents prior to placing reinforcing bars in forms.
- B. Reinforcement:
 1. Position, support and secure reinforcement against displacement.
 2. Locate and support with chairs, runners, bolsters, spacers and hangers, as required.
 3. Set wire ties so ends do not touch forms and are directed into concrete, not toward exposed concrete surfaces.

4. Lap splice lengths: ACI 318 Class B top bar tension splices unless indicated otherwise on the Drawings.
 5. Extend reinforcement to within 2 IN of concrete perimeter edges.
 - a. If perimeter edge is earth formed, extend reinforcement to within 3 IN of the edge.
 6. Minimum concrete protective covering for reinforcement: As shown on Drawings.
 7. Do not weld reinforcing bars.
 8. Welded wire reinforcement:
 - a. Install welded wire reinforcement in maximum practical sizes.
 - b. Splice sides and ends with a splice lap length measured between outermost cross wires of each fabric sheet not less than:
 - 1) One spacing of cross wires plus 2 IN.
 - 2) 1.5 x development length.
 - 3) 6 IN.
 - c. Development length: ACI 318 basic development length for the specified fabric yield strength.
- C. Construction, Expansion, and Contraction Joints:
1. Locate joints as indicated on Contract Drawings or as shown on approved Shop Drawings.
 - a. Where construction joint spacing shown on Drawings exceeds the joint spacing indicated in Paragraph below, submit proposed construction joint location in conformance with this Specification Section.
 2. Unplanned construction joints will not be allowed.
 3. Locate wall vertical construction joints at 50 FT maximum.
 4. Locate construction joints in floor slabs and foundation base slabs so that concrete placements are approximately square and do not exceed 2500 SQFT.
 5. Locate construction joints in columns and walls:
 - a. At the underside of beams, girders, haunches, drop panels, column capitals, and at floor panels.
 - b. Haunches, drop panels, and column capitals are considered part of the supported floor or roof and shall be placed monolithically therewith.
 - c. Column based need not be placed monolithically with the floor below.
 6. Install construction joints perpendicular to main reinforcement with all reinforcement continued across construction joints.
 7. At least 48 HRS shall elapse between placing of adjoining concrete construction.
 8. Thoroughly clean and remove all laitance and loose and foreign particles from construction joints.
 9. Before new concrete is placed, dampen concrete surfaces.
- D. Embedments:
1. Set and build in anchorage devices and other embedded items required for other work that is attached to, or supported by concrete.
 2. See Specification Section 03 15 19 - Anchorage to Concrete.
 3. Use setting diagrams, templates and instructions for locating and setting.
- E. Placing Concrete:
1. Place concrete in compliance with ACI 304R and ACI 304.2R.
 2. Place in a continuous operation within planned joints or sections.
 3. Begin placement when work of other trades affecting concrete is completed.
 4. Place concrete by methods which prevent aggregate segregation.
 5. Do not allow concrete to free fall more than 4 FT.
 6. Where free fall of concrete will exceed 4 FT, place concrete by means of tremie pipe or chute.
- F. Consolidation: Consolidate all concrete using mechanical vibrators supplemented with hand rodding and tamping, so that concrete is worked around reinforcement and embedded items into all parts of forms.
- G. Protection:

1. Protect concrete from physical damage or reduced strength due to weather extremes.
 2. In cold weather comply with ACI 306.1 except as modified herein.
 - a. Do not place concrete on frozen ground or in contact with forms or reinforcing bars coated with frost, ice or snow.
 - b. Do not place heated concrete that is warmer than 80 DEGF.
 - c. If freezing temperatures are expected during curing, maintain the concrete temperature at or above 50 DEGF for 7 days or 70 DEGF for 3 days.
 - d. Do not allow concrete to cool suddenly.
 3. In hot weather comply with ACI 305.1 except as modified herein.
 - a. At air temperature of 90 DEGF and above, keep concrete as cool as possible during placement and curing.
 - b. Do not allow concrete temperature to exceed 90 DEGF at placement.
 - c. Prevent plastic shrinkage cracking due to rapid evaporation of moisture.
 - d. Do not place concrete when the actual or anticipated evaporation rate equals or exceeds 0.2 LBS/SF/HR as determined from ACI 305.1, Figure 2.1.5.
- H. Curing:
1. Begin curing concrete as soon as free water has disappeared from exposed surfaces.
 2. Cure concrete by use of moisture retaining cover, burlap kept continuously wet or by membrane curing compound.
 3. Provide protection as required to prevent damage to concrete and to prevent moisture loss from concrete during curing period.
 4. Provide curing for minimum of 7 days.
 5. Form materials left in place may be considered as curing materials for surfaces in contact with the form materials except in periods of hot weather.
 6. In hot weather follow curing procedures outlined in ACI 305.1.
 7. In cold weather follow curing procedures outlined in ACI 306.1.
 8. Curing vertical surfaces with a curing compound:
 - a. Cover vertical surfaces with a minimum of two coats of the curing compound.
 - b. Allow the preceding coat to completely dry prior to applying the next coat.
 - c. Apply the first coat of curing compound immediately after form removal.
 - d. Vertical surface at the time of receiving the first coat shall be damp with no free water on the surface.
 - e. A vertical surface is defined as any surface steeper than 1 vertical to 4 horizontal.
- I. Form Removal:
1. Remove forms after concrete has hardened sufficiently to resist damage from removal operations or lack of support.
 2. Where no reshoring is planned, leave forms and shoring used to support concrete until it has reached its specified 28-day compressive strength.

3.2 CONCRETE FINISHES

- A. Tolerances:
1. Class A: 1/8 IN in 10 FT.
 2. Class B: 1/4 IN in 10 FT.
- B. Surfaces Exposed to View:
1. Provide a smooth finish for exposed concrete surfaces and surfaces that are:
 - a. To be covered with a coating or covering material applied directly to concrete.
 - b. Scheduled for grout cleaned finish.
 2. Remove fins and projections, and patch voids, air pockets, and honeycomb areas with cement grout.
 3. Cementitious concrete coating:
 - a. Form facing material shall produce a smooth, hard, uniform texture.
 - 1) Use forms specified for surfaces exposed to view.
 - b. Prepare the surface in accordance with manufactures printed installation instructions.
 - c. Brush on coating to entire surface.

- 1) As a mixing liquid for the coating, use bonding agent and water mixture as recommended by the manufacture.
 - 2) Apply two (2) coats at 2 LB/SQYD per coat.
 - d. When second coat is set, float to a uniform texture with a sponge coat.
 - e. Provide this finish at the following locations:
 - 1) Walls, columns, exposed to view.
- C. Surfaces Not Exposed to View:
 - 1. Patch voids, air pockets and honeycomb areas with cement grout.
 - 2. Fill tie holes with nonshrink, nonmetallic grout.
- D. Slab Float Finish:
 - 1. After concrete has been placed, consolidated, struck off, and leveled, do no further work until ready for floating.
 - 2. Do not use water to aid in finishing.
 - 3. Begin floating when water sheen has disappeared and surface has stiffened sufficiently to permit operation.
 - 4. During or after first floating, check planeness of entire surface with a 10 FT straightedge applied at not less than two different angles.
 - 5. Cut down all high spots and fill all low spots during this procedure to produce a surface within Class B tolerance throughout.
 - 6. Refloat slab immediately to a uniform sandy texture.
- E. Troweled Finish:
 - 1. Float finish surface.
 - 2. Next power trowel, and finally hand trowel.
 - 3. Do not use water to aid in finishing.
 - 4. Produce a smooth surface which is relatively free of defects with first hand troweling.
 - 5. Perform additional trowelings by hand after surface has hardened sufficiently.
 - 6. Final trowel when a ringing sound is produced as trowel is moved over surface.
 - 7. Thoroughly consolidate surface by hand troweling.
 - 8. Leave finished surface essentially free of trowel marks, uniform in texture and appearance and plane to a Class A tolerance.
 - 9. On surfaces intended to support floor coverings remove any defects of sufficient magnitude that would show through floor covering by grinding.
- F. Broom Finish: Immediately after concrete has received a float finish as specified, give it a transverse scored texture by drawing a broom across surface.

3.3 GROUT

- A. Preparation:
 - 1. Nonshrinking, nonmetallic grout:
 - a. Clean concrete surface to receive grout.
 - b. Saturate concrete with water for 24 HRS prior to grouting.
- B. Application:
 - 1. Nonshrinking, nonmetallic grout:
 - a. Mix in a mechanical mixer.
 - b. Use no more water than necessary to produce flowable grout.
 - c. Place in accordance with manufacturer's instructions.
 - d. Completely fill all spaces and cavities below the bottom of baseplates.
 - e. Provide forms where baseplates and bedplates do not confine grout.
 - f. Where exposed to view, finish grout edges smooth.
 - g. Except where a slope is indicated on Drawings, finish edges flush at the baseplate, bedplate, member, or piece of equipment.
 - h. Protect against rapid moisture loss by covering with wet rags or polyethylene sheets.
 - i. Wet cure grout for seven days, minimum.

- C. Owner will employ and pay for services of a concrete testing laboratory to perform testing of concrete placed during construction.
1. Contractor to cooperate with Owner in obtaining and testing samples.
- D. Tests During Construction:
1. Strength test:
 - a. For each strength test, mold and cure cylinders from each sample in accordance with ASTM C31.
 - a) 4 IN cylinders may not be used for concrete mixes with concrete aggregate size larger than 1 IN.
 - 2) Quantity:
 - a) 6 IN DIA by 12 IN high: Four cylinders.
 - b) 4 IN DIA by 8 IN high: Six cylinders.
 - b. Field cure one (1) cylinder for the seven day test.
 - 1) Laboratory cure the remaining.
 - c. Test cylinders in accordance with ASTM C39.
 - 1) 6 IN DIA cylinders:
 - a) Test two cylinders at 28 days for strength test result and the one field cured sample at seven days for information.
 - b) Hold remaining cylinder in reserve.
 - 2) 4 IN DIA cylinders:
 - a) Test three cylinders at 28 days for strength test result and the one (1) field cured cylinder at seven days for information.
 - b) Hold remaining cylinders in reserve.
 - d. Strength test result:
 - 1) Average of strengths of two 6 IN DIA cylinders or three 4 IN DIA cylinders from the same sample tested at 28 days.
 - 2) If one cylinder in a test manifests evidence of improper sampling, molding, handling, curing, or testing, discard and test reserve cylinder(s); average strength of remaining cylinders shall be considered strength test result.
 - 3) Should all cylinders in any test show any of above defects, discard entire test.
 - e. Frequency of tests:
 - 1) All other concrete:
 - a) One strength test to be taken not less than once a day, nor less than once for each 60 CU YD or fraction thereof placed in any one day.
 - b) Once for each 5000 SQFT of slab or wall surface area placed each day.
 - c) If total volume of concrete on Project is such that frequency of testing required in above paragraph will provide less than five strength tests for each concrete mix, tests shall then be made from at least five randomly selected batches or from each batch if fewer than five batches are provided.
 2. Slump test:
 - a. Per ASTM C143.
 - b. Determined for each strength test sample.
 - c. Additional slump tests may be taken.
 3. Air content:
 - a. Per ASTM C231, ASTM C173, and ASTM C138.
 - b. Determined for each strength test sample.
 4. Temperature: Determined for each strength test sample.
- E. Evaluation of Tests:
1. Strength test results:
 - a. Average of 28-day strength of two cylinders from each sample.
 - 1) If one cylinder manifests evidence of improper sampling, molding, handling, curing or testing, strength of remaining cylinder will be test result.
 - 2) If both cylinders show any of above defects, test will be discarded.
- F. Acceptance of Concrete:

1. Strength level of each type of concrete shall be considered satisfactory if both of the following requirements are met:
 - a. Average of all sets of three consecutive strength tests equals or exceeds the required specified 28-day compressive strength.
 - b. No individual strength test falls below the required specified 28-day compressive strength by more than 500 PSI.
2. If tests fail to indicate satisfactory strength level, perform additional tests and/or corrective measures as directed by Engineer.
 - a. Perform additional tests and/or corrective measures at no additional cost to Owner.

G. Concrete tolerances per ACI 117.

3.4 SCHEDULES

A. Form Types:

1. Surfaces exposed to view:
 - a. Prefabricated or job-built wood forms.
 - b. Laid out in a regular and uniform pattern with long dimensions vertical and joints aligned.
 - c. Produce finished surfaces free from offsets, ridges, waves, and concave or convex areas.
 - d. Construct forms sufficiently tight to prevent leakage of mortar.
2. Surfaces normally submerged or not normally exposed to view: Wood or steel forms sufficiently tight to prevent leakage of mortar.
3. Other types of forms may be used:
 - a. For surfaces not restricted to plywood or lined forms.
 - b. As backing for form lining.

B. Grout:

1. Nonshrinking, nonmetallic grout: General use.

C. Concrete:

1. Normal weight concrete: All concrete.

D. Concrete Finishes:

1. Slab finishes:
 - a. Use following finishes as applicable, unless otherwise indicated:
 - 1) Floated finish: Surfaces intended to receive roofing, concrete topping, lean concrete, concrete fill and waterproofing.
 - 2) Troweled finish: Interior floor slabs, exposed roof slabs and base slabs of structures, equipment bases, and column bases.
 - 3) Broom finish: Sidewalks, docks, concrete stairs, and ramps.

END OF SECTION

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SECTION 03 15 19
ANCHORAGE TO CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Requirements for all cast-in-place anchor bolts, anchor rods, reinforcing adhesive anchorage, and post-installed concrete anchors required for the Project but not specified elsewhere in the Contract Documents.
 2. Design of all concrete anchors not indicated on the Drawings including, but not limited to, installation of anchors into concrete for the following structural and nonstructural components:
 - a. Structural members and accessories.
 - b. Metal, wood, and plastic fabrications.
 - c. Architectural components.
 - d. Mechanical and electrical equipment and components.
 - e. Plumbing, piping, and HVAC work.
 - f. All other components requiring attachment to concrete.
- B. Related Specification Sections include but are not necessarily limited to:
1. Division 00 - Procurement and Contracting Requirements.
 2. Division 01 - General Requirements.
 3. Section 03 05 05 - Concrete Testing and Inspection.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
1. American Concrete Institute (ACI):
 - a. 318, Building Code Requirements for Structural Concrete and Commentary.
 2. American Concrete Institute/Concrete Reinforcing Steel Institute (ACI-CRSI):
 - a. Adhesive Anchor Installation Certification Program: Adhesive Anchor Installer.
 3. American Institute of Steel Construction (AISC):
 - a. 303, Code of Standard Practice for Steel Buildings and Bridges.
 4. ASTM International (ASTM):
 - a. A36, Standard Specification for Carbon Structural Steel.
 - b. A108, Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
 - c. A123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - d. A153, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - e. A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - f. A496, Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
 - g. A563, Standard Specification for Carbon and Alloy Steel Nuts.
 - h. A780, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
 - i. F436, Standard Specification for Hardened Steel Washers.
 - j. F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
 - k. F594, Standard Specification for Stainless Steel Nuts.
 - l. F1554, Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
 - m. F2329, Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners
 5. ICC Evaluation Service (ICC-ES):

- a. AC193, Acceptance Criteria for Mechanical Anchors in Concrete Elements.
- b. AC308, Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements.
- 6. Building code:
 - a. International Code Council (ICC):
 - 1) International Building Code and associated standards, 2015 Edition including all amendments, referred to herein as Building Code.
- B. Qualifications:
 - 1. Anchor designer for Contractor-designed post-installed anchors and cast in place anchorage shall be a professional civil engineer licensed in the State that the Project is located in.
 - 2. Installer for post-installed anchors shall be trained by the manufacturer or certified by a training program approved by the Engineer.
- C. Post-installed anchors and related materials shall be listed by the following agencies:
 - 1. ICC-ES.
 - 2. Engineer approved equivalent.

1.3 DEFINITIONS

- A. Adhesive Anchors:
 - 1. Post-installed anchors developing their strength primarily from chemical bond between the concrete and the anchor.
 - 2. Includes anchors using acrylics, epoxy and other similar adhesives.
- B. Anchor Bolt: Any cast-in-place anchorage that is made of a headed (i.e. bolt) material.
- C. Anchor Rod: Any cast-in-place or post-installed anchorage made from unheaded, threaded, rod or deformed bar material.
- D. Concrete Anchor: Generic term for either an anchor bolt or an anchor rod.
- E. Galvanizing: Hot-dip galvanizing per ASTM A123, ASTM A153 or ASTM F2329 with minimum coating of 2.0 OZ of zinc per square foot of metal (average of specimens) unless noted otherwise or dictated by standard.
- F. Hardware: As defined in ASTM A153 or ASTM F2329.
- G. Installer or Applicator:
 - 1. Installer or applicator is the person actually installing or applying the product in the field at the Project site.
 - 2. Installer and applicator are synonymous.
- H. MPII: Manufacturer's printed installation instructions.
- I. Mechanical Anchors:
 - 1. Post-installed anchors developing their strength from attachment other than thru adhesives or chemical bond to concrete.
 - 2. Includes expansion anchors, expansion sleeve, screw anchors, undercut anchors, specialty inserts and other similar types of anchorages.
 - 3. Drop-in anchors and other similar anchors are not allowed.
- J. Post-Installed Anchor: Any adhesive or mechanical anchor installed into previously placed and adequately cured concrete.

1.4 SUBMITTALS

- A. Shop Drawings:
 - 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 - 2. Product technical data including:
 - a. Acknowledgement that submitted products meet requirements of referenced standards.
 - b. Manufacturer material data sheet for each anchor.

- 1) Clearly indicate which products on the data sheet are proposed for use on the Project.
 - c. Manufacturer's printed installation instructions.
 - d. Current ICC-ES report for each post-installed anchor system indicating the following:
 - 1) Certification that anchors meet all requirements indicated in this Specification.
 - 2) Performance data showing that anchor is approved for use in cracked concrete.
 - 3) Seismic design categories for which anchor system has been approved.
 - 4) Required installation procedures.
 - 5) Special inspection requirements for installation.
 - e. Anchorage layout drawings and details:
 - 1) Indicate anchor diameter, embedment, length, anchor type, material and finish.
 - 2) Drawings showing location, configuration, spacing and edge distance.
 - f. Contractor Designed Post-Installed Anchors:
 - 1) Show diameter and embedment depth of each anchor.
 - 2) Indicate compliance with ACI 318].
 - 3) Design tension and shear loads used for anchor design.
 - 4) Engineering design calculations:
 - a) Indicate design load to each anchor.
 - b) When the design load is not indicated on Drawings, include calculations to develop anchor forces based on Design Criteria listed herein.
 - c) Sealed and signed by contractor's professional engineer.
 - d) Calculations will be submitted for information purposes only.
 - 5) Type of post-installed anchor system used.
 - a) Provide manufacturer's ICC-ES report for the following:
 - (1) Mechanical anchorage per ICC-ES AC193.
 - (2) Adhesive anchorage per ICC-ES AC308.
- B. Samples:
1. Representative samples of concrete anchors may be requested by Engineer. Review will be for type and finish only. Compliance with all other requirements is exclusively the responsibility of the Contractor.
- C. Informational Submittals:
1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 2. Certification of qualifications for each installer of post-installed anchors.
 - a. Indicate successful completion or certification for each type of approved post-installed anchor as required by the Contract Documents.
 - b. Provide one of the following for each type of anchor, as required by this specification section:
 - 1) Certification of completion for Engineer approved program.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to job site in manufacturer's or distributor's packaging undamaged and complete with installation instructions.
- B. Store above ground on skids or other supports to keep items free of dirt and other foreign debris and to protect against corrosion.
- C. Protect and handle materials in accordance with manufacturer's recommendations to prevent damage or deterioration.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cast-in-place Concrete Anchors:
 1. Building, nonbuilding structures, and equipment:

- a. ASTM F1554, Grade 36 or Grade 55 with weldability supplement S1 for galvanized or non-galvanized threaded rods.
 - b. ASTM A307, Grade A for galvanized headed bolts.
 - 2. All other cast-in-place concrete anchors:
 - a. Stainless steel with matching nut and washer.
 - b. Submerged application: ASTM F593, Type 316.
 - c. Non-submerged application: ASTM F593, Type 304 or Type 316.
- B. Post-Installed Mechanical and Adhesive Concrete Anchors:
 - 1. Stainless steel with matching nut and washer.
 - 2. Submerged application: ASTM F593, Type 316.
 - 3. Non-submerged application: ASTM F593, Type 304 or Type 316.
- C. Reinforcement: See Section 03 21 00.
- D. Headed Studs: ASTM A108 with a minimum yield strength of 50,000 PSI and a minimum tensile strength of 60,000 PSI.
- E. Deformed Bar Anchors: ASTM A496 with minimum yield strength of 70,000 PSI and a minimum tensile strength of 80,000 PSI.
- F. Washers:
 - 1. ASTM F436 unless noted otherwise.
 - 2. If stainless steel anchorage is being used for cast-in-place anchorage, furnish washers of the same material and alloy as in the accompanying anchorage.
 - 3. Plate washers: Minimum 1/2 IN thick fabricated ASTM A36 square plates as required.
 - 4. Follow manufacturer's requirements for all post-installed anchorage.
- G. Nuts:
 - 1. ASTM A563 for all cast-in-place anchorage.
 - 2. If stainless steel anchorage is being used for cast-in-place anchorage, nuts shall meet ASTM F594 and be the matching material and alloy as in the accompanying anchorage.
 - 3. Follow manufacturer's requirements if using post-installed anchorage.
- H. Galvanizing Repair Paint:
 - 1. High zinc dust content paint for regalvanizing welds and abrasions.
 - 2. ASTM A780.
 - 3. Zinc content: Minimum 92 PCT in dry film.
 - 4. ZRC "ZRC Cold Galvanizing" or Clearco "High Performance Zinc Spray."
- I. Dissimilar Materials Protection: See Specification Section 09 96 00.

2.2 CONTRACTOR DESIGNED ANCHORAGE

- A. Acceptable Manufacturers:
 - 1. Post-installed anchor systems for the listed manufacturers will be considered only if a current ICC-ES evaluation report is submitted in accordance with the SUBMITTALS Article in PART 1 of this Specification Section and if the anchor system is approved by the Engineer.
 - a. Hilti.
 - b. Dewalt.
 - c. Simpson Strong-Tie.
 - 2. Submit request for substitution in accordance with Specification Section 01 25 13.
- B. Design the anchorage when any of the following occur:
 - 1. Design load for concrete anchorage is shown on the Drawings.
 - 2. When specifically required by the Contract Documents.
 - 3. When an anchorage is required but not specified in the Drawings.
 - 4. When anchorage is shown on Drawings other than Structural Drawings.
- C. Anchorage Design Loads:

1. Determine all of the design loads, including wind and seismic loads, per the Building Code.
 - a. Anchorage of equipment and non-structural components: Use the actual dead and operating loads provided by the manufacturer.
- D. When Contract Drawings, other than the Structural Drawings, indicate an anchor diameter or length, the Contractor design shall incorporate these as “minimums.”
- E. Cast-in-Place Concrete Anchors:
 1. Provide the material, nominal diameter, embedment length, spacing, edge distance and design capacity to resist the calculated load based on the requirements given in the Building Code including ACI 318.
 2. Design assuming cracked concrete.
- F. Post-installed Concrete Anchors:
 1. Provide the manufacturer’s system name/type, nominal diameter, embedment depth, spacing, minimum edge distance, cover, and design capacity to resist the specified or calculated load based on requirements given in the Building Code, ACI 318 and current ICC-ES report, for the anchor to be used.
 2. Design assuming cracked concrete.

2.3 ENGINEER DESIGNED ANCHORAGE

- A. When the size, length and details of anchorages are shown on Contract Structural Drawings, Contractor design of anchorage is not required unless otherwise indicated.
- B. Acceptable Manufacturers:
 1. Additional newer post-installed anchor systems for the listed manufacturers will be considered only if a current evaluation agency report is submitted in accordance with the SUBMITTALS Article in PART 1 of this Specification Section, the anchor system is certified by ICC-ES for cracked concrete conditions, and if approved by the Engineer.
 2. Mechanical Anchors:
 - a. Hilti:
 - 1) Kwik Bolt TZ (ICC-ES ESR-1917).
 3. Adhesive Concrete Anchors:
 - a. Hilti:
 - 1) HIT RE 500 V3 (ICC ESR-3814).
 4. Concrete Screw Anchors:
 - a. Hilti:
 - 1) Kwik HUS-EZ Screw (ICC-ES ESR-3027).
 5. Submit request for substitution in accordance with Specification Section 01 25 13.
 - a. Substitution request to indicate the proposed anchor has the at least the same tension and shear strength as the specified anchor installed as indicated in the Contract Drawings.
 - b. Calculations to be stamped by a Professional Engineer registered in the state that the Project is located in.

PART 3 - EXECUTION

3.1 GENERAL

- A. Cast-in-Place Anchorage:
 1. Use where anchor rods or bolts are indicated on the Drawings, unless another anchor type is approved by the Engineer.
 2. Provide concrete anchorage as shown on the Drawings or as required to secure components to concrete.
- B. Adhesive Anchorage:
 1. Use only where specifically indicated on the Drawings or when approved for use by the Engineer.

2. May be used where subjected to vibration or where buried or submerged.
 3. Do not use in overhead applications or sustained tension loading conditions such as utility hangers.
 4. Contact Engineer for clarification when anchors will not be installed in compliance with manufacturer's printed installation requirements.
- C. Mechanical Anchorage:
1. Use only where specifically indicated on the Drawings or when approved for use by the Engineer.
 2. Do not use where subjected to vibration.
 3. May be used in overhead applications.
 4. Contact Engineer for clarification when anchors will not be installed in compliance with manufacturer's printed installation requirements.
- D. Do not use powder actuated fasteners and other types of bolts and fasteners not specified herein for structural applications unless approved by the Engineer or specified in Contract Documents.

3.2 PREPARATION

- A. Provide adequate time to allow for proper installation and inspection prior to placing concrete for cast-in-place concrete anchorage.
- B. Prior to installation, inspect and verify areas and conditions under which concrete anchorage is to be installed.
1. Notify Engineer of conditions detrimental to proper and timely completion of work.
 2. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the Engineer.
- C. Special Inspection is required in accordance with the Building Code for all concrete anchorage.
1. Notify the Special Inspector that an inspection is required prior to concrete placement (or during post-installed anchorage installation).
 2. See the FIELD QUALITY CONTROL Article in PART 3 of this Specification Section for additional requirements.
- D. Post-installed anchor manufacturer's representative shall demonstrate and observe the proper installation procedures for the post-installed anchors at no additional expense to the Owner.
1. Follow such procedures to assure acceptable installation.
 2. Adhesive anchors must be installed in concrete aged a minimum of 21 days

3.3 INSTALLATION

- A. Tie cast-in-place anchorage in position to embedded reinforcing steel using wire.
1. Tack welding of anchorage is prohibited.
 2. Coat the projected portion of carbon steel anchors and nut threads with a heavy coat of clean grease after concrete has cured.
 3. Anchorage location tolerance shall be in accordance with AISC 303.
 4. Provide steel or durable wood templates for all column and equipment anchorage.
 - a. Templates to be placed above top of concrete and not impede proper concrete placement and consolidation.
- B. Unless noted or specified otherwise:
1. Connect aluminum and steel members to concrete and masonry using stainless steel cast-in-place anchorage unless shown otherwise.
 - a. Provide dissimilar materials protection per Specification Section 09 96 00.
 2. Provide washers for all anchorage.
 3. Where exposed, extend threaded anchorage a minimum of 1/2 IN above the top of the fully engaged nut.
 - a. If anchorage is cut off to the required maximum height, threads must be dressed to allow nuts to be removed without damage to the nuts.
- C. Do the following after nuts are snug-tightened down:

1. If using post-installed anchorage, follow MPII.
 2. Upset threads of anchorage to prevent nuts from backing off.
 - a. Provide double nut or lock nut in lieu of upset threads for items that may require removal in the future.
 3. For all other cast-in-place anchorage material, tighten nuts down an additional 1/8 turn to prevent nuts from backing off.
 4. If two (2) nuts are used per concrete anchor above the base plate, tighten the top nut an additional 1/8 turn to "lock" the two (2) nuts together.
 5. If using post-installed anchorage, follow manufacturer's installation procedures.
- D. Assure that embedded items are protected from damage and are not filled in with concrete.
- E. Secure architectural components such that it will not be aesthetically distorted nor fasteners overstressed from expansion, contraction or installation.
- F. Coat aluminum surfaces in contact with dissimilar materials in accordance with Specification Section 09 96 00.
- G. Repair damaged galvanized surfaces in accordance with ASTM A780.
 1. Prepare damaged surfaces by abrasive blasting or power sanding.
 2. Apply galvanizing repair paint to minimum 6 mils DFT in accordance with manufacturer's instructions and ASTM A780.
- H. For post-installed anchors, comply with the MPII on the hole diameter and depth required to fully develop the tensile strength of the anchor or reinforcing bar.
 1. Use hammer drills to create holes.
 2. Properly clean out the hole per the ICC-ES reports utilizing a non-metallic fiber bristle brush and compressed air or as otherwise required to remove all loose material from the hole prior to installing the anchor in the presence of the Special Inspector.

3.4 FIELD QUALITY CONTROL

- A. Special Inspection:
1. See Section 01 45 33.
 2. See Section 03 05 05.

3.5 CLEANING

- A. After concrete has been placed, remove protection and clean all anchorage of all concrete, dirt, and other foreign matter.

END OF SECTION

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DIVISION 07

THERMAL AND MOISTURE PROTECTION



SECTION 07 92 00
JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sealing all joints which will permit penetration of dust, air or moisture.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American Concrete Institute (ACI):
 - a. 302.1R, Guide for Concrete Floor and Slab Construction.
 - 2. ASTM International (ASTM):
 - a. C834, Standard Specification for Latex Sealants.
 - b. C920, Standard Specification for Elastomeric Joint Sealants.
 - c. C1521, Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.
 - 3. NSF International (NSF):
 - a. 61, Drinking Water System Components -- Health Effects.
 - 4. Underwriters Laboratories, Inc. (UL).
- B. Qualifications: Sealant applicator shall have minimum five (5) years experience using products specified on projects with similar scope.

1.3 DEFINITIONS

- A. Corrosive Areas Include: All areas of the project.
- B. Defect(ive): Failure of watertightness or airtightness.
- C. Finish sealant: Sealant material per this specification applied over face of compressible sealant or expanding foam sealant specified, to provide a finished, colored sealant joint.
- D. Installer or Applicator:
 - 1. Installer or applicator is the person actually installing or applying the product in the field at the Project site.
 - 2. Installer and applicator are synonymous.
- E. "Interior wet areas": Entire area is considered wet.
- F. "Seal," "sealing" and "sealant": Joint sealant work.

1.4 SUBMITTALS

- A. Shop Drawings:
 - 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 - 2. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's installation instructions.
 - c. Manufacturer's recommendations for joint cleaner, primer, backer rod, tooling and bond breaker.
 - 3. Certification from sealant manufacturer stating product being used is recommended for and is best suited for joint in which it is being applied.

4. Certification of applicator qualification.
- B. Test Results:
1. Provide adhesion test results for each sealant sample including adhesion results compared to adhesion requirements.
 2. Manufacturer's authorized factory representative recommended remedial measures for all failing tests.
- C. Informational Submittals:
1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver material in manufacturer's original unopened containers with labels intact: Labels shall indicate contents and expiration date on material.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
1. Compressible sealant:
 - a. Polytite Manufacturing Corporation.
 - b. Emseal.
 - c. Norton.
 - d. Sandell.
 2. Expanding foam sealant:
 - a. Macklanburg Duncan.
 - b. Convenience Products.
 - c. FAI International, Inc.
 3. Polyether sealants:
 - a. BASF.
 - b. ChemLink, Inc.
 - c. Tremco.
 4. Polysulfide rubber sealant:
 - a. Pecora.
 - b. BASF.
 - c. PolySpec.
 5. Polyurethane sealants:
 - a. Pecora.
 - b. Sika Chemical Corp.
 - c. BASF.
 - d. Tremco.
 6. Backer rod, compressible filler, primer, joint cleaners, bond breaker: As recommended by sealant manufacturer.
- B. Submit request for substitution in accordance with Specification Section 01 25 13.

2.2 MATERIALS

- A. Sealants - General:
1. Provide colors matching materials being sealed.
 2. Where compound is not exposed to view in finished work, provide manufacturer's color which has best performance.
 3. Nonsagging sealant for vertical and overhead horizontal joints.
 4. Joint cleaner, primer, bond breaker: As recommended by sealant manufacturer.
 5. Sealant backer rod and/or compressible filler:

- a. Closed cell polyethylene, polyethylene jacketed polyurethane foam, or other flexible, nonabsorbent, non-bituminous material recommended by sealant manufacturer to:
 - 1) Control joint depth.
 - 2) Break bond of sealant at bottom of joint.
 - 3) Provide proper shape of sealant bead.
 - 4) Serve as expansion joint filler.
- B. Compressible Sealant:
 - 1. Foamed polyurethane strip saturated with polymerized polybutylene waterproofing coated on front face with nonreactive release agent that will act as bond breaker for applied sealant.
 - a. Polytite Manufacturing Corp. "Polytite-B."
 - 2. Fire rated where required.
 - 3. Adhesive: As recommended by sealant manufacturer.
- C. Expanding Foam Sealant:
 - 1. One (1) or two (2) component fire rated moisture cured expanding urethane.
 - 2. Shall not contain formaldehyde.
 - 3. Density: Minimum 1.5 PCF.
 - 4. Closed cell content: Minimum 70 PCT.
 - 5. R-value: Minimum 5.0/IN.
 - 6. Flame spread: Less than 25.
 - 7. Smoke developed: Less than 25.
- D. Polyether Sealant:
 - 1. Silyl-terminated polyether polymer.
 - 2. ASTM C920, Type S, Grade NS, Class 50, Use NT, M, A, and O.
 - a. BASF MasterSeal 150.
 - b. ChemLink DuraLink.
 - c. Tremco Dymonic FC
- E. Polysulfide Rubber Sealant:
 - 1. One (1) or two (2) component.
 - 2. Meet ASTM C920.
 - a. Pecora Synthacalk GC2+.
 - b. PolySpec THIOKOL 2235.
- F. Polyurethane Sealant:
 - 1. One (1) or two (2) components.
 - 2. Paintable.
 - 3. Meet ASTM C920 Type S or Type M, Grade NS or P, Class 25, Use NT, T, M, A and O.
 - a. Pecora Dynatrol-IXL, Dynatrol II, Urexpan NR-200, NR-201.
 - b. Sika Chemical Corporation Sikaflex-1a, Sikaflex-2C NS/SL.
 - c. BASF MasterSeal NP-1, NP-II, SL-1 SL-2.
 - d. Tremco Dymonic or Dymeric, Vulkem 116,227,45,245.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before use of any sealant, investigate its compatibility with joint surfaces, fillers and other materials in joint system.
- B. Use only compatible materials.
- C. Where required by manufacturer, prime joint surfaces.
 - 1. Limit application to surfaces to receive sealant.
 - 2. Mask off adjacent surfaces.

3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions and UL requirements.
- B. Clean all joints.
- C. Make all joints water and airtight.
- D. At changes in direction of joints, joint intersections and where sealant joints interface with other construction, install continuous sealant as necessary to ensure a weather-tight seal.
- E. Make depth of sealing compounds, except expanding foam sealant, not more than one-half width of joint, but in no case less than 1/4 IN nor more than 1/2 IN unless recommended otherwise by the manufacturer.
- F. Provide correctly sized backer rod, compressible filler or compressible sealant in all joints to depth recommended by manufacturer:
 - 1. Take care to not puncture backer rod and compressible filler.
 - 2. Provide joint backer rod as recommended by the manufacturer for joint filler.
- G. Apply bond breaker where required.
- H. Tool sealants using sufficient pressure to fill all voids.
- I. Upon completion, leave sealant with smooth, even, neat finish.
- J. Where piping, conduit, ductwork, etc., penetrate wall, seal each side of wall opening.
- K. Install compressible sealant to position at indicated depth.
 - 1. Size so that width of material is twice joint width.
 - 2. Take care to avoid contamination of sides of joint.
 - 3. Protect side walls of joint (to depth of finish sealant).
 - 4. Install with adhesive faces in contact with joint sides.
 - 5. Install finish sealant where indicated.
- L. Install expanding foam sealant to minimum 4 IN depth or thickness of wall being penetrated if less than 4 IN or as indicated on Drawings.
 - 1. Hold material back from exposed face of wall as necessary to allow for installation of backer rod and finish sealant.
 - a. Allow expanding foam sealant to completely cure prior to installing backer rod and finish sealant.
 - 2. Trim off excess material flush with surface of the wall if not providing finished sealant.

3.3 SEALANT WORK

- A. General:
 - 1. Work includes but is not limited to: Sealing all joints which will permit penetration of dust, air, or moisture.
 - 2. Refer to SCHEDULE for materials to be used.
- B. Flashing, reglets and retainers.
- C. Exterior Insulation and Finish System joints.
- D. Openings:
 - 1. Perimeters of door and window frames, louvers, grilles, etc.
- E. Penetrations of walls, floors and decks.
- F. Other joints where sealant, expanding foam sealant or compressible sealant is indicated.

3.4 FIELD QUALITY CONTROL

- A. Adhesion Testing:
 - 1. Perform adhesion tests in accordance with ASTM C1521 per the following criteria:
 - a. All joint types: One (1) test per every 3000 LF of joint sealed.

- b. Manufacturer's authorized factory representative shall recommend, in writing, remedial measures for all failing tests.

3.5 SCHEDULE

- A. Furnish sealant as indicated for the following areas:
 - 1. Exterior areas:
 - a. Above grade: Polyether.
 - b. Below grade: Polyurethane.
 - 2. Interior areas:
 - a. Corrosive areas:
 - 1) Wet exposure: Polysulfide.
 - 3. Immersion:
 - a. Prolonged contact with or immersion in:
 - 1) Nonpotable water, wastewater or sewage: Polysulfide.
 - 4. Compressible sealant: Where indicated.
 - 5. Exterior wall penetrations: Expanding urethane foam, with finish sealant.
 - a. Finish sealant:
 - 1) Exterior side:
 - a) Above grade: Polyether.
 - b) Below grade: Polyurethane.
 - 2) Interior side:
 - a) Corrosive area:
 - (1) Wet exposure: Polysulfide.

END OF SECTION

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DIVISION 10
SPECIALTIES



SECTION 10 14 00
IDENTIFICATION DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Tag, tape and stenciling systems for equipment, piping, valves, fans, ductwork and similar items, and hazard and safety signs.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American Society of Mechanical Engineers (ASME):
 - a. A13.1, Scheme for the Identification of Piping Systems.
 - 2. The International Society of Automation (ISA).
 - 3. National Electrical Manufacturers Association/American National Standards Institute (NEMA/ANSI):
 - a. Z535.1, Safety Color Code.
 - b. Z535.2, Environmental and Facility Safety Signs.
 - c. Z535.3, Criteria for Safety Symbols.
 - d. Z535.4, Product Safety Signs and Labels.
 - 4. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code (NEC).
 - 5. Occupational Safety and Health Administration (OSHA):
 - a. 29 CFR 1910.145, Specification for Accident Prevention Signs and Tags.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 - 2. Product technical data including:
 - a. Catalog information for all identification systems.
 - b. Acknowledgement that products submitted meet requirements of standards referenced.
 - 3. Identification register, listing all items in PART 3 of this Specification Section to be identified, type of identification system to be used, lettering, location and color.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. W.H. Brady Co.
 - 2. Panduit.
 - 3. Seton.
 - 4. National Band and Tag Co.
 - 5. Carlton Industries, Inc.
- B. Submit request for substitution in accordance with Specification Section 01 25 13.

2.2 MANUFACTURED UNITS

- A. Type A1 - Round Metal Tags:
 - 1. Materials:
 - a. Aluminum or stainless steel.
 - b. Stainless steel shall be used in corrosive environments.
 - 2. Size:
 - a. Diameter: 1-1/2 IN minimum.
 - b. Thickness: 0.035 IN (20 GA) minimum.
 - 3. Fabrication:
 - a. 3/16 IN minimum mounting hole.
 - b. Legend: Stamped and filled with black coloring.
 - 4. Color: Natural.
- B. Type A2 - Rectangle Metal Tags:
 - 1. Materials: Stainless steel.
 - 2. Size:
 - a. 3-1/2 IN x 1-1/2 IN minimum.
 - b. Thickness: 0.036 IN (20 GA) minimum.
 - 3. Fabrication:
 - a. 3/16 IN minimum mounting hole.
 - b. Legend: Stamped and filled with black coloring.
 - 4. Color: Natural.
- C. Type A3 - Metal Tape Tags:
 - 1. Materials: Aluminum or stainless steel.
 - 2. Size:
 - a. Width 1/2 IN minimum.
 - b. Length as required by text.
 - 3. Fabrication:
 - a. 3/16 IN minimum mounting hole.
 - b. Legend: Embossed.
 - 4. Color: Natural.
- D. Type B1- Square Nonmetallic Tags:
 - 1. Materials: Fiberglass reinforced plastic.
 - 2. Size:
 - a. Surface: 2 x 2 IN minimum.
 - b. Thickness: 100 mils.
 - 3. Fabrication:
 - a. 3/16 IN mounting hole with metal eyelet.
 - b. Legend: Preprinted and permanently embedded and fade resistant.
 - 4. Color:
 - a. Background: Manufacturer standard or as specified.
 - b. Lettering: Black.
- E. Type B2 - Nonmetallic Signs:
 - 1. Materials: Fiberglass reinforced or durable plastic.
 - 2. Size:
 - a. Surface: As required by text.
 - b. Thickness: 60 mils minimum.
 - 3. Fabrication:
 - a. Rounded corners.
 - b. Drilled holes in corners with grommets.
 - c. Legend: Preprinted, permanently embedded and fade resistant for a 10 year minimum outdoor durability.
 - 4. Color:

- a. Background: Manufacturer standard or as specified.
 - b. Lettering: Black.
 - 5. Standards for OSHA signs: NEMA/ANSI Z535.1, NEMA/ANSI Z535.2, NEMA/ANSI Z535.3, NEMA/ANSI Z535.4, OSHA 29 CFR 1910.145.
- F. Type C - Laminated Name Plates:
 - 1. Materials: Phenolic or DR (high impact) acrylic.
 - 2. Size:
 - a. Surface: As required by text.
 - b. Thickness: 1/16 IN.
 - 3. Fabrication:
 - a. Outdoor rated and UV resistant when installed outdoors.
 - b. Two (2) layers laminated.
 - c. Legend: Engraved through top lamination into bottom lamination.
 - d. Two (2) drilled side holes, for screw mounting.
 - 4. Color: Black top surface, white core, unless otherwise indicated.
- G. Type D - Self-Adhesive Tape Tags and Signs:
 - 1. Materials: Vinyl tape or vinyl cloth.
 - 2. Size:
 - a. Surface: As required by text.
 - b. Thickness: 5 mils minimum.
 - 3. Fabrication:
 - a. Indoor/Outdoor grade.
 - b. Weather and UV resistant inks.
 - c. Permanent adhesive.
 - d. Legend: Preprinted.
 - e. Wire markers to be self-laminating.
 - 4. Color: White with black lettering or as specified.
 - 5. Standards for OSHA signs: NEMA/ANSI Z535.1, NEMA/ANSI Z535.2, NEMA/ANSI Z535.3, NEMA/ANSI Z535.4, OSHA 29 CFR 1910.145.
- H. Type E - Heat Shrinkable Tape Tags:
 - 1. Materials: Polyolefin.
 - 2. Size: As required by text.
 - 3. Fabrication:
 - a. Legend: Preprinted.
 - 4. Color: White background, black printing.
- I. Type G - Stenciling System:
 - 1. Materials:
 - a. Exterior type stenciling enamel.
 - b. Either brushing grade or pressurized spray can form and grade.
 - 2. Size: As required.
 - 3. Fabrication:
 - a. Legend: As required.
 - 4. Color: Black or white for best contrast.

2.3 ACCESSORIES

- A. Fasteners:
 - 1. Bead chain: #6 brass, aluminum or stainless steel.
 - 2. Plastic strap: Nylon, urethane or polypropylene.
 - 3. Screws: Self-tapping, stainless steel.
 - 4. Adhesive, solvent activated.

2.4 MAINTENANCE MATERIALS

- A. Where stenciled markers are provided, clean and retain stencils after completion and include in extra stock, along with required stock of paints and applicators.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

- A. Install identification devices at specified locations.
- B. All identification devices to be printed by mechanical process, hand printing is not acceptable.
- C. Attach tags to equipment with sufficient surface or body area with solvent activated adhesive applied to back of each tag.
- D. Attach tags with 1/8 IN round or flat head screws to equipment without sufficient surface or body area, or porous surfaces.
 - 1. Where attachment with screws should not or cannot penetrate substrate, attach with plastic strap.
- E. Single items of equipment enclosed in a housing or compartment to be tagged on outside of housing.
 - 1. Several items of equipment mounted in housing to be individually tagged inside the compartment.

3.2 SCHEDULES

- A. General:
 - 1. Miscellaneous OSHA hazard signage:
 - a. Tag Type: Type B2 - Nonmetallic Signs.
 - b. Fastener: Screw or adhesive.
 - c. Size: 10 IN x 14 IN.
 - d. Location: Field located as directed by Owner.
 - e. Allowance: Provide 5 OSHA Danger, Caution, Safety Instruction or Biohazard signs as directed by Owner.
 - 1) Description of hazard shall be determined by Owner.
- B. Process Systems:
 - 1. General:
 - a. Provide arrows and markers on piping.
 - 1) At 20 FT maximum centers along continuous lines.
 - 2) At changes in direction (route) or obstructions.
 - 3) At valves, risers, "T" joints, machinery or equipment.
 - 4) Where pipes pass through floors, walls, ceilings, cladding assemblies and like obstructions provide markers on both sides.
 - b. Position markers on both sides of pipe with arrow markers pointing in flow direction.
 - 1) If flow is in both directions use double headed arrow markers.
 - c. Apply tapes and stenciling in uniform manner parallel to piping.
 - 2. Valves:
 - a. Tag type:
 - 1) Outdoor locations: Type B1 - Square Nonmetallic Tags.
 - 2) Indoor noncorrosive:
 - a) Type A1 - Round Metal Tags.
 - b) Type B1 - Square Nonmetallic Tags.
 - 3) Indoor corrosive:
 - a) Stainless steel Type A1 - Round Metal Tags.
 - b) Type B1 - Square Nonmetallic Tags.
 - b. Fastener:

- 1) Type A1: Chain of the same material.
 - 2) Type B1: Stainless steel chain.
 - c. Color: Per ASME A13.1 corresponding to the piping system.
 - d. Legend:
 - 1) Letter height: 1/4 IN minimum.
 - 2) Valve designation as indicated on the Drawings (e.g., “V-xxx”).
 - 3. Process equipment (e.g., UV odor control units, etc.):
 - a. Tag type:
 - 1) Type B2 - Nonmetallic Signs.
 - 2) Type D - Self-Adhesive Tape Tags and Signs.
 - 3) Type G - Stenciling System.
 - b. Fastener:
 - 1) Self.
 - 2) Screws.
 - 3) Adhesive.
 - c. Legend:
 - 1) Letter height: 1/2 IN minimum.
 - 2) Equipment designation as indicated on the Drawings (e.g., “Primary Sludge Pump P-xxx”).
 - 4. Piping systems:
 - a. Tag type:
 - 1) Outdoor locations: Type G - Stenciling System.
 - 2) Indoor locations:
 - a) Type D - Self-Adhesive Tape Tags and Signs.
 - b) Type G - Stenciling System.
 - b. Fastener: Self.
 - c. Color: Per ASME A13.1.
 - d. Legend:
 - 1) Letter height: Manufacturers standard for the pipe diameter.
 - 2) Mark piping in accordance with ASME A13.1.
 - 3) Use piping designation as indicated on the Drawings.
 - 4) Arrow: Single arrow.
 - 5. Equipment that starts automatically:
 - a. Tag type:
 - 1) Type B2 - Nonmetallic Signs.
 - 2) Type D - Self-Adhesive Tape Tags and Signs.
 - b. Fastener:
 - 1) Type B2 - Screw or adhesive.
 - 2) Type D - Self.
 - c. Size: 5 IN x 7 IN
 - d. Location: Equipment name.
 - e. Legend:
 - 1) OSHA Warning Sign.
 - 2) Description of Warning: “THIS MACHINE STARTS AUTOMATICALLY”.
- C. Instrumentation Systems:
- 1. Instrumentation Equipment (e.g., flow control valves, primary elements, etc.):
 - a. Tag type:
 - 1) Outdoor locations: Type B1 - Square Nonmetallic Tags.
 - 2) Indoor noncorrosive:
 - a) Type A1 - Round Metal Tags.
 - b) Type B1 - Square Nonmetallic Tags.
 - 3) Indoor corrosive:
 - a) Stainless steel Type A1 - Round Metal Tags.
 - b) Type B1 - Square Nonmetallic Tags.

- b. Fastener:
 - 1) Type A1: Chain of the same material.
 - 2) Type B1: Stainless steel chain.
 - c. Legend:
 - 1) Letter height: 1/4 IN minimum.
 - 2) Equipment ISA designation as indicated on the Drawings (e.g., "FIT-xxx").
 - 2. Enclosure for instrumentation and control equipment, (e.g., PLC control panels, etc.):
 - a. Tag type: Type C - Phenolic Name Plates.
 - b. Fastener: Screws.
 - c. Legend:
 - 1) Letter height: 1/2 IN minimum.
 - 2) Equipment name (e.g., "PLC CONTROL PANEL PCP-xxx").
 - 3. Components inside equipment enclosure, (e.g., PLC's, control relays, contactors, and timers):
 - a. Tag type: Type D - Self-Adhesive Tape Tags.
 - b. Fastener: Self.
 - c. Legend:
 - 1) Letter height: 3/16 IN minimum.
 - 2) Description or function of component (e.g., "PLC-xxx" or "CR-xxx").
 - 4. Through enclosure door mounted components (e.g., selector switches, controller digital displays, etc.):
 - a. Tag type: Type C - Phenolic Name Plates.
 - b. Fastener: Screws.
 - c. Legend:
 - 1) Letter height: 1/4 IN minimum.
 - 2) Component ISA tag number as indicated on the Drawings (e.g., "HS-xxx").
- D. HVAC and Odor Control Systems:
- 1. General:
 - a. Provide arrows and markers on ducts.
 - 1) At 20 FT maximum centers along continuous lines.
 - 2) At changes in direction (route) or obstructions.
 - 3) At dampers, risers, branches, machinery or equipment.
 - 4) Where ducts pass through floors, walls, ceilings, cladding assemblies and like obstructions provide markers on both sides.
 - b. Position markers on both sides of duct with arrow markers pointing in flow direction.
 - 1) If flow is in both directions use double headed arrow markers.
 - c. Apply tapes and stenciling in uniform manner parallel to ducts.
 - 2. HVAC Equipment and Odor Control Fans (e.g., unit heaters, exhaust fans, air handlers, etc.):
 - a. Tag type:
 - 1) Type B2 - Nonmetallic Signs.
 - 2) Type C - Phenolic Name Plates.
 - b. Fastener: Screws.
 - c. Legend:
 - 1) Letter height: 1 IN minimum.
 - 2) Equipment designation as indicated on the Drawings (e.g., "EF-xxx").
 - 3. Ductwork:
 - a. Tag type:
 - 1) Type D - Self-Adhesive Tape Tags and Signs.
 - 2) Type G - Stenciling System.
 - b. Fastener: Self.
 - c. Legend:
 - 1) Letter height: 1 IN minimum.
 - 2) Description of ductwork, (e.g., "AIR SUPPLY").

- 3) Arrows: Single arrow.
 - 4. Enclosure for instrumentation and control equipment, (e.g., fan control panels, etc.):
 - a. Tag type: Type C - Phenolic Name Plates.
 - b. Fastener: Screws.
 - c. Legend:
 - 1) Letter height: 1/2 IN minimum.
 - 2) Equipment designation as indicated on the Drawings (e.g., "FAN CONTROL PANEL FCP-xxx").
 - 5. Components inside equipment enclosure, (e.g., controller's, control relays, contactors, and timers):
 - a. Tag type: Type D - Self-Adhesive Tape Tags and Signs.
 - b. Fastener: Self.
 - c. Legend:
 - 1) Letter height: 3/16 IN minimum.
 - 2) Description or function of component (e.g., "CR-xxx").
 - 6. Through enclosure door mounted equipment (e.g., selector switches, controller digital displays, etc.):
 - a. Tag type: Type C - Phenolic Name Plates.
 - b. Fastener: Screws.
 - c. Legend:
 - 1) Letter height: 1/4 IN minimum.
 - 2) Component tag number as indicated on the Drawings or as defined by contractor (e.g., "HS-xxx").
- E. Electrical Systems:
- 1. Switchgear, switchboards and motor control centers:
 - a. Tag type: Type C - Phenolic Name Plates.
 - b. Fastener: Screws.
 - c. Main equipment legend:
 - 1) Letter height:
 - a) First line: 1 IN minimum.
 - b) Subsequent lines: 3/8 IN minimum.
 - 2) First line: Equipment name (e.g., "MAIN SWITCHBOARD MSBxxx").
 - 3) Second line:
 - a) Source of power (e.g., "FED FROM MCCxxx LOCATED IN ROOM xxx").
 - b) Include the building name or number if the source is in another building.
 - 4) Third line: System voltage and phase (e.g., "480/277 V, 3PH").
 - 5) Fourth line: Date installed (e.g., "INSTALLED JULY 20xx").
 - d. Main and feeder device legend:
 - 1) Letter height: 3/8 IN minimum.
 - 2) Description of load (e.g., "MAIN DISCONNECT", "PUMP Pxxx" or "PANELBOARD HPxxx").
 - 2. Panelboards and transformers:
 - a. Tag type: Type C - Phenolic Name Plates.
 - b. Fastener: Screws.
 - c. Legend:
 - 1) Letter height:
 - a) First line: 3/8 IN minimum.
 - b) Subsequent lines: 3/16 IN minimum.
 - 2) First line: Equipment name (e.g., "PANELBOARD LPxxx" or "TRANSFORMER Txxx").
 - 3) Second line (panelboards only): System voltage and phase (e.g., "208/120V, 3PH").
 - 4) Third line:
 - a) Source of power (e.g., "FED FROM MCCxxx LOCATED IN ROOM xxx").

- b) Include the building name or number if the source is in another building.
 - 5) Fourth line: Date installed (e.g., "INSTALLED JULY 20xx").
- 3. Transfer switches:
 - a. Tag type: Type C - Phenolic Name Plates.
 - b. Fastener: Screws.
 - c. Legend:
 - 1) Letter height:
 - a) First line: 3/8 IN minimum.
 - b) Subsequent lines: 3/16 IN minimum.
 - 2) First line: Equipment name (e.g., "AUTOMATIC TRANSFER SWITCH ATSxxx").
 - 3) Second line: Normal source of power (e.g., "NORMAL SOURCE FED FROM MCCxxx").
 - 4) Third line: Emergency source of power (e.g., "EMERGENCY SOURCE FED FROM SGENxxx").
 - 5) Fourth line: Date installed (e.g., "INSTALLED JULY 20xx").
- 4. Safety switches, separately mounted circuit breakers and motor starters, VFD's, etc.:
 - a. Tag type: Type C - Phenolic Name Plates.
 - b. Fastener: Screws.
 - c. Legend:
 - 1) Letter height: 1/4 IN minimum.
 - 2) First line: Description of load equipment is connected to (e.g., "PUMP Pxxx").
- 5. Enclosure for instrumentation and control equipment, (e.g., lighting control panels, etc.):
 - a. Tag type: Type C - Phenolic Name Plates.
 - b. Fastener: Screws.
 - c. Legend:
 - 1) Letter height: 1/2 IN minimum.
 - 2) Equipment name (e.g., "LIGHTING CONTROL PANEL LCPxxx").
- 6. Components inside equipment enclosures (e.g., circuit breakers, fuses, control power transformers, control relays, contactors, timers, etc.):
 - a. Tag type: Type D - Self-Adhesive Tape Tags and Signs.
 - b. Fastener: Self.
 - c. Legend:
 - 1) Letter height: 3/16 IN minimum.
 - 2) Description or function of component (e.g., "M-xxx", "CR-xxx" or "TR-xxx").
- 7. Through enclosure door mounted equipment (e.g., selector switches, controller digital displays, etc.):
 - a. Tag type: Type C - Phenolic Name Plates.
 - b. Fastener: Screws.
 - c. Legend:
 - 1) Letter height: 1/4 IN minimum.
 - 2) Component tag number as indicated on the Drawings or as defined by contractor (e.g., "HS-xxx").
- 8. Conductors in control panels and in pull or junction boxes where multiple circuits exist.
 - a. Tag type: Type D - Self-Adhesive Tape Tags.
 - b. Fastener: Self.
 - c. Tag conductor at both ends.
 - d. Legend:
 - 1) Letter height: 1/8 IN minimum.
 - 2) Circuit number or wire number as scheduled on the Drawings or as furnished with the equipment.
- 9. Conductors in handholes and manholes.
 - a. Tag type: Type A3 - Metal Tape Tags.
 - b. Fastener: Nylon strap.
 - c. Tag conductor at both ends.

- d. Legend:
 - 1) Letter height: 1/8 IN minimum.
 - 2) Circuit number or wire number as scheduled on the Drawings.
- 10. Grounding conductors associated with grounding electrode system in accordance with the following:
 - a. Tag type: Type D - Self-Adhesive Tape Tags.
 - b. Fastener: Self.
 - c. Legend:
 - 1) Letter height: 1/8 IN minimum.
 - 2) Function of conductor (e.g., "MAIN BONDING JUMPER", "TO GROUND RING", "TO MAIN WATER PIPE").
- 11. Flash protection for switchboards, panelboards, industrial control panels and motor control centers:
 - a. Tag type: Type D - Self-Adhesive Tape Signs.
 - b. Fastener: Self.
 - c. Legend: Per NFPA 70.
- 12. Equipment where more than one (1) voltage source is present:
 - a. Tag type:
 - 1) Type B2 - Nonmetallic Signs.
 - 2) Type D - Self-Adhesive Tape Signs.
 - b. Fastener:
 - 1) Screw or adhesive.
 - 2) Self.
 - c. Size: 1-3/4 IN x 2-1/2 IN.
 - d. Location: Exterior face of enclosure or cubical.
 - e. Legend:
 - 1) OSHA Danger Sign.
 - 2) Description of Danger: "MULTIPLE VOLTAGE SOURCES".

3.3 HAZARD AND SAFETY SIGNS

- A. Provide 10 Hazard and Safety Signs:
 - 1. Type B2.
 - 2. Inscription as directed by Owner.

END OF SECTION

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SECTION 10 44 33
FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Portable fire extinguishers.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
 - 3. Section 05 50 00 - Metal Fabrications.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. Americans with Disabilities Act (ADA):
 - a. 2010 ADA Standards for Accessible Design.
 - 2. National Fire Protection Association (NFPA):
 - a. 10, Standard for Portable Fire Extinguishers.
 - 3. Underwriters Laboratories, Inc. (UL):
 - a. 8, Water Based Agent Fire Extinguishers.
 - b. 154, Carbon Dioxide Fire Extinguishers.
 - c. 299, Dry Chemical Fire Extinguishers.
 - d. 626, Water Fire Extinguishers.
 - e. 711, Rating and Fire Testing of Fire Extinguishers.
 - f. 2129, Halocarbon Clean Agent Fire Extinguishers.

1.3 DEFINITIONS

- A. Authority Having Jurisdiction (AHJ): Building official, fire chief, fire marshal or other individual having statutory authority.

1.4 SUBMITTALS

- A. Shop Drawings:
 - 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 - 2. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's installation instructions.
 - c. Ratings and classification of extinguishers.
- B. Contract Closeout Information:
 - 1. Operation and Maintenance Data:
 - a. See Specification Section 01 33 04 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and install filled and charged extinguishers just prior to building occupancy.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. Fire extinguishers:
 - a. Amerex Corporation.
 - b. Ansul – Tyco Fire Protection Products.
 - c. Badger Fire Protection.
 - d. United Technologies - Kidde.
 - e. Buckeye Fire Equipment.
 - 2. Fire extinguisher signs:
 - a. Seton.
 - b. Compliance Signs.
 - c. Safety Sign.
- B. Submit request for substitution in accordance with Specification Section 01 25 13.

2.2 MANUFACTURED UNITS

- A. Fire Extinguisher (FEXT):
 - 1. Steel bodied, all metal top (head) and valves.
 - 2. Multi-purpose dry chemical extinguisher with hose and nozzle.
 - 3. Provide one (1) listed 10 LB. 4A-60BC extinguisher for each treated air exhaust fan enclosure.
 - a. Approximate location noted on Drawings as “FEXT”.
 - 4. Finish: Red with epoxy finish coat.
- B. Wall Brackets:
 - 1. Bracket type to fit specified extinguisher.
 - 2. Furnish bracket for each extinguisher not in cabinet.
 - 3. Bracket to be finished in red or black enamel.
- C. Fire Extinguisher Signage:
 - 1. Single faced: SETON #21999.
 - 2. Double faced: SETON #22001.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions and NFPA 10.
 - 1. Install units with extinguisher top not over 48 IN above floor.
 - 2. Install wall brackets to interior of treated air exhaust fan enclosure per enclosure manufacturer recommendations.
 - a. See Specification Section 05 50 00 for anchorage.
- B. Fire extinguisher locations shown on Drawings are approximate locations.
 - 1. Verify all extinguisher mounting locations with the AHJ.
- C. Provide "FIRE EXTINGUISHER" sign for each extinguisher location.
 - 1. Provide single or double faced sign to provide optimum visibility for extinguisher location.

END OF SECTION

SECTION 10 65 00
FABRIC CURTAIN SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Vinyl laminated reinforced fabric curtains with clear vinyl vision panels around Truck Load-Out Station, moveable on curtain track.
 - 2. Fixed vinyl laminated reinforced fabric curtains with clear vinyl vision panels for vertical finish from top of curtain track to roof.
- B. Related Sections include but are not necessarily limited to:
 - 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
 - 2. Division 1 - General Requirements.

1.2 SUBMITTALS

- A. Samples: Furnish samples for each color.
- B. Final acceptance of vinyl laminated fabric shall be contingent upon Engineer's approval of samples.
- C. Samples Maintenance Data:
 - 1. Include in Materials and Finishes Maintenance Manual.
 - 2. Instructions shall contain recommended cleaning materials and application methods, including precautions in the use of cleaning materials that may be detrimental to the surface if improperly applied.
- D. Design Submittal:
 - 1. Design layout shop drawings of fabric curtains, rail system, support structure, and closure panels. Show dimensions, anchorage, obstructions, and features of the final installed system as it will be installed.
 - 2. Design shall account for load requirements and seismic criteria for this project and shall be sealed by a Professional Engineer licensed in the State of Alaska.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Take care to prevent damage during delivery and handling.
- B. Store all materials in a clean, dry storage area.
- C. Storage area temp shall be maintained above 40 DegF with normal humidity.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Steel Guard Safety Corp.
- B. AmCraft.

2.2 MATERIALS

- A. Vinyl Fabric:
 - 1. Vinyl laminated reinforced fabric.
 - 2. Weight: 14-18 OZ/SQ YD.
 - 3. Adhesion: 20 LBS/2 IN.
 - 4. Tear:

- a. Warp: 70 LBS.
 - b. Fill: 80 LBS.
 5. Tensil:
 - a. Warp: 245 LBS.
 - b. Fill: 242 LBS.
 6. Hydrostatic resistance: 340 PSI.
 7. Fire rated self-extinguishing.
 8. Duracote "Dura-Pro 6116," or equal.
 9. 20 Mil Clear, at vision panels.
 10. Color: As selected by Owner from manufacturer's standards.
- B. Curtain Track:
1. Heavy duty, 11 gauge, anodized.
 2. Extruded aluminum I-beam construction.
 3. Mill finish, exterior class.
 4. Atlas Silk "Model No. 301," or equal.
- C. Curtain Ceiling Clamps:
1. Stainless steel or galvanized steel.
 2. Attachment to wood trusses with two 1/2 IN diameter stainless steel anchor bolts.
 3. Automatic Devices Company "Model No. 1423," or equal.
- D. Curtain Hanging Clamps:
1. Stainless steel or hot dipped galvanized steel.
 2. Suspended from ceiling with 2-5/8 IN diameter steel hanger rods attached at 45°.
 3. Automatic Devices Company "Model No. 4208," or equal.
- E. Curtain Carrier:
1. Carrier body, swivel, firm chains: Stainless steel or galvanized steel.
 2. Wheels: Solid nylon, 1 IN diameter.
 3. Automatic Devices Company, "Model No. 4237 galvanized or stainless steel," or equal.
- F. Curtain Grommets: No. 2 brass.
- G. Curtain Bottom Hem Chain:
1. Galvanized steel or stainless steel.
 2. 0.33 LBS/FT.
- H. Curtain Carrier Hooks: Aluminum or stainless steel.

2.3 FABRICATION AND MANUFACTURER

- A. Fabric Partition:
1. Seams: Double lock stitch with No. 69 nylon thread.
 2. Top Hems: 3-1/2 IN jute webbing set with covered grommets on 12 IN centers.
 3. Side Hems: 2 IN double turned.
 4. Bottom Hem: 6 IN with separate pocket to enclose bottom hem chain.
 5. Walk-Draw construction.
 6. Length: Layout as shown on Drawings.
 7. Height: moveable curtains approximately 12-14 FT, as shown on Drawings. Maximum 1/2 IN clearance from floor to bottom of curtain. Fixed curtains from approximately 12-14 FT to underside of roof deck.
 8. Provide cutouts for equipment and piping that penetrates or passes through the curtain as requirement.
 - a. Cutouts shall allow for curtains to be moved away from the obstruction.
 - b. Cuts in fabric shall be sealed per manufacturer to prevent fraying, delamination, or other damage when in use.
 - c. Clearance of cutouts around obstructions shall be 1/2 IN or less.
- B. Curtain Track:

1. Mounted from metal support beams along ceiling of prefabricated metal building. Track will hang level at elevation shown on Drawings and be supported with hanging rods as designed by the curtain manufacturer.
 2. Track supports installed on maximum 3 FT - 6 IN centers.
 3. Single carriers spaced 12 IN on center.
- C. Curtain Mounting:
1. Top hem attached to carrier trim with carrier "S" hooks.
 2. Curtain overlap and sections and shown on Drawings.
 3. Adjust carrier trim to allow a maximum of 6 IN between bottom of partition hem and floor or platform surfaces.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Check areas scheduled to receive partitions for correct dimension, plumbness of walls, and soundness of ceiling surfaces that would affect installation of holding brackets.
- B. Verify location of plumbing piping and process piping to assure compatibility with installation of partitions and allow for design of penetrations to account for obstructions passing through curtains and panels.
- C. Do not begin installation of partitions until conditions are satisfactory and shop drawing have been approved.

3.2 ADJUST AND CLEAN

- A. Adjust and lubricate hardware for proper operation after installation.
- B. Perform final adjustments to hardware.
- C. Clean exposed surfaces and partitions, hardware, fittings, and accessories.

END OF SECTION

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DIVISION 23

HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)



SECTION 23 05 93
HVAC SYSTEMS - BALANCING AND TESTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Adjusting, balancing, and testing of all heating, ventilating and air conditioning (HVAC) systems, including the following systems:
 - a. Air distribution and exhaust systems.
 - b. Air moving equipment.
- B. Related Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
 - 3. Section 23 31 00 - HVAC: Ductwork.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. Associated Air Balance Council (AABC):
 - a. National Standards for Total System Balance.
 - 2. American Industrial Hygiene Association (AIHA):
 - a. Z9.5, Laboratory Ventilation.
 - 3. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE):
 - a. HVAC Systems and Equipment Handbook, Chapter entitled "Testing, Adjusting, and Balancing".
 - 4. National Environmental Balancing Bureau (NEBB):
 - a. Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
- B. Qualifications:
 - 1. Work of this Section to be accomplished by an independent testing and balancing firm certified by one (1) of the following:
 - a. Associated Air Balance Council (AABC).
 - b. National Environmental Balancing Bureau (NEBB).
 - c. Other certification entity approved by Engineer.
 - 2. The independent firm shall not be the same firm as the firm installing the HVAC equipment, nor under contract to the firm installing the equipment.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 - 2. Certifications:
 - a. Letter stating the name and qualifications of the firm proposed.
 - b. Evidence that relevant subcontractors have been notified of the requirement to coordinate balance and test elements in the work with the testing and balancing firm.
 - 3. Report forms:
 - a. Procedures and forms to be used in calibrating of test instruments, balancing systems, and recording and reporting test data.
- B. Informational Submittals:
 - 1. Completed test reports and data forms upon completion of installation, balance and testing of HVAC systems.

- a. Insert recorded information on report forms required by specifications and approved for use on project.
- b. Additional written verification and other related information clearly identifying project, date and specifics of verification.
- c. Utilize report forms similar to those shown in Section V of AABC Standard.
- d. Provide forms typed and signed by the testing and balancing firm.

PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SPECIFICATION SECTION)

PART 3 - EXECUTION

3.1 PREPARATION

- A. Secure approved Shop Drawings of all HVAC equipment.
- B. Procedures and Forms:
 1. Submit procedures and forms to be used in calibration of test instruments, balancing systems, and recording and reporting test data.
 2. Obtain approval before beginning balancing and testing.
- C. Do not begin balancing and testing until HVAC systems are complete and in full working order.
 1. Place HVAC systems into full operation and continue their operation during each working day of balancing and testing.
- D. Provide qualified heating and ventilating Engineer(s) to supervise and perform balancing and testing.
- E. Review design Drawings, specifications, approved Shop Drawings and other related items to become thoroughly acquainted with the design of HVAC systems.
- F. Check all installed systems against Contract Drawings, Specifications and Shop Drawings to see that system is installed as required.
 1. Report deficiencies to the Engineer.
 2. Report deficiencies to Contractor for remedial action including providing corrective measures required in the function of any part of system to complete balancing.
- G. Make necessary adjustments as required to balance the systems.

3.2 FIELD QUALITY CONTROL

- A. Balance and Test Air Systems:
 1. Adjust equipment RPM to design requirements.
 2. Report motor full load amperes.
 3. Obtain design CFM at fans.
 - a. Make pitot tube traverse of main supply and exhaust ducts within 5 PCT.
 4. Test and record system static pressures, suction and discharge.
 5. Obtain design CFM for recirculated air.
 6. Obtain design CFM outside air.
 7. Test and record entering air temperatures, (DB, heating and cooling).
 8. Test and record leaving air temperatures, (DB, heating and cooling).
 9. Test and record leaving air temperatures, (WB, cooling).
 10. Adjust dampers in supply, exhaust and return air ducts to design CFM.
 11. Test diffusers, grilles, and registers as follows:
 - a. Adjust to comply with design requirements within 10 PCT.
 - b. Identify location and area of each.
 - c. Adjust face velocity to establish required CFM.
 - 1) Retest after initial adjustments.
 - d. Adjust to minimize drafts and to ensure uniform air distribution in all areas.

12. Identify and list size, type and manufacturer of diffusers, grilles, registers, and HVAC equipment.
 - a. Use manufacturer's ratings on equipment to make required calculations.
13. Adjust and assure that the operation of automatically operated dampers are as specified.
 - a. Check and calibrate controls.
14. Prepare and submit reports.

END OF SECTION

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SECTION 23 31 00
HVAC - DUCTWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. HVAC ductwork and accessories.
 - a. Material in this specification is intended for use on HVAC system modifications (Building #1).
 - b. Foul Air (FA) and Treated Air (TA) dampers and ductwork are specified in Section 40 10 16.
- B. Related Specification Sections include but are not necessarily limited to:
1. Division 00 - Procurement and Contracting Requirements.
 2. Division 01 - General Requirements.
 3. Section 01 61 03 - Equipment: Basic Requirements.
 4. Section 40 10 16 - Odor Control Duct and Accessories.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
1. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE):
 - a. 52, Method of Testing Air Conditioning Devices Used in General Ventilation for Removing Particulate Matter.
 2. National Fire Protection Association (NFPA).
 3. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA):
 - a. Ducted Electric Heat Guide for Air Handling Systems.
 - b. HVAC Duct Construction Standards - Metal and Flexible.
 4. Underwriters Laboratory, Inc. (UL):
 - a. 555, Standard for Safety Fire Damper and Ceiling Fire Damper.
 - b. 555S, Standard for Safety Leakage Rated Dampers for Use in Smoke Control Systems.
 - c. Building Materials Directory.
 5. Building code:
 - a. International Code Council (ICC):
 - 1) International Building Code and associated standards, 2012 Edition including all amendments, referred to herein as Building Code.
- B. Qualifications:
1. Fabricator: Firms regularly engaged in the manufacture of the specific product, of type, size required, whose products have been in use in similar service for not less than three (3) years.
 2. Installers: Firm with at least five (5) years installation experience on products similar to that required for this Project.

1.3 DEFINITIONS

- A. Installer or Applicator:
1. Installer or applicator is the person actually installing or applying the product in the field at the Project site.
 2. Installer and applicator are synonymous.

1.4 SUBMITTALS

- A. Shop Drawings:
1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.

2. See Specification Section 01 61 03.
 3. Efficiency ratings per ASHRAE 52 for factory built and assembled filter units.
 4. Scaled ductwork drawings (1/4 IN equals 1 FT) showing duct and accessory layout and support.
- B. Contract Closeout Information:
1. Operation and Maintenance Data:
 - a. See Specification Section 01 33 04 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
- C. Miscellaneous Submittal:
1. Documentation of qualifications for fabricators and installers.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
1. Transverse joints (factory fabricated aluminum):
 - a. Ductmate Industries, Inc.
 2. Turning vanes:
 - a. Ductmate Industries, Inc.
 - b. Duro Dyne.
 - c. SEMCO Incorporated.
 - d. Ward Industries, Inc.
 3. Flexible duct connections:
 - a. Vent Fabrics.
 - b. Duro Dyne.
 4. Grilles and registers:
 - a. Anemostat.
 - b. Price.
 - c. Titus.
 5. Temperature control and automatic dampers:
 - a. Air Balance.
 - b. Ruskin.
 - c. American Warming.
- B. Submit request for substitution in accordance with Specification Section 01 25 13.

2.2 COMPONENTS

- A. Duct and Fittings (Metallic):
1. Materials:
 - a. 3003 H-14 aluminum alloy:
 - 1) Comply with ASTM B209.
 2. Fabrication (aluminum):
 - a. Minimum sheet material thickness:
 - 1) Ducts with largest side or diameter to 30 IN: 0.05 IN thick.
 - 2) Ducts with largest side or diameter greater than 30 IN: 0.08 IN thick.
 - b. Utilize SMACNA HVAC Duct Construction Standards for minimum of 2 IN water gage static pressure for the minimum sheet material thickness specified herein.
 - 1) Heavier gage sheet material may be used with associated reinforcement as an alternate to minimum thickness specified.
 - 2) Lighter gage sheet material with associated reinforcement shall not be used as an alternate to minimum thickness specified.
 - c. Longitudinal seams:

- 1) 0.050 material:
 - a) Pittsburgh seam.
 - b) Continuously welded.
 - 2) 0.080 material: Continuously welded.
 - d. Continuously weld seams on factory assembled units.
 - e. Transverse joints (Alternate A):
 - 1) SMACNA T-22 companion flange.
 - 2) Gasketed.
 - 3) Rigidity class:
 - a) Ducts with largest side or diameter to 30 IN: SMACNA Class D (1-1/2 x 1-1/2 x 1/8 IN angles).
 - b) Ducts with largest side or diameter greater than 30 to 54 IN: SMACNA Class H (2-1/2 x 2-1/2 x 3/16 IN angles).
 - f. Transverse joints (Alternate B):
 - 1) Materials and fabrication:
 - a) Angles: Aluminum.
 - (1) Ductmate 35.
 - b) Corners: Aluminum.
 - (1) Ductmate DC 35.
 - c) Snap cleats: Aluminized or stainless steel.
 - d) Gaskets: Closed cell neoprene.
 - e) Bolts: Stainless steel.
 - f) Sheet metal screws: Self-drilling stainless steel with unthreaded section under head.
 - 2) Fabrication:
 - a) Rigidity class: SMACNA Class H.
 - b) 3/8 IN DIA x 1 IN bolts.
- B. Supports and Hangers:
- 1. Materials (for aluminum duct):
 - a. Support angles: Aluminum or stainless steel, minimum 1-1/2 by 1-1/2 by 1/4 angle.
 - b. Hanger rods: Stainless steel.
 - c. Anchors: Stainless steel wedge type.
 - 2. Materials (for galvanized duct):
 - a. Support angles: Galvanized or stainless steel, minimum 1-1/2 by 1-1/2 by 1/4 angle.
 - b. Hanger rods: Galvanized or Stainless steel.
 - c. Anchors: Stainless steel wedge type.
 - 3. Fabrication: Trapeze type units.
 - 4. Strap hangers are not allowed.
- C. Turning Vanes:
- 1. Materials: Same as duct.
 - 2. Fabrication:
 - a. Fabricate double vane units.
 - b. Pressure drop through elbows: Maximum 20 PCT of velocity pressure.
- D. Flexible Connections:
- 1. Materials: Hypalon, double coated closely woven glass fabric.
 - 2. Fabrication: Withstand 4.5 IN water column, positive and negative pressure.
- E. Air Grille and Register Assembly:
- 1. Materials:
 - a. Assembly: Extruded aluminum.
 - b. Gaskets: Sponge rubber.
 - 2. Fabrication:
 - a. Supply registers: Two (2) sets individually adjustable louvers.
 - b. Exhaust and return registers: 45-degree deflection front blades.

- c. Dampers: Key-operated opposed blade.
 - d. Screws, duct collars, and transitions as required.
 - e. Finish:
 - 1) Manufacturer's standard factory applied finish.
 - 2) Color: White.
 - f. Basis of design: Titus model 300FL.
- F. Temperature Control, Automatic and Manually (Volume) Operated Dampers:
- 1. Material:
 - a. Body: 6063 T5 aluminum.
 - b. Seal blade edge: Extruded vinyl.
 - 2. Fabrication:
 - a. Frame thickness: 0.125 IN minimum.
 - b. Provide flanged connections.
 - c. Blades:
 - 1) Two-position damper: Parallel blade.
 - 2) Mixing and volume damper: Opposed blade.
 - 3) Airfoil shape.
 - 4) Maximum 6 IN width.
 - d. Linkage: Concealed in frame.
 - e. Axles: 1/2 IN plated steel hex.
 - f. Bearings: Molded synthetic.
 - g. Seals:
 - 1) Jamb: Flexible compression type.
 - h. Control shaft: Removable, 1/2 IN DIA.
 - i. Air leakage (4 FT SQ damper) at 4 IN WG pressure: 99 CUFTM maximum.
 - j. Provide outboard support for operator linkage where damper motor is to be installed outside of duct.
 - k. Provide stainless steel locking quadrants for manual (volume) dampers.
 - l. Provide fold out operator mounting bracket where damper motor is to be installed on face of damper or inside duct.
 - m. Finish: 215 R1 anodized.
- G. Damper Actuators:
- 1. Provide operators of proper size and number to secure true throttling or two-position action as required.
 - 2. Furnish damper operators for installation inside ductwork and attached to frame of damper, or installed outside ductwork and connected to extended shaft as required.
 - 3. Provide operators for outside air, spring-loaded with sufficient power to assure tight closing of dampers on fan shutdown or in the fail safe position indicated by "Sequence of Controls."
 - 4. Electric operators:
 - a. Provide operators:
 - 1) Fully immersed in oil gear train.
 - 2) Enclosed in closed cast aluminum housing.
 - 3) Rated for Class I, Division 2 area.
 - b. As an alternate to 4.a.3: Provide operators in NEMA 7 enclosure, Belimo ZS-260.
 - c. Provide damper operators with integral spring return motor springs to make controls fail safe in position specified under "Sequence of Controls."
 - d. Provide fully modulating operators from proportional electric controllers.
 - e. Provide end switches or proportioning controllers permitting simultaneous operation or interlocking with other equipment.
 - f. Provide separate electrical circuits for damper operators with no more than four (4) operators on a circuit.
 - 5. Coordinate with dampers provided:
 - a. Provide damper operators that are rated for the required torque.

6. If single damper operator cannot meet torque requirement, provide sectional dampers to match operator torque.
 7. Ensure coordination to provide for the installation of tight closing dampers low leakage type (6 CUFTM per square foot at 4 IN WC pressure across damper) with compatible dampers, damper operators and related controls.
- H. Duct sealer:
1. NFPA rating of "Non-Combustible".
 2. Flame spread rating: 25 or lower, in dry condition.
 3. Smoke developed rating: 50 or lower, in dry condition.
 4. Resistant to water and water vapors.
 5. Comply with UL 181.
 6. Pressure rupture rating: 16 IN WG, minimum.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. See Specification Section 01 61 03.
- B. Metal Ductwork:
1. Install with longitudinal seams sealed for zero leakage.
 - a. For welded seams, submit sample for approval by Engineer.
 2. Install gaskets at each transverse joint and fasten sections together with bolts.
 - a. Tighten for zero leakage.
 3. Install supports and hangers with anchors in accordance with SMACNA HVAC Duct Construction Standards.
 4. Install turning vanes in square elbows:
 - a. Unsupported vane length not to exceed 48 IN.
 - b. Position vanes at proper angle to meet specified pressure drop.
 5. Install flexible connections at fans:
 - a. Locate as close as possible to fan.
 - b. Allow 1 IN of slack to prevent vibration transmission.
 - c. Install thrust restraints across connectors.
 6. Install access doors where indicated on Drawings and at smoke and fire damper in accordance with NFPA requirements.
 7. Volume extractors:
 - a. Install at supply registers, grilles, diffusers and supply branch connections from ducts.
 - b. Provide branch duct extensions into main duct above and below extractor when branch duct is narrower than main duct.
- C. Air Grille and Register Assemblies:
1. Install where shown on Drawings of size and capacities shown on Drawings.
 2. Install prime painted grilles and registers in areas where duct work is concealed.
 - a. Field paint to match adjacent surface finish.

END OF SECTION



DIVISION 26

ELECTRICAL



SECTION 26 05 00
ELECTRICAL - BASIC REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Basic requirements for electrical systems for wastewater treatment plant in Skagway Alaska
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
 - 3. Section 01 61 03 - Equipment - Basic Requirements.
 - 4. Section 03 15 19 - Anchorage to Concrete.
 - 5. Section 10 14 00 - Identification Devices.
 - 6. Section 26 05 19 - Wire and Cable - 600 Volt and Below.
 - 7. Section 26 05 33 - Raceways and Boxes.
 - 8. Section 26 05 48 - Seismic Bracing Systems.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American Institute of Steel Construction (AISC):
 - a. Steel Construction Manual.
 - 2. American National Standards Institute (ANSI).
 - 3. ASTM International (ASTM):
 - a. A36/A36M, Standard Specification for Carbon Structural Steel.
 - b. A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - c. A153/A153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 4. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - a. C2, National Electrical Safety Code (NESC).
 - 5. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - b. ICS 6, Industrial Control and Systems Enclosures.
 - 6. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code (NEC) latest edition.
 - b. 820, Standard for Fire Protection in Wastewater Treatment and Collection Facilities latest edition.
 - 7. Underwriters Laboratories, Inc. (UL).
- B. Products to be listed by a Nationally Recognized Testing Laboratory (NRTL) in accordance with applicable product standards.
 - 1. Applicable product standards including, but not limited to, ANSI, FM, IEEE, NEMA and UL.
 - 2. NRTL includes, but is not limited to, CSA Group Testing and Certification (CS), FM Approvals LLC (FM), Intertek Testing Services NA, Inc. (ETL), and Underwriters Laboratories, Inc. (UL).

1.3 DEFINITIONS

- A. For the purposes of providing materials and installing electrical work the following definitions shall be used.

1. Outdoor area: Exterior locations where the equipment is normally exposed to the weather and including below grade structures, such as vaults, manholes, handholes and in-ground pump stations.
2. Architecturally finished interior area: Offices, laboratories, conference rooms, restrooms, corridors and other similar occupied spaces.
3. Non-architecturally finished interior area: Pump, chemical, mechanical, electrical rooms and other similar process type rooms.
4. Highly corrosive and corrosive area: Areas identified on the Drawings where there is a varying degree of spillage or splashing of corrosive materials such as water, wastewater or chemical solutions; or chronic exposure to corrosive, caustic or acidic agents, chemicals, chemical fumes or chemical mixtures.
5. Hazardous areas: Class I, II or III areas as defined in NFPA 70.
6. Shop fabricated: Manufactured or assembled equipment for which a UL test procedure has not been established.

1.4 PROJECT CONDITIONS

- A. Comply with the requirements of Specifications Sections 01 11 20 Job Conditions, 01 30 00 Special Conditions, and 01 81 10 Wind and Seismic Design Criteria.
- B. Provide complete, functional, operational electrical system in compliance with NFPA 70 for new ultraviolet odor control systems and associated exhaust fans.
- C. Provide building interior and exterior illumination levels (40 foot-candles minimum on the floor) in areas where new mechanical piping will be furnished and installed in this Contract. New LED lighting fixtures to be wired to existing lighting panelboard and lighting branch circuits. Refer to Specification Section 26 50 00 for requirements.
- D. Maintain Skagway, Alaska Wastewater Treatment Plant Operation:
 1. All existing equipment in the wastewater treatment plant must be operational prior to beginning the phased construction.
 - a. Coordinate with the Owner's operations and maintenance staffs to verify they have equipment operational and construction can proceed.
 - b. Temporary equipment and wiring, installed in accordance with the NFPA70, may be used if necessary to maintain operation or to limit downtime.
 - c. Under no circumstances shall equipment be taken out of service without the Owner's permission.

1.5 SUBMITTALS

- A. Shop Drawings:
 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of submittal process.
 2. See Specification Section 01 61 03 and individual specification sections for submittal requirements for products defined as equipment.
 3. General requirements:
 - a. Provide manufacturer's technical information on products to be used, including product descriptive bulletin.
 - b. Include data sheets that include manufacturer's name and product model number.
 - 1) Clearly identify all optional accessories.
 - c. Acknowledgement that products are NRTL listed or are constructed utilizing NRTL recognized components.
 - d. Manufacturer's delivery, storage, handling and installation instructions.
 - e. Product installation details.
 - f. Short Circuit Current Rating (SCCR) nameplate marking per NFPA 70, include any required calculations.
 - g. See individual specification sections for any additional requirements.
 4. Fabrication and/or layout drawings:

- a. Provide a conductor identification schedule for all power, control, communication and protective circuits.
 - 1) Schedule to include the following information:
 - a) Conductor identification number.
 - b) Conductor size.
 - c) Number of conductors.
 - d) Type of conductor.
 - e) Size of conductor.
 - f) Size of conductor usage descriptions.
 - g) Conductor run (to and from).
 - h) Conduit size and type.
 - b. Provide circuit schedules for all power, control, communication, and protective circuits.
- B. Operation and Maintenance Manuals:
 - 1. See Specification Section 01 33 04 for requirements for:
 - a. The mechanics and administration of the submittal process.
 - b. The content process of Operation and Maintenance Manuals.
- C. When a Specification Section includes products specified in another Specification Section, each Specification Section shall have the required Shop Drawing transmittal form per Specification Section 01 33 00 and all Specification Sections shall be submitted simultaneously.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. See Specification Section 01 65 50.
- B. Protect nameplates on electrical equipment to prevent defacing.

1.7 AREA DESIGNATIONS

- A. Designation of an area will determine the NEMA rating of the electrical equipment enclosures, types of conduits and installation methods to be used in that area.
 - 1. Outdoor areas:
 - a. Wet.
 - b. Also, corrosive and/or hazardous when specifically designated on the Drawings or in the Specifications.
 - 2. Indoor areas:
 - a. Dry.
 - b. Also, wet, corrosive and/or hazardous when specifically designated on the Drawings or in the Specifications.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, refer to specific Electrical Specification Sections and specific material paragraphs below for acceptable manufacturers.
- B. Submit request for substitution in accordance with Specification Section 01 25 13.
- C. Provide all components of a similar type by one (1) manufacturer.

2.2 MATERIALS

- A. Electrical Equipment Support Pedestals and/or Racks:
 - 1. Manufacturers:
 - a. Modular strut:
 - 1) Unistrut Building Systems.
 - 2) B-Line by Eaton.
 - 3) Globe Strut.
 - 4) Superstrut by Thomas & Betts.

2. Material requirements:
 - a. Modular strut:
 - 1) Galvanized steel: ASTM A123/123M or ASTM A153/A153M.
 - 2) Stainless steel: AISI Type 316.
 - 3) PVC coated galvanized steel: ASTM A123/A123M or ASTM A153/A153M and 20 MIL PVC coating.
 - b. Structural members (e.g., I beams, L and C channels):
 - 1) Galvanized steel: ASTM A36/A36M steel with galvanizing per ASTM A123/A123M.
 - 2) Stainless steel: AISI Type 316
 - c. Mounting plates:
 - 1) Galvanized steel: ASTM A36/A36M steel with galvanizing per ASTM A123/A123M.
 - 2) Stainless steel: AISI Type 316
 - d. Mounting hardware:
 - 1) Galvanized steel ASTM A36/A36M steel with galvanizing per ASTM A123/A123M.
 - 2) Stainless steel AISI Type 316.
 - e. Anchorage per Specification Section 03 15 19.
- B. Field touch-up of galvanized surfaces.
 1. Zinc-rich primer.
 - a. One coat, 3.0 MILS, ZRC by ZRC Products.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install and wire all equipment, including pre-purchased equipment, and perform all tests necessary to assure conformance to the Drawings and Specification Sections and ensure that equipment is ready and safe for energization.
- B. Install equipment in accordance with the requirements of:
 1. NFPA 70.
 2. IEEE C2.
 3. The manufacturer's instructions.
 4. Specification Section 26 05 48 for seismic bracing of suspended components and equipment anchorage.
- C. In general, conduit routing is not shown on the Drawings.
 1. The Contractor is responsible for routing all conduits including those shown on one-line and control block diagrams and home runs shown on floor plans.
 2. Conduit routings and stub-up locations that are shown are approximate; exact routing to be as required for equipment furnished and field conditions.
- D. When complete branch circuiting is not shown on the Drawings:
 1. A homerun indicating panelboard name and circuit number will be shown and the circuit number will be shown adjacent to the additional devices (e.g., light fixture and receptacles) on the same circuit.
 2. The Contractor is to furnish and install all conduit and conductors required for proper operation of the circuit.
 3. The indicated home run conduit and conductor size shall be used for the entire branch circuit.
 4. See Specification Section 26 05 19 for combining multiple branch circuits in a common conduit.
- E. Do not use equipment that exceed dimensions or reduce clearances indicated on the Drawings or as required by the NFPA 70.

- F. Install equipment plumb, square and true with construction features and securely fastened.
- G. Install electrical equipment, including pull and junction boxes, minimum of 6 IN from process, gas, air and water piping and equipment.
- H. Install equipment so it is readily accessible for operation and maintenance, is not blocked or concealed and does not interfere with normal operation and maintenance requirements of other equipment.
- I. Device Mounting Schedule:
 - 1. Unless indicated otherwise on the Drawings, mounting heights are as indicated below:
 - a. Light switch (to center): 46 IN.
 - b. Receptacle in architecturally finished areas (to center): 18 IN.
 - c. Receptacle on exterior wall of building (to center): 18 IN.
 - d. Receptacle in non-architecturally finished areas (to center): 46 IN.
 - e. Telephone outlet in architecturally finished areas (to center): 18 IN.
 - f. Telephone outlet for wall-mounted phone (to center): 46 IN.
 - g. Safety switch (to center of operating handle): 54 IN.
 - h. Separately mounted motor starter (to center of operating handle): 54 IN.
 - i. Pushbutton or selector switch control station (to center): 46 IN.
 - j. Panelboard (to top): 72 IN.
- J. Avoid interference of electrical equipment operation and maintenance with structural members, building features and equipment of other trades.
 - 1. When it is necessary to adjust the intended location of electrical equipment, unless specifically dimensioned or detailed, the Contractor may make adjustments in equipment locations in accordance with the following without obtaining the Engineer's approval:
 - a. 1 FT at grade, floor and roof level in any direction in the horizontal plane.
 - b. 1 FT for equipment other than lighting at ceiling level in any direction in the horizontal plane.
 - c. 1 FT for lighting fixtures at ceiling level in any direction in the horizontal plane.
 - d. 1 FT on walls in a horizontal direction within the vertical plane.
 - e. Changes in equipment location exceeding those defined above require the Engineer's approval.
- K. Provide electrical equipment support system per the following area designations:
 - 1. Wet areas:
 - a. Galvanized system consisting of galvanized steel channels and fittings, nuts and hardware.
 - b. Field touch-up cut ends and scratches of galvanized components with the specified primer during the installation, before rust appears.
 - 2. Corrosive areas:
 - a. Stainless steel system consisting of stainless steel channels and fittings, nuts and hardware.
 - b. PVC coated steel system consisting of PVC coated steel channels and fittings with stainless steel nuts and hardware.
 - 3. Highly corrosive areas:
 - a. PVC coated steel system consisting of PVC coated steel channels and fittings with stainless steel nuts and hardware.
- L. Provide all necessary anchoring devices and supports rated for the equipment load based on dimensions and weights verified from approved submittals, or as recommended by the manufacturer.
 - 1. See Specification Section 03 15 19.
 - 2. Do not cut, or weld to, building structural members.
 - 3. Do not mount safety switches or other equipment to equipment enclosures, unless enclosure mounting surface is properly braced to accept mounting of external equipment.

- M. Provide corrosion resistant spacers to maintain 1/4 IN separation between metallic equipment and/or metallic equipment supports and mounting surface in wet areas, on below grade walls and on walls of liquid containment or processing areas such as Basins, Clarifiers, Digesters, Reservoirs, etc.
- N. Do not place equipment fabricated from aluminum in direct contact with earth or concrete.
- O. Screen or seal all openings into equipment mounted outdoors to prevent the entrance of rodents and insects.
- P. Do not use materials that may cause the walls or roof of a building to discolor or rust.
- Q. Identify electrical equipment and components in accordance with Specification Section 10 14 00.
- R. Provide field markings and/or documentation of available short-circuit current (available fault current) and related information for equipment as required by the NFPA 70 and other applicable codes.
- S. Provide equipment or control panels with Short Circuit Current Rating (SCCR) labeling as required by NFPA 70 and other applicable codes.
 - 1. Determine the SCCR rating by one of the following methods:
 - a. Method 1: SCCR rating meets or exceeds the available fault current of the source equipment when indicated on the Drawings.
 - b. Method 2: SCCR rating meets or exceeds the source equipment's Amp Interrupting Current (AIC) rating as indicated on the Drawings.
 - c. Method 3: SCCR rating meets or exceeds the calculated available short circuit current at the control panel.
 - 2. The source equipment is the switchboard, panelboard, motor control center or similar equipment where the equipment or control panel circuit originates.
 - 3. For Method 3, provide calculations justifying the SCCR rating. Utilize source equipment available fault current or AIC rating as indicated on the Drawings.

3.2 FIELD QUALITY CONTROL

- A. Verify exact rough-in location and dimensions for connection to electrified equipment, provided by others.
 - 1. Secure Shop Drawings for equipment furnished by Owner and installed by Contractor.
 - 2. See Specification Section 01 73 20 for openings and penetrations in structures.
- B. Replace equipment and systems found inoperative or defective and re-test.
- C. Cleaning:
 - 1. See Specification Section 01 74 13.
- D. The protective coating integrity of support structures and equipment enclosures shall be maintained.
 - 1. Repair galvanized components utilizing a zinc rich paint.
 - 2. Repair painted components utilizing touch up paint provided by or approved by the manufacturer.
 - 3. Repair PVC coated components utilizing a patching compound, of the same material as the coating, provided by the manufacturer of the component.
 - 4. Repair surfaces which will be inaccessible after installation prior to installation.
 - 5. See Specification Section 26 05 33 for requirements for conduits and associated accessories.
- E. Replace nameplates damaged during installation.
- F. Perform tests in the presence of the Engineer.
 - 1. Schedule tests with the Engineer.

3.3 DEMONSTRATION

- A. Demonstrate equipment in accordance with Specification Section 01 75 00.

END OF SECTION

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SECTION 26 05 19
WIRE AND CABLE - 600 VOLT AND BELOW

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Material and installation requirements for:
 - a. Building wire.
 - b. Power cable.
 - c. Control cable.
 - d. Shielded VFD cable.
 - e. Instrumentation cable.
 - f. Wire connectors.
 - g. Insulating tape.
 - h. Pulling lubricant.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
 - 3. Section 26 05 00 - Electrical: Basic Requirements.
 - 4. Section 26 08 13 - Acceptance Testing.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - a. 1202, Standard for Flame-Propagation Testing of Wire and Cable.
 - 2. Insulated Cable Engineers Association (ICEA):
 - a. S-58-679, Standard for Control Cable Conductor Identification.
 - 3. National Electrical Manufacturers Association (NEMA):
 - a. ICS 4, Industrial Control and Systems: Terminal Blocks.
 - 4. National Electrical Manufacturers Association/Insulated Cable Engineers Association (NEMA/ICEA):
 - a. WC 57/S-73-532, Standard for Control Cables.
 - b. WC 70/S-95-658, Non-Shielded Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy.
 - 5. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code (NEC).
 - b. 262, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.
 - 6. Telecommunications Industry Association/Electronic Industries Alliance/American National Standards Institute (TIA/EIA/ANSI):
 - a. 568, Commercial Building Telecommunications Cabling Standard.
 - 7. Underwriters Laboratories, Inc. (UL):
 - a. 44, Standard for Safety Thermoset-Insulated Wires and Cables.
 - b. 83, Standard for Safety Thermoplastic-Insulated Wires and Cables.
 - c. 467, Standard for Safety Grounding and Bonding Equipment.
 - d. 486A, Standard for Safety Wire Connectors and Soldering Lugs for use with Copper Conductors.
 - e. 486C, Standard for Safety Splicing Wire Connections.
 - f. 510, Standard for Safety Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape.
 - g. 1581, Standard for Safety Reference Standard for Electrical Wires, Cables, and Flexible Cords.
 - h. 2250, Standard for Safety Instrumentation Tray Cable.

1.3 DEFINITIONS

- A. Cable: Multi-conductor, insulated, with outer sheath containing either building wire or instrumentation wire.
- B. Instrumentation Cable:
 - 1. Multiple conductor, insulated, twisted or untwisted, with outer sheath.
 - 2. The following are specific types of instrumentation cables:
 - a. Analog signal cable:
 - 1) Used for the transmission of low current (e.g., 4-20mA DC) or low voltage (e.g., 0-10 VDC) signals, using No. 16 AWG and smaller conductors.
 - 2) Commonly used types are defined in the following:
 - a) TSP: Twisted shielded pair.
 - b) TST: Twisted shielded triad.
 - b. Digital signal cable: Used for the transmission of digital signals between computers, PLC's, RTU's, etc.
- C. Power Cable: Multi-conductor, insulated, with outer sheath containing building wire, No. 8 AWG and larger.
- D. Shielded VFD Cable: Multi-conductor, insulated, with shield, drain wire and building wires, No. 12 and larger.
- E. Control Cable: Multi-conductor, insulated, with outer sheath containing building wires, No. 14, No. 12 or No. 10 AWG.
- F. Building Wire: Single conductor, insulated, with or without outer jacket depending upon type.

1.4 SUBMITTALS

- A. Shop Drawings:
 - 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 - 2. Product technical data:
 - a. Provide submittal data for all products specified in PART 2 of this Specification Section except:
 - 1) Wire connectors.
 - 2) Insulating tape.
 - 3) Cable lubricant.
 - b. See Specification Section 26 05 00 for additional requirements.
 - c. Operation and Maintenance Data:
 - 1) See Specification Section 01 33 04 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. See Specification Section 26 05 00.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. Building wire, power and control cable:
 - a. Aetna Insulated Wire.
 - b. Alphawire.
 - c. Cerrowire.
 - d. Encore Wire Corporation.
 - e. General Cable.
 - f. Okonite Company.

- g. Southwire Company.
- 2. Shielded VFD cable:
 - a. Belden Inc.
 - b. General Cable.
 - c. Okonite Company.
 - d. Olfex Wire and Cable, Inc.
 - e. Priority Wire and Cable (Prysmian).
 - f. Rockbestos-Surprenant Cable Corp.
 - g. Southwire Company.
- 3. Instrumentation cable:
 - a. Analog cable:
 - 1) Alphawire.
 - 2) Belden Inc.
 - 3) General Cable.
- 4. Wire connectors:
 - a. Burndy Corporation.
 - b. Buchanan.
 - c. Ideal.
 - d. IlSCO.
 - e. 3M Co.
 - f. Teledyne Penn Union.
 - g. Thomas and Betts.
 - h. Phoenix Contact.
- 5. Insulating and color coding tape:
 - a. 3M Co.
 - b. Plymouth Bishop Tapes.
 - c. Red Seal Electric Co.

B. Submit request for substitution in accordance with Specification Section 01 25 13.

2.2 MANUFACTURED UNITS

A. Building Wire:

- 1. Conductor shall be copper with 600 V rated insulation.
- 2. Conductors shall be stranded, except for conductors used in lighting and receptacle circuits which may be stranded or solid.
- 3. Conductors No. 8 AWG and smaller shall be copper and conductors No. 6 AWG and larger shall be AA 8000 series aluminum alloy, all with a 600 V rated insulation.
- 4. Surface mark with manufacturer's name or trademark, conductor size, insulation type and UL label.
- 5. Conform to NEMA/ICEA WC 70/S-95-658 and UL 44 for type XHHW-2 insulation.

B. Power Cable:

- 1. Conductor shall be copper with 600 V rated insulation.
- 2. Surface mark with manufacturer's name or trademark, conductor size, insulation type and UL label.
- 3. Conform to NEMA/ICEA WC 70/S-95-658 and UL 44 and UL 1277 for type XHHW-2 insulation with an overall PVC jacket.
- 4. Number of conductors as required, including a bare ground conductor.
- 5. Individual conductor color coding:
 - a. ICEA S-58-679, Method 4.
 - b. See PART 3 of this Specification Section for additional requirements.
- 6. Conform to NFPA 70 Type TC.

C. Control Cable:

- 1. Conductor shall be copper with 600 V rated insulation.
- 2. Surface mark with manufacturer's name or trademark, conductor size, insulation type and UL label.

3. Conform to NEMA/ICEA WC 57/S-73-532 and UL 44 and UL 1277 for type XHHW-2 insulation with an overall PVC jacket.
 4. Number of conductors as required, provided with or without bare ground conductor of the same AWG size.
 - a. When a bare ground conductor is not provided, an additional insulated conductor shall be provided and used as the ground conductor (e.g., 6/c No. 14 w/g and 7/c No. 14 are equal).
 5. Individual conductor color coding:
 - a. ICEA S-58-679, Method 1, Table E-2.
 - b. See PART 3 of this Specification Section for additional requirements.
 6. Conform to NFPA 70 Type TC.
- D. Electrical Equipment Control Wire:
1. Conductor shall be copper with 600 V rated insulation.
 2. Conductors shall be stranded.
 3. Surface mark with manufacturer's name or trademark, conductor size, insulation type and UL label.
 4. Conform to UL 44 for Type SIS insulation.
 5. Conform to UL 83 for Type MTW insulation.
 6. Surface mark with manufacturer's name or trademark, conductor size, insulation type and UL label.
 7. When installed exposed outdoors, UL listed and marked as sunlight resistant.
 8. Use manufacturer approved fittings.
 9. Conform to NFPA 70, Type MC-HL, UL 1569, UL 2225, IEEE 1202, IEEE 1580.
- E. Shielded VFD Cable:
1. Conductor shall be copper, stranded with 600 V rated insulation.
 2. Surface mark with manufacturer's name or trademark, conductor size, insulation type and UL label.
 3. Cables No. 1 AWG and less:
 - a. Conform to NEMA/ICEA WC 70/S-95-658 and UL 44 and UL 1277 for type RHW-2 or XHHW-2 insulation with an overall PVC jacket.
 - b. Shielding: 85 PCT tinned copper braid, full size tinned copper drain wire and 100 PCT foil shield.
 - c. Number of conductors: 3 PH and 1 full size ground.
 4. When installed exposed outdoors, UL listed and marked as sunlight resistant.
- F. Instrumentation Cable:
1. Surface mark with manufacturer's name or trademark, conductor size, insulation type and UL label.
 2. Analog cable:
 - a. Tinned copper conductors.
 - b. 600 V PVC insulation with PVC jacket.
 - c. Twisted with 100 PCT foil shield coverage with drain wire.
 - d. Six (6) twists per foot minimum.
 - e. Individual conductor color coding: ICEA S-58-679, Method 1, Table E-2.
 - f. Conform to UL 2250, UL 1581 and NFPA 70 Type ITC.
 3. Digital cable:
 - a. As recommended by equipment (e.g., PLC, RTU) manufacturer.
 - b. Horizontal voice and data cable:
 - 1) Category 6 per TIA/EIA/ANSI 568.
 - 2) Cable shall be label-verified.
 - 3) Cable jacket shall be factory marked at regular intervals indicating verifying organization and performance level.
 - 4) Conductors: No. 24 AWG solid untinned copper.
 - 5) Rated CMP per NFPA 70.
 - c. Conform to NFPA 262 and NFPA 70 Type ITC.

- G. Wire Connectors:
 - 1. Twist/screw on type:
 - a. Insulated pressure or spring type solderless connector.
 - b. 600 V rated.
 - c. Ground conductors: Conform to UL 486C and/or UL 467 when required by local codes.
 - d. Phase and neutral conductors: Conform to UL 486C.
 - 2. Compression and mechanical screw type:
 - a. 600 V rated.
 - b. Ground conductors: Conform to UL 467.
 - c. Phase and neutral conductors: Conform to UL 486A.
 - 3. Terminal block type:
 - a. High density, screw-post barrier-type with white center marker strip.
 - b. 600 V and ampere rating as required, for power circuits.
 - c. 600 V, 20 ampere rated for control circuits.
 - d. 300 V, 15 ampere rated for instrumentation circuits.
 - e. Conform to NEMA ICS 4 and UL 486A.

- H. Insulating and Color Coding Tape:
 - 1. Pressure sensitive vinyl.
 - 2. Premium grade.
 - 3. Heat, cold, moisture, and sunlight resistant.
 - 4. Thickness, depending on use conditions: 7, 8.5, or 10 MIL.
 - 5. For cold weather or outdoor location, tape must also be all-weather.
 - 6. Color:
 - a. Insulating tape: Black.
 - b. Color coding tape: Fade-resistant color as specified herein.
 - 7. Comply with UL 510.

- I. Pulling Lubricant: Cable manufacturer's standard containing no petroleum or other products which will deteriorate insulation.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Permitted Usage of Insulation Types:
 - 1. Type XHHW-2:
 - a. Building wire and power and control cable in architectural and non-architectural finished areas.
 - b. Building wire and power and control cable in conduit in outdoor areas and below grade.
 - c. Building wire and power and control cable in cable tray in outdoor areas.
 - 2. Type SIS and MTW:
 - a. For the wiring of control equipment within control panels and field wiring of control equipment within switchgear, switchboards, motor control centers.
 - 3. Shielded VFD Cable:
 - a. For wiring between a VFD and motor when routing in cable trays or conduit.

- B. Conductor Size Limitations:
 - 1. Feeder and branch power conductors shall not be smaller than No. 12 AWG unless otherwise indicated on the Drawings.
 - 2. Control conductors shall not be smaller than No. 14 AWG
 - 3. Instrumentation conductors shall not be smaller than No. 16 AWG.

- C. Color Code All Wiring as Follows:
 - 1. Building wire:

	240 V, 208 V, 240/120 V, 208/120 V	480 V, 480/277 V
Phase 1	Black	Brown
Phase 2	Red *	Orange
Phase 3	Blue	Yellow
Neutral	White	White or Gray
Ground	Green	Green

* Orange when it is a high leg of a 120/240 V Delta system.

- a. Conductors No. 6 AWG and smaller: Insulated phase, neutral and ground conductors shall be identified by a continuous colored outer finish along its entire length.
 - b. Conductors larger than No. 6 AWG:
 - 1) Insulated phase and neutral conductors shall be identified by one (1) of the following methods:
 - a) Continuous colored outer finish along its entire length.
 - b) 3 IN of colored tape applied at the termination.
 - 2) Insulated grounding conductor shall be identified by one (1) of the following methods:
 - a) Continuous green outer finish along its entire length.
 - b) Stripping the insulation from the entire exposed length.
 - c) Using green tape to cover the entire exposed length.
 - 3) The color coding shall be applied at all accessible locations, including but not limited to: Junction and pull boxes, wireways, manholes and handholes.
 2. Power cables ICEA S-58-679, Method 4 with:
 - a. Phase and neutral conductors identified with 3 IN of colored tape, per the Table herein, applied at the terminations.
 - b. Ground conductor: Bare.
 3. Shielded VFD cable ICEA S-58-679, Method 4 with:
 - a. Phase conductors identified with 3 IN of colored tape, per the Table herein, applied at the terminations.
 - b. Ground conductor: Green color insulation or bare.
 4. Control cables ICEA S-58-679, Method 1, Table E-2:
 - a. When a bare ground is not provided, one (1) of the colored insulated conductors shall be re-identified by stripping the insulation from the entire exposed length or using green tape to cover the entire exposed length.
 - b. When used in power applications the colored insulated conductors used as phase and neutral conductors may have to be re-identified with 3 IN of colored tape, per the Table herein, applied at the terminations.
- D. Install all wiring in raceway unless otherwise indicated on the Drawings.
- E. Feeder, branch, control and instrumentation circuits shall not be combined in a raceway, cable tray, junction or pull box, except as permitted in the following:
1. Where specifically indicated on the Drawings.
 2. Where field conditions dictate and written permission is obtained from the Engineer.
 3. Control circuits shall be isolated from feeder and branch power and instrumentation circuits but combining of control circuits is permitted.
 - a. The combinations shall comply with the following:
 - 1) 12 VDC, 24 VDC and 48 VDC may be combined.
 - 2) 125 VDC shall be isolated from all other AC and DC circuits.
 - 3) AC control circuits shall be isolated from all DC circuits.
 4. Instrumentation circuits shall be isolated from feeder and branch power and control circuits but combining of instrumentation circuits is permitted.
 - a. The combinations shall comply with the following:
 - 1) Analog signal circuits may be combined.

- 2) Digital signal circuits may be combined but isolated from analog signal circuits.
- 5. Multiple branch circuits for similar loads may be combined in a common raceway, such as multiple lighting circuits or multiple receptacle circuits or other 120Vac circuits. Do not combine lighting and receptacle circuits.
 - a. Do not combine control device circuits with lighting or receptacle circuits.
 - b. Contractor is responsible for making the required adjustments in conductor and raceway size, in accordance with all requirements of the NFPA 70, including but not limited to:
 - 1) Up sizing conductor size for required ampacity de-ratings for the number of current carrying conductors in the raceway.
 - 2) The neutral conductors may not be shared.
 - 3) Up sizing raceway size for the size and quantity of conductors.
- F. Ground the drain wire of shielded instrumentation cables at one (1) end only.
 - 1. The preferred grounding location is at the load (e.g., control panel), not at the source (e.g., field mounted instrument).
- G. Splices and terminations for the following circuit types shall be made in the indicated enclosure type using the indicated method.
 - 1. Feeder and branch power circuits:
 - a. Device outlet boxes:
 - 1) Twist/screw on type connectors.
 - b. Junction and pull boxes and wireways:
 - 1) Twist/screw on type connectors for use on No. 8 and smaller wire.
 - 2) Compression, mechanical screw or terminal block or terminal strip type connectors for use on No. 6 AWG and larger wire.
 - c. Motor terminal boxes:
 - 1) Twist/screw on type connectors for use on No. 10 AWG and smaller wire.
 - 2) Insulated mechanical screw type connectors for use on No. 8 AWG and larger wire.
 - d. Manholes or handholes:
 - 1) Twist/screw on type connectors pre-filled with epoxy for use on No. 8 AWG and smaller wire.
 - 2) Watertight compression or mechanical screw type connectors for use on No. 6 AWG and larger wire.
 - 2. Control circuits:
 - a. Junction and pull boxes: Terminal block type connector.
 - b. Manholes or handholes: Twist/screw on type connectors pre-filled with epoxy.
 - c. Control panels and motor control centers: Terminal block or strips provided within the equipment or field installed within the equipment by the Contractor.
 - 3. Instrumentation circuits can be spliced where field conditions dictate and written permission is obtained from the Engineer.
 - a. Maintain electrical continuity of the shield when splicing twisted shielded conductors.
 - b. Junction and pull boxes: Terminal block type connector.
 - c. Control panels and motor control centers: Terminal block or strip provided within the equipment or field installed within the equipment by the Contractor.
 - 4. Non-insulated compression and mechanical screw type connectors shall be insulated with tape or hot or cold shrink type insulation to the insulation level of the conductors.
 - 5. Provide electrical equipment enclosure and cable sealing bushing when exposed conductors or cables enter the enclosure from cable trays.
- H. Insulating Tape Usage:
 - 1. For insulating connections of No. 8 AWG wire and smaller: 7 MIL vinyl tape.
 - 2. For insulating splices and taps of No. 6 AWG wire or larger: 10 MIL vinyl tape.
 - 3. For insulating connections made in cold weather or in outdoor locations: 8.5 MIL, all weather vinyl tape.

I. Color Coding Tape Usage: For color coding of conductors.

3.2 FIELD QUALITY CONTROL

A. Acceptance Testing:

1. See Specification Section 26 08 13.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Material and installation requirements for grounding and bonding system(s).
 - a. Provide supplementary grounding and bonding for complete, functional, operative electrical installation in compliance with NFPA 70 for new ultraviolet odor control systems and associated exhaust fans.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
 - 3. Section 10 14 00 - Identification Devices.
 - 4. Section 26 05 00 - Electrical - Basic Requirements.
 - 5. Section 26 05 19 - Wire and Cable - 600 Volt and Below.
 - 6. Section 26 05 33 - Raceways and Boxes.
 - 7. Section 26 08 13 - Acceptance Testing.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. ASTM International (ASTM):
 - a. B8, Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
 - 2. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - a. 837, Standard for Qualifying Permanent Connections Used in Substation Grounding.
 - 3. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code (NEC).
 - 4. Underwriters Laboratories, Inc. (UL):
 - a. 467, Grounding and Bonding Equipment.
- B. Assure ground continuity is continuous throughout the entire Project.
- C. Grounding and insulation of electrical components are critical for protecting operators from electrical shock and protecting the equipment.
- D. All UV systems should be provided with Ground Fault Interrupt (GFI) circuits. The transformer in the ballast must not be isolated from the ground, otherwise ground faults will not be properly detected, and safety can be compromised.
- E. UV reactors must be capable of being isolated and locked out for maintenance, both hydraulically and electrically. The UV reactor must be shut down before it can be opened.
- F. The varying nature of UV reactor loads can induce harmonic distortion, and this can lead to problems involving overheating and can affect VFDs. Size and provide isolation transformer (transforming ratio 1:1) in UV odor control vendor panel to block harmonics to control distortion.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 - 2. Product technical data.

- a. Provide submittal data for all products specified in PART 2 of this Specification Section.
 - b. See Specification Section 26 05 00 for additional requirements.
- B. Fabrication and/or layout drawings:
- 1. Plan drawing(s) showing type, size and locations of all grounding system components.
- C. Informational Submittals:
- 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 - 2. Ground rod and/or grounding system resistance and continuity test reports signed by the Project's supervising electrical foreman.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
- 1. Ground rods and bars and grounding clamps, connectors and terminals:
 - a. ERICO by Pentair.
 - b. Harger Lightning & Grounding.
 - c. Heary Bros. Lightning Protection Co. Inc.
 - d. Burndy by Hubbell.
 - e. Robbins Lightning, Inc.
 - f. Blackburn by Thomas & Betts.
 - g. Thompson Lightning Protection, Inc.
 - 2. Exothermic weld connections:
 - a. ERICO by Pentair - Cadweld.
 - b. Harger Lightning & Grounding - Ultraweld.
 - c. Burndy by Hubbell - Thermoweld.
 - d. FurseWELD by Thomas & Betts.
 - 3. Prefabricated composite test stations:
 - a. Armorcast Products Company.
 - b. MacLean Highline.
 - c. Quazite by Hubbell

2.2 COMPONENTS

- A. Wire and Cable:
- 1. Bare conductors: Soft drawn stranded copper meeting ASTM B8.
 - 2. Insulated conductors: Color coded green, per Specification Section 26 05 19.
- B. Conduit: As specified in Specification Section 26 05 33.
- C. Ground Bars:
- 1. Solid copper:
 - a. 1/4 IN thick.
 - b. 4 IN wide.
 - c. 24 IN long minimum in main service entrance electrical rooms, 12 IN long elsewhere.
 - 2. Predrilled grounding lug mounting holes.
 - 3. Stainless steel or galvanized steel mounting brackets.
 - 4. Insulated standoffs.
- D. Ground Rods:
- 1. 3/4 IN x 10 FT
 - 2. Copper-clad:
 - a. 10 MIL minimum uniform coating of electrolytic copper molecularly bonded to a rigid steel core.

- b. Corrosion resistant bond between the copper and steel.
 - c. Hard drawn for a scar-resistant surface.
- E. Grounding Clamps, Connectors and Terminals:
 - 1. Mechanical type:
 - a. Standards: UL 467.
 - b. High copper alloy content.
 - 2. Compression type for interior locations:
 - a. Standards: UL 467.
 - b. High copper alloy content.
 - c. Non-reversible.
 - d. Terminals for connection to bus bars shall have two bolt holes.
 - 3. Compression type suitable for direct burial in earth or concrete:
 - a. Standards: UL 467, IEEE 837.
 - b. High copper alloy content.
 - c. Non-reversible.
 - d. Factory filled with oxide inhibiting compound.
- F. Exothermic Weld Connections:
 - 1. Copper oxide reduction by aluminum process.
 - 2. Molds properly sized for each application.
- G. Prefabricated Composite Material Test Stations:
 - 1. Body and cover: Fiberglass reinforced polymer concrete conforming to all test provisions of SCTE 77.
 - 2. Minimum load ratings: SCTE 77 Tier 15.
 - 3. Open bottom.
 - 4. Stackable design as required for 3 FT depth.
 - 5. Cover:
 - a. Engraved legend of "GROUND".
 - b. Lay-in non-bolt down.
 - c. Size: 12 IN round or 12 IN square.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
 - 1. Install products in accordance with manufacturer's instructions.
 - 2. Size grounding conductors and bonding jumpers in accordance with NFPA 70, Article 250, except where larger sizes are indicated on the Drawings.
 - 3. Remove paint, rust, or other non-conducting material from contact surfaces before making ground connections. After connection, apply manufacturers approved touch-up paint to protect metallic surface from corrosion.
 - 4. Where ground conductors pass through floor slabs or building walls provide nonmetallic sleeves and install sleeve per Specification Section 01 73 20.
 - a. Seal the sleeve interior to stop water penetration.
 - 5. Do not splice grounding electrode conductors except at ground rods.
 - 6. Install ground rods and grounding electrode conductors in undisturbed, firm soil.
 - a. Provide excavation required for installation of ground rods and conductors.
 - b. Use driving studs or other suitable means to prevent damage to threaded ends of sectional rods.
 - c. Unless otherwise specified, connect conductors to ground rods with compression type connectors or exothermic weld.
 - d. Provide sufficient slack in conductor to prevent conductor breakage during backfill or due to ground movement.

- e. Backfill excavation completely, thoroughly tamping to provide good contact between backfill materials and ground rods and conductors.
 - 7. Do not use exothermic welding if it will damage the structure the grounding conductor is being welded to.
- B. Grounding Electrode System:
- 1. Field locate existing grounding electrode system in accordance with NFPA 70, Article 250 for the purpose of grounding and bonding all new pipe/electrical and mechanical equipment/devices/components in this Contract.
 - a. All grounding electrode conductors pig tails shall terminate on a main ground bar located adjacent to the service entrance equipment.
 - 2. Grounding electrode conductor terminations:
 - a. Ground bars mounted on wall: Use a two-hole compression type conductor terminal and bolt it to the ground bar with two bolts.
 - b. Ground bars in electrical equipment: Use compression type conductor terminal and bolt it to the ground bar or manufacturer's provided mechanical type termination device.
 - c. Piping systems: Use mechanical type connections.
 - d. Building steel, below grade and encased in concrete: Use compression type connector or exothermic weld.
 - e. Building steel, above grade: Use a two-hole compression type conductor terminal and bolt to the steel with two bolts or exothermic weld.
 - f. Ground rod: Compression type or exothermic weld, unless otherwise specified.
 - g. At all above grade terminations, the conductors shall be labeled per Specification Section 10 14 00.
 - 3. Field verify existing ground ring grounding system:
 - a. Ground ring shall consist of ground rods and a conductor looped around the structure.
 - b. Placed at a minimum of 10 FT from the structure foundation and 2 FT-6 IN below grade.
 - c. Field verify that a minimum of four ground rods are placed at the corners of the structure and additional rods so that the maximum distance between ground rods does not exceed 50 FT.
 - d. Field verify existing Building/Structure grounding:
 - 1) Bonding of building/structure metal support columns to the ground ring at all corners of the structure.
 - e. Grounding conductor: Bare copper grounding conductor, #2/0 minimum size.
 - f. Ground rod test stations: Minimum one for testing system ground resistance (not to exceed 10 ohms).
- C. Supplemental Grounding Electrode:
- 1. Provide the following grounding in addition to the equipment ground conductor supplied with the feeder conductors whether or not shown on the Drawings.
 - a. See Grounding Electrode System paragraph for conductor termination requirements.
 - 2. Metal light poles:
 - a. Connect metal pole and pole base reinforcing steel to a ground rod.
 - b. Grounding conductor: Bare #6 AWG minimum.
 - 3. Equipment support rack and pedestals mounted outdoors:
 - a. Connect metallic structure to a ground rod.
 - b. Grounding conductor: #6 AWG minimum.
- D. Other Bonding Requirements:
- 1. Other metal piping:
 - a. Connect in a daisy chain or radial fashion: interior hot and cold water piping system and process piping.
- E. Telecommunications Grounding System:
- 1. Coil 5 FT of insulated #6 AWG conductor at each telephone terminal board and mechanically connected to the ground bar.

2. Grounding bar: Mounted on or adjacent to telephone terminal board.
- F. Raceway Bonding/Grounding:
1. Install all metallic raceway so that it is electrically continuous.
 2. Provide an equipment grounding conductor in all raceways with insulation identical to the phase conductors, unless otherwise indicated on the Drawings.
 3. NFPA 70 required grounding bushings shall be of the insulating type.
 4. Provide double locknuts at all panels.
 5. Bond all conduits, at entrance and exit of equipment, to the equipment ground bus or lug.
 6. Provide bonding jumpers if conduits are installed in concentric knockouts.
 7. Make all metallic raceway fittings and grounding clamps tight to ensure equipment grounding system will operate continuously at ground potential to provide low impedance current path for proper operation of overcurrent devices during possible ground fault conditions.
- G. Equipment Grounding:
1. Ground all utilization equipment with an equipment grounding conductor.
- H. Cable Tray Grounding:
1. Make metal cable tray electrically continuous by one of the following methods:
 - a. Tray sections and fittings suitable for grounding purposes.
 - b. Provide bonding jumpers at discontinuous joints.
- I. Prefabricated Composite Material Test Station:
1. Place test station on a foundation of compacted 1/4 to 1/2 IN crushed rock or gravel a minimum of 8 IN thick and 6 IN larger than handholes footprint on all sides.
 2. Provide concrete encasement ring around test station per manufacturers installation instructions (minimum of 10 IN wide x 12 IN deep).

3.2 FIELD QUALITY CONTROL

- A. Leave grounding system uncovered until observed by Owner.
- B. Acceptance testing:
1. See Specification Section 26 08 13.
 2. Provide a continuity test on the components of the grounding electrode system.
 3. Complete grounding system: Resistance of 10 ohms or less.
 4. Test resistance of installed ground system after backfilling and before connection to any other grounded system including underground piping, utility services or other building ground systems.
 - a. Perform test at the ground rod test station.

END OF SECTION

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SECTION 26 05 33

RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Material and installation requirements for:
 - a. Conduits.
 - b. Conduit fittings.
 - c. Conduit supports.
 - d. Wireways.
 - e. Outlet boxes.
 - f. Pull and junction boxes.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
 - 3. Division 03 - Concrete
 - 4. Division 26 - Electrical
 - a. Section 26 05 00 - Electrical - Basic Requirements.
 - b. Section 26 05 19 - Wire and Cable - 600 Volt and Below.
 - c. Section 26 05 43 - Electrical - Exterior Underground.
 - d. Section 26 27 26 - Wiring Devices.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. ASTM International (ASTM):
 - a. A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - b. A153/A153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 2. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - b. RN 1, Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
 - 3. National Electrical Manufacturers Association/American National Standards Institute (NEMA/ANSI):
 - a. C80.1, Electric Rigid Steel Conduit (ERSC).
 - b. OS 1, Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
 - 4. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code (NEC).
 - b. 820, Standard for Fire Protection in Wastewater Treatment and Collection Facilities.
 - 5. Underwriters Laboratories, Inc. (UL):
 - a. 1, Standard for Flexible Metal Conduit.
 - b. 50, Enclosures for Electrical Equipment, Non-Environmental Considerations.
 - c. 360, Standard for Liquid-Tight Flexible Metal Conduit.
 - d. 467, Grounding and Bonding Equipment.
 - e. 514B, Conduit, Tubing, and Cable Fittings.
 - f. 651A, Schedule 40 and 80 High Density Polyethylene (HDPE) Conduit.
 - 6. 870, Standard for Wireways, Auxiliary Gutters, and Associated Fittings.
 - 7. Building code:

- a. International Building Code and associated standards, latest Edition including all State of Alaska and Municipality of Skagway amendments, referred to herein as Building Code.

1.3 SUBMITTALS

- A. Shop Drawings:
 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 2. Product technical data:
 - a. Provide submittal data for all products specified in PART 2 of this Specification Section except:
 - 1) Conduit fittings.
 - 2) Support systems.
 - b. See Specification Section 26 05 00 for additional requirements.
 3. Fabrication and/or layout drawings:
 - a. Proposed location and details of construction for openings in slabs and walls for raceway runs.
 - b. Identify dimensional size of pull and junction boxes to be used.
 - c. Seismic location installation details.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. See Specification Section 26 05 00.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 1. Rigid metal conduits:
 - a. Allied Tube and Conduit.
 - b. Western Tube and Conduit Corporation.
 - c. Wheatland Tube.
 2. PVC coated rigid metal conduits:
 - a. Ocal by Thomas & Betts.
 - b. Robroy Industries.
 3. Flexible conduit:
 - a. AFC Cable Systems.
 - b. Anamet, Inc.
 - c. Electri-Flex Company.
 - d. International Metal Hose Company.
 - e. Southwire Company, LLC.
 4. Wireway:
 - a. Hoffman Engineering.
 - b. Wiegmann by Hubbell.
 - c. Square D by Schneider Electric.
 5. Conduit fittings and accessories:
 - a. Appleton by Emerson Electric Co.
 - b. Carlon by Thomas & Betts.
 - c. Cantex, Inc.
 - d. Crouse-Hinds by Eaton.
 - e. Killark by Hubbell.
 - f. Osburn Associates, Inc.
 - g. O-Z/Gedney by Emerson Electric Co.
 - h. Raco by Hubbell.
 - i. Steel City by Thomas & Betts.

- j. Thomas & Betts.
- 6. Support systems:
 - a. Unistrut by Atkore International, Inc.
 - b. B-Line by Eaton.
 - c. Kindorf by Thomas & Betts.
 - d. Minerallac Company.
 - e. CADDY by Pentair.
 - f. Superstrut by Thomas & Betts.
- 7. Outlet, pull and junction boxes:
 - a. Appleton by Emerson Electric Co.
 - b. Crouse-Hinds by Eaton
 - c. Killark by Hubbell.
 - d. O-Z/Gedney by Emerson Electric Co.
 - e. Steel City by Thomas & Betts.
 - f. Raco by Hubbell
 - g. Bell by Hubbell.
 - h. Hoffman Engineering.
 - i. Wiegmann by Hubbell.
 - j. B-Line by Eaton.
 - k. Adalet.
 - l. RITTAL North America LLC.
 - m. Stahlin by Robroy Enclosures.

B. Submit request for substitution in accordance with Specification Section 01 25 13.

2.2 RIGID METAL CONDUITS

- A. Rigid Galvanized Steel Conduit (RGS):
 - 1. Mild steel with continuous welded seam.
 - 2. Metallic zinc applied by hot-dip galvanizing or electro-galvanizing.
 - 3. Threads galvanized after cutting.
 - 4. Internal coating: Baked lacquer, varnish or enamel for a smooth surface.
 - 5. Standards: NFPA 70 Type RMC, NEMA/ANSI C80.1, UL 6.
- B. PVC-Coated Rigid Steel Conduit (PVC-RGS):
 - 1. Nominal 40 MIL Polyvinyl Chloride Exterior Coating:
 - a. Coating: Bonded to hot-dipped galvanized rigid steel conduit conforming to NEMA/ANSI C80.1.
 - b. The bond between the PVC coating and the conduit surface: Greater than the tensile strength of the coating.
 - 2. Nominal 2 mil, minimum, urethane interior coating.
 - 3. Urethane coating on threads.
 - 4. Conduit: Epoxy prime coated prior to application of PVC and urethane coatings.
 - 5. Female Ends:
 - a. Have a plastic sleeve extending a minimum of 1 pipe diameter or 2 IN, whichever is less beyond the opening.
 - b. The inside diameter of the sleeve shall be the same as the outside diameter of the conduit to be used with it.
 - 6. Standards: NFPA 70 Type RMC, NEMA/ANSI C80.1, UL 6, NEMA RN 1.

2.3 FLEXIBLE CONDUIT

- A. PVC-Coated Flexible Galvanized Steel (liquid-tight) Conduit (FLEX-LT):
 - 1. Core formed of continuous, spiral wound, hot-dip galvanized steel strip with successive convolutions securely interlocked.
 - 2. Extruded PVC outer jacket positively locked to the steel core.
 - 3. Liquid and vaportight.
 - 4. Standard: NFPA 70 Type LFMC, UL 360.

2.4 WIREWAY

- A. General:
 - 1. Suitable for lay-in conductors.
 - 2. Designed for continuous grounding.
 - 3. Covers:
 - a. Hinged or removable in accessible areas.
 - b. Non-removable when passing through partitions.
 - 4. Finish: Rust inhibiting primer and manufacturer's standard paint inside and out except for stainless steel type.
 - 5. Standards: UL 870, NEMA 250.
- B. Watertight (NEMA 4X rated) Wireway:
 - 1. 14 GA Type 304 or 316 stainless steel bodies and covers without knockouts and 10 GA stainless steel flanges.
 - 2. Cover: Fully gasketed and held in place with captive clamp type latches.
 - 3. Flanges: Fully gasketed and bolted.

2.5 CONDUIT FITTINGS AND ACCESSORIES

- A. Fittings for Use with RGS \:
 - 1. General:
 - a. Finish: Electrostatically applied epoxy powder coat.
 - b. In hazardous locations listed for use in Class I, Groups C and D locations.
 - 2. Locknuts:
 - a. Threaded steel or malleable iron.
 - b. Gasketed or non-gasketed.
 - c. Grounding or non-grounding type.
 - 3. Bushings:
 - a. Threaded, insulated metallic.
 - b. Grounding or non-grounding type.
 - 4. Hubs: Threaded, insulated and gasketed metallic for raintight connection.
 - 5. Couplings:
 - a. Threaded straight type: Same material and finish as the conduit with which they are used on.
 - b. Threadless type: Gland compression or self-threading type, concrete tight.
 - 6. Unions: Threaded galvanized steel or zinc plated malleable iron.
 - 7. Conduit bodies (ells and tees):
 - a. Body: Zinc plated cast iron or cast copper free aluminum with threaded hubs.
 - b. Standard and mogul size.
 - c. Cover:
 - 1) Clip-on type with stainless steel screws.
 - 2) Gasketed or non-gasketed galvanized steel, zinc plated cast iron or cast copper free aluminum.
 - 8. Conduit bodies (round):
 - a. Body: Zinc plated cast iron or cast copper free aluminum with threaded hubs.
 - b. Cover: Threaded screw on type, gasketed, galvanized steel, zinc plated cast iron or cast copper free aluminum.
 - 9. Sealing fittings:
 - a. Body: Zinc plated cast iron or cast copper free aluminum with threaded hubs.
 - b. Standard and mogul size.
 - c. With or without drain and breather.
 - d. Fiber and sealing compound: UL listed for use with the sealing fitting.
 - 10. Hazardous location flexible coupling (HAZ-FLEX):
 - a. Liquid tight and arc resistant.
 - b. Electrically conductive so no bonding jumper is required.
 - c. Dry and wet areas:

- 1) Bronze braided covering over flexible brass core.
 - 2) Bronze end fittings.
 - 3) Zinc-plated steel or malleable iron unions and nipples.
 - d. Corrosive areas:
 - 1) Stainless steel braided covering over flexible stainless steel core.
 - 2) Stainless steel end fittings.
 - 3) Aluminum unions and nipples.
 - 11. Expansion couplings:
 - a. 4 IN nominal straight-line conduit movement in either direction.
 - b. Galvanized steel with insulated bushing.
 - c. Gasketed for wet locations.
 - d. Internally or externally grounded.
 - 12. Expansion/deflection couplings:
 - a. 3/4 IN nominal straight-line conduit movement in either direction.
 - b. 30-degree nominal deflection from the normal in all directions.
 - c. Metallic hubs, neoprene outer jacket and stainless steel jacket clamps.
 - d. Internally or externally grounded.
 - e. Watertight, raintight and concrete tight.
 - 13. Standards: UL 467, UL 514B, UL 1203.
- B. Fittings for Use with PVC-RGS:
- 1. The same material and construction as those fittings listed under paragraph "Fittings for Use with RGS" and coated as defined under paragraph "PVC Coated Rigid Steel Conduit (PVC-RGS)."
- C. Fittings for Use with FLEX-LT
- 1. Connector:
 - a. Straight or angle type.
 - b. Metal construction, insulated and gasketed.
 - c. Composed of locknut, grounding ferrule and gland compression nut.
 - d. Liquid tight.
 - 2. Standards: UL 467, UL 514B.
- D. Weather and Corrosion Protection Tape:
- 1. PVC based tape, 10 mils thick.
 - 2. Protection against moisture, acids, alkalis, salts and sewage and suitable for direct bury.
 - 3. Used with appropriate pipe primer.

2.6 ALL RACEWAY AND FITTINGS

- A. Mark Products:
- 1. Identify the nominal trade size on the product.
 - 2. Stamp with the name or trademark of the manufacturer.

2.7 OUTLET BOXES

- A. Cast Outlet Boxes:
- 1. Zinc plated cast iron or die-cast copper free aluminum with manufacturer's standard finish.
 - 2. Threaded hubs and grounding screw.
 - 3. Styles:
 - a. "FS" or "FD".
 - b. "Bell".
 - c. Single or multiple gang and tandem.
 - d. "EDS" or "EFS" for hazardous locations.
 - 4. Accessories: 40 MIL PVC exterior coating and 2 MIL urethane interior coating.
 - 5. Standards: UL 514A, UL 1203.
- B. See Specification Section 26 27 26 for wiring devices, wallplates and coverplates.

2.8 PULL AND JUNCTION BOXES

- A. NEMA 4X Rated (metallic):
 - 1. Body and cover: 14 GA Type 304 or 316 stainless steel.
 - 2. Seams continuously welded and ground smooth.
 - 3. No knockouts.
 - 4. External mounting flanges.
 - 5. Hinged door and stainless steel screws and clamps.
 - 6. Door with oil-resistant gasket.
- B. NEMA 7 Rated:
 - 1. Cast gray iron alloy or copper-free aluminum with manufacturer's standard finish.
 - 2. Drilled and tapped openings or tapered threaded hub.
 - 3. Cover bolted-down with stainless steel bolts or threaded cover with neoprene gasket.
 - 4. External mounting flanges.
 - 5. Grounding lug.
 - 6. Accessories: 40 MIL PVC exterior coating and 2 MIL urethane interior coating.
- C. Miscellaneous Accessories:
 - 1. Rigid handles for covers larger than 9 SQFT or heavier than 25 LBS.
 - 2. Split covers when heavier than 25 LBS.
 - 3. Weldnuts for mounting optional panels and terminal kits.
 - 4. Terminal blocks: Screw-post barrier-type, rated 600 volt and 20 ampere minimum.
- D. Standards: NEMA 250, UL 50.

2.9 SUPPORT SYSTEMS

- A. Multi-conduit Surface or Trapeze Type Support and Pull or Junction Box Supports:
 - 1. Material requirements.
 - a. Galvanized steel: ASTM A123/A123M or ASTM A153/A153M.
 - b. Stainless steel: AISI Type 316.
 - c. PVC coat galvanized steel: ASTM A123/A123M or ASTM A153/A153M and 20 MIL PVC coating.
- B. Single Conduit and Outlet Box Support Fasteners:
 - 1. Material requirements:
 - a. Zinc plated steel.
 - b. Stainless steel.
 - c. Malleable iron.
 - d. PVC coat malleable iron or steel: 20 MIL PVC coating.
 - e. Steel protected with zinc phosphate and oil finish.

2.10 OPENINGS AND PENETRATIONS IN WALLS AND FLOORS

- A. Sleeves, smoke and fire stop fitting through walls and floors:
 - 1. See Specification Section 01 73 20.

PART 3 - EXECUTION

3.1 RACEWAY INSTALLATION - GENERAL

- A. Shall be in accordance with the requirements of:
 - 1. NFPA 70.
 - 2. NFPA 820.
 - 3. Manufacturer instructions.
- B. Size of Raceways:
 - 1. Raceway sizes are shown on the Drawings, if not shown on the Drawings, then size in accordance with NFPA 70.
 - 2. Unless specifically indicated otherwise, the minimum raceway size shall be:

- a. Conduit: 3/4 IN.
 - b. Wireway: 2-1/2 IN x 2-1/2 IN.
- C. Field Bending and Cutting of Conduits:
- 1. Utilize tools and equipment recommended by the manufacturer of the conduit, designed for the purpose and the conduit material to make all field bends and cuts.
 - 2. Do not reduce the internal diameter of the conduit when making conduit bends.
 - 3. Prepare tools and equipment to prevent damage to the PVC coating.
 - 4. Degrease threads after threading and apply a zinc rich paint.
 - 5. Debur interior and exterior after cutting.
- D. Male threads of conduit systems shall be coated with an electrically conductive anti-seize compound.
- E. The protective coating integrity of conduits, fittings, outlet, pull and junction boxes and accessories shall be maintained.
- 1. Repair galvanized components utilizing a zinc rich paint.
 - 2. Repair painted components utilizing touch up paint provided by or approved by the manufacturer.
 - 3. Repair PVC coated components utilizing a patching compound, of the same material as the coating, provided by the manufacturer of the conduit; or a self-adhesive, highly conformable, cross-linked silicone composition strip, followed by a protective coating of vinyl tape.
 - a. Total nominal thickness: 40 MIL.
 - 4. Repair surfaces which will be inaccessible after installation prior to installation.
- F. Remove moisture and debris from conduit before wire is pulled into place.
- 1. Pull mandrel with diameter nominally 1/4 IN smaller than the interior of the conduit, to remove obstructions.
 - 2. Swab conduit by pulling a clean, tight-fitting rag through the conduit.
 - 3. Tightly plug ends of conduit with tapered wood plugs or plastic inserts until wire is pulled.
- G. Only nylon or polyethylene rope shall be used to pull wire and cable in conduit systems.
- H. Where portions of a raceway are subject to different temperatures and where condensation is known to be a problem, as in cold regions (Skagway Alaska) and where passing from the interior to the exterior of a building, the raceway shall be sealed to prevent circulation of warm air to colder section of the raceway.
- I. Fill openings in walls, floors, and ceilings and finish flush with surface.
- 1. See Specification Section 01 73 20.

3.2 RACEWAY ROUTING

- A. Raceways shall be routed in the field unless otherwise indicated.
- 1. Conduit and fittings shall be installed, as required, for a complete system that has a neat appearance and is in compliance with all applicable codes.
 - 2. Run in straight lines parallel to or at right angles to building lines.
 - 3. Do not route conduits:
 - a. Through areas of high ambient temperature or radiant heat.
 - b. In suspended concrete slabs.
 - c. In concrete members including slabs, slabs on grade, beams, walls, and columns unless specifically located and detailed on structural Drawings.
 - 4. Locate sleeves or conduits penetrating floors, walls, and beams so as not to significantly impair the strength of the construction. Do not place conduit penetrations in columns.
 - 5. Conduit shall not interfere with, or prevent access to, piping, valves, ductwork, or other equipment for operation, maintenance and repair.
 - 6. Provide pull boxes or conduit bodies as needed so that there is a maximum of 360 DEG of bends in the conduit run or in long straight runs to limit pulling tensions.

- B. Maintain minimum spacing between parallel conduit and piping runs in accordance with the following when the runs are greater than 30 FT:
 - 1. Between instrumentation and telecommunication: 1 IN.
 - 2. Between instrumentation and 125 V, 48 V and 24 VDC, 2 IN.
 - 3. Between instrumentation and 600 V and less AC power or control: 6 IN.
 - 4. Between instrumentation and greater than 600 VAC power: 12 IN.
 - 5. Between telecommunication and 125 V, 48 V and 24 VDC, 2 IN.
 - 6. Between telecommunication and 600 V and less AC power or control: 6 IN.
 - 7. Between 125 V, 48 V and 24 VDC and 600 V and less AC power or control: 2 IN.
 - 8. Between 125 V, 48 V and 24 VDC and greater than 600 VAC power: 2 IN.
 - 9. Between process, gas, air and water pipes: 6 IN.
- C. Conduits shall be installed to eliminate moisture pockets.
 - 1. Where water cannot drain to openings, provide drain fittings in the low spots of the conduit run.
- D. Conduit shall not be routed on the exterior of structures except as specifically indicated on the Drawings.
- E. Where sufficient room exists within the housing of roof-mounted equipment, the conduit shall be stubbed up inside the housing.
- F. Provide all required openings in walls, floors, and ceilings for conduit penetration.
 - 1. See Specification Section 01 73 20.

3.3 RACEWAY APPLICATIONS

- A. Permitted Raceway Types per Wire or Cable Types:
 - 1. Power wire or cables: All raceway types.
 - 2. Control wire or cables: All raceway types.
 - 3. Instrumentation cables: Metallic raceway.
 - 4. Motor leads from a VFD: RGS.
 - 5. Telecommunication cables: All raceway types.
- B. Permitted Raceway Types Per Area Designations:
 - 1. Dry areas:
 - a. RGS.
 - b.
 - 2. Wet areas:
 - a. RGS.
 - 3. Corrosive areas:
 - a. PVC-RGS.
 - 4. Highly corrosive areas:
 - a. PVC-RGS.
 - 5. NFPA 70 hazardous areas:
 - a. RGS.
- C. Permitted Raceway Types Per Routing Locations:
 - 1. In stud framed walls:
 - a. RGS.
 - 2. In concrete block or brick walls:
 - a. RGS.
 - 3. Embedded in poured concrete walls and floors:
 - a. RGS.
 - b. Fiberglass (above grade rated) when emerging from concrete into areas designated as wet, corrosive or highly corrosive.
 - c. PVC-RGS when emerging from concrete into areas designated as wet, corrosive or highly corrosive.
 - 4. Beneath floor slab-on-grade:

- a. PVC-40.
- 5. Through floor penetrations, see Specification Section 01 73 20:
 - a. PVC-RGS in areas designated as wet, corrosive or highly corrosive.
- 6. Direct buried conduits and ductbanks:
 - a. RGS.
 - b. 90 DEG elbows for transitions to above grade:
 - 1) PVC-RGS.
 - c. Long sweeping bends greater than 15 DEG:
 - 1) PVC-RGS.
- 7. Concrete encased ductbanks:
 - a. RGS
 - b. 90 degree elbows for transitions to above grade:
 - 1) PVC-RGS.
 - c. Long sweeping bends greater than 15 DEG:
 - 1) RGS for sizes 2 IN and larger.
- D. FLEX-LT conduits shall be install as the final conduit connection to light fixtures, dry type transformers, motors, electrically operated valves, instrumentation primary elements, and other electrical equipment that is liable to vibrate.
 - 1. The maximum length shall not exceed:
 - a. 6 FT to light fixtures.
 - b. 3 FT to motors.
 - c. 2 FT to all other equipment.
- E. In hazardous areas, HAZ-FLEX coupling shall be installed as the final conduit to motors, electrically operated valves, instrumentation primary elements and electrical equipment that is liable to vibrate.
 - 1. The maximum length shall not exceed:
 - a. 3 FT to motors.
 - b. 2 FT to all other equipment.
- F. NEMA 4X Rated Wireway:
 - 1. Surface mounted in areas designated as wet and or corrosive.

3.4 CONDUIT FITTINGS AND ACCESSORIES

- A. Conduit Seals:
 - 1. Installed in conduit systems located in hazardous areas as required by the NFPA 70.
 - 2. Filler plug and drain shall be accessible.
 - 3. Pour the conduit seals in a two-step process.
 - a. Pour the seal and leave cover off.
 - b. After seal is dry, inspect for proper sealing, install cover and mark (for example, paint or permanent marker) as complete.
- B. Install Expansion Fittings:
 - 1. Where conduits are exposed to the sun and conduit run is greater than 200 FT.
- C. Install Expansion/Deflection Fittings:
 - 1. Where conduits enter a structure.
 - a. Except electrical manholes and handholes.
 - b. Except where the ductbank is tied to the structure with rebar.
 - 2. Where conduits span structural expansions joints.
- D. Threaded connections shall be made wrench-tight.
- E. Conduit joints shall be watertight:
 - 1. Where subjected to possible submersion.
 - 2. In areas classified as wet.

3. Underground.
- F. Terminate Conduits:
1. In metallic outlet boxes:
 - a. RGS:
 - 1) Conduit hub and locknut.
 - 2) Insulated bushing and two locknuts.
 - 3) Use grounding type locknut or bushing when required by NFPA 70.
 2. In NEMA 4X rated enclosures:
 - a. Watertight, insulated and gasketed hub and locknut.
 3. In NEMA 7 rated enclosures:
 - a. Into an integral threaded hub.
 4. When stubbed up through the floor into floor mount equipment:
 - a. With an insulated grounding bushing on metallic conduits.
 - b. With end bells on nonmetallic conduits.
- G. Threadless couplings shall only be used to join new conduit to existing conduit when the existing conduit end is not threaded and it is not practical or possible to cut threads on the existing conduit with a pipe threader.

3.5 CONDUIT SUPPORT

- A. Permitted multi-conduit surface or trapeze type support system per area designations and conduit types:
1. Dry or wet and/or hazardous areas:
 - a. Galvanized system consisting of: Galvanized steel channels and fittings, nuts and hardware and conduit clamps.
 2. Corrosive areas:
 - a. PVC coated steel system consisting of: PVC coated galvanized steel channels and fittings and conduit clamps with stainless steel nuts and hardware.
 3. Highly corrosive areas:
 - a. PVC coated steel system consisting of: PVC coated galvanized steel channels and fittings and conduit clamps with stainless steel nuts and hardware.
 4. Conduit type shall be compatible with the support system material.
 - a. Galvanized steel system may be used with RGS.
 - b. Stainless steel system may be used with RGS and PVC-RGS.
 - c. PVC coated galvanized steel system may be used with PVC-RGS.
 - d.
- B. Permitted single conduit support fasteners per area designations and conduit types:
1. Dry or wet and/or hazardous areas:
 - a. Material: Zinc plated steel, stainless steel and malleable iron.
 - b. Types of fasteners: Straps, hangers with bolts, clamps with bolts and bolt on beam clamps.
 2. Corrosive areas:
 - a. Material: Stainless steel and PVC coat malleable iron or steel.
 - b. Types of fasteners: Straps, hangers with bolts, clamps with bolts and bolt on beam clamps.
 3. Highly corrosive areas:
 - a. Material: PVC coat malleable iron or steel.
 - b. Types of fasteners: Straps, hangers with bolts, clamps with bolts and bolt on beam clamps.
 4. Conduit type shall be compatible with the support fastener material.
 - a. Zinc plated steel, steel protected with zinc phosphate and oil finish and malleable iron fasteners may be used with RGS
 - b. Stainless steel system may be used with RGS and PVC-RGS.
 - c. PVC coated fasteners may be used with PVC-RGS

- d. In seismic locations provide required supports and/or sway bracing per local Building Codes.
- C. Conduit Support General Requirements:
- 1. Maximum spacing between conduit supports per NFPA 70.
 - 2. Support conduit from the building structure.
 - 3. Do not support conduit from process, gas, air or water piping; or from other conduits.
 - 4. Provide hangers and brackets to limit the maximum uniform load on a single support to 25 LBS or to the maximum uniform load recommended by the manufacturer if the support is rated less than 25 LBS.
 - a. Do not exceed maximum concentrated load recommended by the manufacturer on any support.
 - b. Conduit hangers:
 - 1) Continuous threaded rods combined with struts or conduit clamps: Do not use perforated strap hangers and iron bailing wire.
 - c. Do not use suspended ceiling support systems to support raceways.
 - d. Hangers in metal roof decks:
 - 1) Utilize fender washers.
 - 2) Not extend above top of ribs.
 - 3) Not interfere with vapor barrier, insulation, or roofing.
 - 5. Conduit support system fasteners:
 - a. Use sleeve-type expansion anchors as fasteners in masonry wall construction.
 - b. Do not use concrete nails and powder-driven fasteners.
 - 6. Comply with the requirements of Specification Section 05 50 00 for fasteners in cast-in-place concrete construction.

3.6 OUTLET, PULL AND JUNCTION BOX INSTALLATION

- A. General:
- 1. Install products in accordance with manufacturer's instructions.
 - 2. See Specification Section 26 05 00 and the Drawings for area classifications.
 - 3. Fill unused punched-out, tapped, or threaded hub openings with insert plugs.
 - 4. Size boxes to accommodate quantity of conductors enclosed and quantity of conduits connected to the box.
- B. Outlet Boxes:
- 1. Permitted uses of cast outlet boxes:
 - a. Housing of wiring devices surface mounted in non-architecturally finished dry, wet, corrosive, highly corrosive and hazardous areas.
 - b. Pull and junction box surface mounted in non-architecturally finished dry, wet, corrosive and highly corrosive areas.
 - 2. Mount device outlet boxes where indicated on the Drawings and at heights as scheduled in Specification Section 26 05 00.
 - 3. Set device outlet boxes plumb and vertical to the floor.
 - 4. Outlet boxes recessed in walls:
 - a. Install with appropriate stud wall support brackets or adjustable bar hangers so that they are flush with the face of the wall.
 - b. Locate in ungrouted cell of concrete block with bottom edge of box flush with bottom edge of block and flush with the face of the block.
 - 5. Place barriers between switches in boxes with 277 V switches on opposite phases.
 - 6. Back-to-back are not permitted.
 - 7. When an outlet box is connected to a PVC coated conduit, the box shall also be PVC coated.
- C. Pull and Junction Boxes:
- 1. Install pull or junction boxes in conduit runs where indicated or required to facilitate pulling of wires or making connections.
 - a. Make covers of boxes accessible.
 - 2. Permitted uses of NEMA 4X metallic enclosure:

- a. Pull or junction box surface mounted in areas designated as wet and/or corrosive.
- 3. Permitted uses of NEMA 7 enclosure:
 - a. Pull or junction box surface mounted in areas designated as Class I hazardous.
 - 1) Provide PVC coating in corrosive and highly corrosive areas when PVC coated conduit is used.

3.7 FIELD QUALITY CONTROL

- A. Coordinate installation with adjacent work to ensure proper clearances and to prevent electrical hazards.
- B. Accessories: Provide accessories as required for a complete installation, including insulated bushings and inserts.
- C. Unused Openings: Close unused raceway openings using manufacturers recommended accessories.
- D. Clean exposed surfaces using non-abrasive materials and methods recommended by manufacturer. Protect raceways and boxes until acceptance.

END OF SECTION

SECTION 26 05 48
ELECTRICAL SEISMIC RESTRAINT SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. The design and installation of seismic bracing and anchorage required for electrical equipment, conduit, cable tray, and bus ducts.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements including:
 - a. Section 01 11 20 Job Conditions
 - b. Section 01 30 00 Special conditions
 - c. Section 01 81 10 Wind and Seismic Design Criteria.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American Society of Civil Engineers (ASCE):
 - a. 7, Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
 - 2. ASTM International (ASTM):
 - a. A36/A36M, Standard Specification for Carbon Structural Steel.
 - b. A307, Standard Specification Carbon Steel Bolts, Studs, and Threaded Rod, 60,000 PSI Tensile Strength.
 - c. A500/A500M, Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - d. A588/A588M, Standard Specification for High-Strength Low-Alloy Structural Steel, up to 50 KSI (345 MPa) Minimum Yield Point, with Atmospheric Corrosion Resistance.
 - e. A992/A992M, Standard Specification for Structural Steel Shapes.
 - f. F1554, Standard Specification for Anchor Bolts, Steel, 36, 55, and 105 KSI Yield Strength.
 - 3. Building code:
 - a. International Building Code (IBC) – latest Edition as adopted by the State of Alaska and amended by the Municipality of Skagway.
 - b. National Fire Protection Association (NFPA) 5000 Building Construction and Safety Code latest Edition including all State of Alaska, Municipality of Skagway amendments.

1.3 SYSTEM DESCRIPTION

- A. Contractor is responsible for design and installation of seismic bracing and anchorage systems.
- B. Description of Systems:
 - 1. Transverse and longitudinal bracing for seismic forces on suspended electrical systems including conduit, cable tray, bus duct, and equipment.
 - 2. Anchorage of floor and roof mounted electrical equipment.
- C. Seismic Design Requirements:
 - 1. Seismic design criteria: Provide bracing and anchoring for equipment, conduit, cable tray, bus duct, designed, constructed, and installed to resist stresses produced by lateral forces.
- D. Design and install seismic anchorage and bracing for all floor or roof mounted equipment weighing 400 LBS or more and all suspended or wall mounted equipment weighing 20 LBS or more.
- E. Seismic forces shall be presumed to act through the center of mass of the equipment in a direction that will produce the largest single anchor force.

- F. Installation Inspection:
 - 1. Certify that seismic bracing system installed is in accordance with approved Shop Drawings

1.4 SUBMITTALS

- A. Shop Drawings:
 - 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 - 2. Product technical data:
 - a. Seismic control devices.
 - 3. Fabrication and/or layout drawings:
 - a. Layout and mounting detail drawings showing system and proposed brace locations for all systems including pre-engineered systems.
 - b. The specific detail for each type of brace or anchor must be referenced on a plan that identifies the required location.
 - 1) Supplying a book of details without referencing the proper detail to a specific location on a plan is not acceptable.
 - c. Structural calculations for required lateral force level for each component.
 - d. All submittals, including pre-approved systems, shall be signed and sealed by a licensed engineer, licensed in the state in which the project is located.
- B. Certifications:
 - 1. Certificate that seismic bracing system installed is in accordance with approved Shop Drawings.

1.5 PROJECT CONDITIONS

- A. Seismic (Earthquake) Loads:
 - 1. Comply with requirements of Specification Section 01 81 10 Wind and Seismic Design Criteria, Section 01 11 20 Job Conditions, and Section 01 30 00 Special Conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. Pre-engineered suspended bracing systems:
 - a. Unistrut by Atkore International, Inc.
 - b. TOLCO by Eaton.
 - c. B-Line by Eaton.
 - 2. Custom engineered systems designed using specified criteria and common building materials.
- B. Submit request for substitution in accordance with Specification Section 01 25 13.

2.2 EQUIPMENT ANCHORS AND SUPPORTS

- A. Drilled-in-place concrete anchors shall have an approved ICBO Evaluation Services Report.
- B. Cast-in-place anchors shall comply with ASTM A36, ASTM A307, or ASTM F1554, 36 ksi.
- C. Anchors permanently exposed to weather or corrosive environments shall be stainless steel or hot-dipped galvanized.
- D. Structural steel for supports: ASTM A36, A588, A992 or A500.
- E. Cold formed metal and connection material: Unistrut, or equal.
- F. Any details provided are based on assumed equipment and arrangement.

1. The Contractor shall be responsible for design and acquiring approval for support and anchorage of equipment and arrangement which varies from equipment and arrangement assumed in detail provided.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Every run which requires bracing shall have a minimum of two transverse braces and one longitudinal brace.
 1. A "run" is defined as suspended pipe, conduit, cable tray, bus ductor trapeze rack having a minimum 10 FT straight run length.
- B. Brace spacing shall not exceed the maximum allowable brace spacing as engineered by the manufacturer or custom bracing designer.
- C. Bracing may be omitted from conduit, cable tray and bus duct runs less than 10 FT in length.
- D. Bracing may be omitted from conduit, cable tray and bus duct runs where rod hung supports of less than 12 IN. (305 MM) in length are required.
 1. All unbraced suspended utility systems having 2 IN conduit and larger or systems weighing more than 5 LBS/FT shall be installed with a minimum 6 IN clearance to suspended ceiling vertical hanger wires.
 2. The conduit, cable tray, or bus duct shall be installed such that the lateral motion of the members will not cause damaging impact with other systems or structural members or loss of vertical support.
- E. A longitudinal brace at a 90 DEG change in direction may act as a transverse brace if it is located within 2 FT of the change in direction.
- F. A transverse brace may act as a longitudinal brace if it is located within 2 FT of a change in direction and if the brace arm and anchorage have been sized to meet or exceed the requirements of the longitudinal brace.
- G. When bracing equipment or a utility system that is suspended from an overhead deck, brace back to the overhead deck or to the supporting structure supporting the deck.
 1. Do not brace to another element of the structure which may respond differently during a seismic event.
- H. Obtain approval from the Structural Engineer prior to attaching any brace elements to structural steel or wood framing.
- I. When utilizing cable bracing, tension the cable to remove slack without inducing uplift of the suspended element.
 1. Tension seismic bracing system prior to system start-up and adjust if necessary after equipment start-up.
- J. As a general rule, do not mix rigid bracing with cable bracing in the same run.
 1. However, once bracing has transitioned a 90 DEG change in run direction, the bracing may switch from rigid to cable or vice versa if required due to a significant change in overhead deck elevation or to provide an implementable bracing scheme in a congested area.
- K. Install brace members at an angle of 45 DEG from horizontal within a tolerance of +2-1/2 DEG or -45 DEG provided the brace length is accounted for in design.
 1. Brace angle may be increased to 60 DEG provided the brace spacing is reduced to 1/2 that required for a 45 DEG brace.
- L. Seismic bracing may not pass through a building separation joint.
 1. Utility systems that pass through a separation joint must be seismically restrained no greater than 5 FT from the point of connection.

- 2. Any hardware designed to accommodate seismic movement across the span of the separation joint shall be installed per manufacturer's installation and listing instructions.
- M. With approval of the Structural Engineer, utility systems that are suspended from the overhead deck may be braced to load bearing concrete or CMU (concrete masonry) walls provided that the walls and the overhead decks will respond similarly during a seismic event.
- N. Each layer of a multiple layer trapeze rack shall be braced individually based on the weight of the individual layer.
- O. Conduit, cable tray, or bus duct constructed of non ductile material (plastic or fiberglass), shall have brace spacing reduced to 1/2 of the spacing allowed for ductile materials.
- P. Where brace elements are through-bolted, the mounting hole in the element is to be no more than 1/16 IN in diameter larger than the bolt or threaded rod.
- Q. Seismic braces shall directly brace the support and not the hanger.

3.2 SUSPENDED ELECTRICAL SYSTEMS

- A. Install seismic bracing for all conduit 2-1/2 IN trade size or greater.
- B. All trapeze assemblies supporting conduits, cable trays or bus ducts shall be braced considering the total weight of the elements on the trapeze.
 - 1. For the purposes of calculating weight, all conduits are to be treated as full.
- C. Brace all trapeze racks which support conduit 2-1/2 IN trade size or larger.
 - 1. Brace all other conduit rack, cable tray or bus duct trapezes having a minimum weight in excess of 10 LBS/LF.
 - 2. Include a minimum 10 PCT additional capacity for future additions.
- D. Seismic bracing may be omitted from cable trays, conduit and bus ducts suspended by rod hung supports 12 IN or less in length from the top of the element to the bottom of the structural attachment of the hanger provided lateral motion will not cause damaging impacts to other systems or loss of system vertical support.
- E. For steel and aluminum bus ducts, conduit and cable trays:
 - 1. Provide transverse bracing at 40 FT maximum spacing unless otherwise noted.
 - 2. Provide longitudinal bracing at 80 FT maximum spacing unless otherwise noted.
- F. All vertical risers involving conduit 2-1/2 IN in diameter or larger shall include lateral restraint at maximum 30 FT intervals and at the top and bottom of the riser.
- G. Make provisions to eliminate seismic impact between components.

3.3 FLOOR OR ROOF MOUNTED EQUIPMENT

- A. Provide one anchor on each leg or corner.
 - 1. Support with a minimum of three 3/8 IN DIA anchors.
- B. Friction shall be neglected when designing anchors for shear.
- C. Vertical seismic forces, when required, shall be presumed to act concurrently with horizontal seismic forces.
- D. Batteries on racks or for generators shall have wrap around restrains to ensure that the batteries will not slide laterally. Spacers shall be used between the restrains and cases to prevent damage to the cases.
- E. Electrical cabinet design shall comply with the applicable NEMA standards. Cutouts in the lower shear panel that have not been made by the manufacturer and reduce significantly the strength of the cabinet shall be specifically evaluated.

END OF SECTION

SECTION 26 08 13
ACCEPTANCE TESTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Basic requirements for acceptance testing.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
 - a. Section 01 61 03 - Equipment: Basic Requirements.
 - 3. Division 10 – Specialties.
 - 4. Division 23 – Heating, Ventilation and Air Conditioning (HVAC).
 - 5. Division 26 – Electrical.
 - 6. Division 40 – Process Interconnections.
 - 7. Division 44 – Pollution and Waste Control Equipment.
 - a. Section 44 31 43 – Ultraviolet Odor Control System.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. InterNational Electrical Testing Association (NETA):
 - a. ATS, Standard for Acceptance Testing Specifications for Electric Power Equipment and Systems, latest edition.
 - 2. Nationally Recognized Testing Laboratory (NRTL).
- B. Qualifications:
 - 1. Testing firm qualifications: See Specification Section 01 61 03.
 - 2. Field personnel:
 - a. See Specification Section 01 61 03.
 - b. As an alternative, supervising technician certified by the equipment manufacturer.
 - 3. Analysis personnel:
 - a. See Specification Section 01 61 03
 - b. As an alternative, supervising technician certified by the equipment manufacturer.
- C. Phasing Diagram:
 - 1. Coordinate with Utility Company for phase rotations and Phase A, B and C markings.
 - a. Create a phasing diagram showing the coordinated phase rotations with UV odor control systems g through the transformers.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 - 2. See Specification Section 01 61 03 for electrical equipment and connection testing plan submittal requirements.
- B. Informational Submittals:
 - 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 - 2. Prior to energizing equipment:
 - a. Coordinated phasing diagram.

- b. Photocopies of all continuity tests.
- 3. Within two (2) weeks after successful completion of Demonstration Period (Commissioning Period):
 - a. Single report containing information including:
 - 1) Summary of Project.
 - 2) Information from pre-energization testing.
 - 3) See testing and monitoring reporting requirements in Specification Section 01 61 03.

PART 2 - PRODUCTS

2.1 FACTORY QUALITY CONTROL

- A. Provide Electrical equipment with all factory tests required by the applicable industry standards or NRTL.
- B. Factory testing will not be accepted in lieu of field acceptance testing requirements specified in this Specification Section and Specification Section 01 61 03.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

- A. General:
 - 1. See Specification Section 01 61 03.
 - 2. Complete electrical testing in three (3) phases:
 - a. Pre-energization testing phase.
 - b. Equipment energized with no load.
 - c. Equipment energized under load.
 - 3. Perform testing in accordance with this Specification Section and NETA ATS.
 - 4. Provide field setting and programming of all adjustable protective devices and meters to settings as determined by the approved coordination study.
- B. Equipment Monitoring and Testing Plan: See Specification Section 01 61 03.
- C. Instruments Used in Equipment and Connections Quality Control Testing: See Specification Section 01 61 03.
- D. Testing and Monitoring Program Documentation: See Specification Section 01 61 03.
- E. Electrical Equipment and Connections Testing Program:
 - 1. See Specification Section 01 61 03.
 - 2. See individual Division 26 Specification Sections for equipment specific testing requirements.
 - 3. Test all electrical equipment.
 - a. Perform all required NETA testing.
 - b. Perform all required NETA testing plus the optional testing identified with each specific type of equipment in Article 3.2 of this Specification Section.
 - 4. See Schedule at the end of PART 3 for equipment to be tested and specific test requirements.

3.2 SPECIFIC EQUIPMENT TESTING REQUIREMENTS

- A. Cable - Low Voltage:
 - 1. Perform inspections and tests per NETA ATS 7.3.2.
- B. Low Voltage Molded Case Circuit Breakers:
 - 1. Perform inspections and tests per NETA ATS 7.6.1.1.
 - 2. Components:

- a. Test all components per applicable paragraphs of this Specification Section and NETA ATS.
 - b. Thermal magnetic breakers: Visual and mechanical inspection per NETA ATS only.
 - c. Solid state trip type: Visual and mechanical inspection and electrical tests per NETA ATS.
 - 3. Record as-left settings.
- C. Instrument Transformers:
 - 1. Perform inspections and tests per NETA ATS 7.10.
 - 2. Components: Test all components per applicable paragraphs of this Specification Section and NETA ATS.
 - 3. Perform the following optional tests per NETA ATS:
 - a. Dielectric withstand test on potential transformers.
- D. Metering:
 - 1. Perform inspections and tests per NETA ATS 7.11.
 - 2. Components: Test all components per applicable paragraphs of this Specification Section and NETA ATS.
- E. Grounding:
 - 1. Perform inspections and tests per NETA ATS 7.13.
 - 2. Components: Test all components per applicable paragraphs of this Specification Section and NETA ATS.
- F. Motors:
 - 1. Perform inspections and tests per NETA ATS 7.15.
 - 2. See Specification Section 01 61 03.
- G. Motor Controllers and Variable/Adjustable Speed Drives (VFD/ASD) associated with odor control system exhaust fans:
 - 1. Perform inspections and tests per NETA ATS 7.16 and 7.17 all electrical tests.
 - 2. Components: Test all components per applicable paragraphs of this Specification Section and NETA ATS.
 - 3. Perform the following tests per NETA ATS:
 - a. Motor running overcurrent protection.
 - b. Control wiring insulation resistance.
 - c. For VFD/ASD apply minimum and maximum speed setpoints. Verify setpoints are within limitations of the load coupled to the motor.
 - d. Perform operational tests by initiating control devices
 - 1) Slowly vary drive speed between minimum and maximum. Observe motor and load for unusual noise or vibration.
 - 2) Verify operation of drive from remote start/stop and speed control signals.
- H. Existing Generator to power new UV Odor Control Systems loads:
 - 1. Perform inspections and tests per NETA ATS 7.15.2.
 - 2. Components: Test all components per applicable paragraphs of this Specification Section and NETA ATS.
 - 3. Perform the following additional tests:
 - a. Load and cycle crank test per manufacturer field engineering services.
- I. Control System Functional Test:
 - 1. Perform test upon completion of equipment acceptance tests.
 - 2. The test is to prove the correct interaction of all sensing, processing and action devices.
 - 3. Develop a test plan and parameters for evaluating the performance of the system.
 - 4. Perform the following tests:
 - a. Verify the correct operation of all interlock safety devices for fail-safe functions in addition to design function.
 - b. Verify the correct operation of all sensing devices, alarms and indicating devices.

5. Systems to be tested:
 - a. UV Odor Control Systems including control panel (hardwired control relays based) and appurtenances.
 - 1) Odor control exhaust fans operation.
 - b. Standby Generator Systems to take new UV Odor Control Systems and associated Exhaust Fans loads.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Material and installation requirements for:
 - a. Wall switches.
 - b. Receptacles.
 - c. Device wallplates and coverplates.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
 - 3. Section 26 05 00 - Electrical - Basic Requirements.
 - 4. Section 26 05 33 - Raceways and Boxes.
 - 5. Section 26 24 19 - Motor Control Equipment.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - b. WD 1, General Color Requirements for Wiring Devices.
 - c. WD 6, Wiring Devices - Dimensional Requirements.
 - 2. Underwriters Laboratories, Inc. (UL):
 - a. 20, General-Use Snap Switches.
 - b. 498, Standard for Attachment Plugs and Receptacles.
 - c. 514A, Metallic Outlet Boxes.
 - d. 894, Standard for Switches for Use in Hazardous (Classified) Locations.
 - e. 943, Ground-Fault Circuit-Interruption.
 - f. 1010, Standard for Receptacle-Plug Combinations for Use in Hazardous (Classified) Locations.
 - g. 1310, Standard for Class 2 Power Units.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 - 2. Product technical data:
 - a. Provide submittal data for all products specified in PART 2 of this Specification Section.
 - b. See Specification Section 26 05 00 for additional requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. Wall switches and receptacles:
 - a. Bryant Electric.
 - b. Cooper Wiring Devices by Eaton.

- c. Hubbell Incorporated Wiring Device-Kellems.
- d. Leviton Manufacturing Company.
- e. Legrand/Pass & Seymour.
- f. Eaton Crouse-Hinds.
- g. Appleton Electric Co.
- h. Hubbell Killark.

2.2 WALL SWITCHES

- A. Basic requirements unless modified in specific requirements paragraph of switches per designated areas or types:
 - 1. Industrial Specification Grade.
 - 2. Quiet action, snap switch.
 - 3. Self-grounding with grounding terminal.
 - 4. Back and side wired.
 - 5. Solid silver cadmium oxide contacts.
 - 6. Rugged thermoplastic and/or nylon housing and one-piece switch arm.
 - 7. Ratings: 20 A, 120/277 VAC.
 - 8. Switch handle type: Toggle.
 - 9. Switch handle color: Ivory.
 - 10. Types as indicated on the Drawings:
 - a. Single-pole.
 - b. Double-pole.
 - c. 3-way.
 - d. 4-way.
 - e. Momentary contact.
 - 11. Standards: UL 20, UL 514A, NEMA WD 1, NEMA WD 6.
- B. Corrosive and Wet or Damp Area Specific Requirements:
 - 1. Corrosion resistant nickel plated metal parts.
 - 2. Coverplate for use on metallic outlet boxes:
 - a. Cast aluminum, gasketed, stainless steel hardware, natural, lacquer, or factory painted finish.
 - b. Operator type:
 - 1) Front mounted lever to operate snap switch.
 - 2) Push/pull operator to operate snap switch.
 - 3) Spring type door to cover snap switch.
 - c. Wet location rated.
 - d. Single or multiple gang as required.
- C. Hazardous and Wet or Damp Area specific requirements:
 - 1. Rated for Class I, Division 1 and 2, Groups C and D; and Class II, Division 1 and 2 areas, Groups E, F, and G.
 - 2. Assembly consists of outlet box, snap switch and coverplate.
 - a. NEMA 3, 7 and 9 rated.
 - 3. Outlet box:
 - a. Cast iron alloy, galvanized and factory painted finish.
 - b. Cast aluminum, natural, lacquer, or factory painted finish.
 - 4. Snap switch (EDS Type):
 - a. Enclosed in separate sealing chamber and approved for installation without additional external sealing fittings.
 - b. Sealing chamber has prewired factory sealed pigtail leads.
 - 5. Snap switch (EFS Type):
 - a. Not enclosed in separate sealing chamber requiring external sealing fittings.
 - 6. Coverplate:
 - a. Cast iron alloy, stainless steel hardware, galvanized and factory painted finish.
 - b. Cast aluminum, stainless steel hardware, natural, lacquer, or factory painted finish.

- c. Operator type:
 - 1) Front mounted lever to operate snap switch.
 - 2) Side rocker arm operator to operate snap switch.
 - 7. Standards: UL 894.
- D. Hazardous and Corrosive or Highly Corrosive and Dry, Wet or Damp Area Specific Requirements:
 - 1. Rated for Class I, Division 1 and 2, Groups C and D; and Class II, Division 1 and 2 areas, Groups E, F, and G.
 - 2. Assembly consists of outlet box, snap switch and coverplate.
 - a. NEMA 7 rated.
 - 3. Outlet box:
 - a. Cast iron alloy, galvanized and factory painted finish.
 - b. Cast aluminum, natural, lacquer, or factory painted finish.
 - 4. Snap switch (EDS Type):
 - a. Enclosed in separate sealing chamber and approved for installation without additional external sealing fittings.
 - b. Sealing chamber has prewired factory sealed pigtail leads.
 - 5. Snap switch (EFS Type):
 - a. Not enclosed in separate sealing chamber requiring external sealing fittings.
 - 6. Coverplate:
 - a. Cast iron alloy, stainless steel hardware, galvanized and factory painted finish.
 - b. Operator type:
 - 1) Front mounted lever to operate snap switch.
 - 2) Side rocker arm operator to operate snap switch.
 - 7. Standards: UL 894.
- E. Hazardous and Corrosive or Highly Corrosive and Dry, Wet or Damp Area Specific Requirements:
 - 1. Rated for Class I, Division 1 and 2, Groups C and D.
 - 2. Assembly consists of outlet box, snap switch and coverplate.
 - a. NEMA 7 rated.
 - 3. Outlet box:
 - a. High strength glass reinforced non-metallic compound.
 - b. Aluminum grounding grid imbedded into enclosure.
 - 4. Snap switch (EFS Type):
 - a. Not enclosed in separate sealing chamber. External sealing fittings required.
 - 5. Coverplate:
 - a. High strength glass reinforced non-metallic compound, gasketed and coated stainless steel hardware.
 - b. Operator type: Non-metallic, front mounted lever to operate snap switch.
 - 6. Standards: UL 894.

2.3 RECEPTACLES

- A. Basic requirements unless modified in specific requirements paragraph of receptacles and per designated areas:
 - 1. Industrial Specification Grade.
 - 2. Straight blade.
 - 3. Brass triple wipe line contacts.
 - 4. One-piece grounding system with double wipe brass grounding contacts and self-grounding strap with grounding terminal.
 - 5. Back and side wired.
 - 6. Rating: 20 A, 125 VAC.
 - 7. High impact nylon body.
 - 8. Receptacle body color:
 - a. Normal power: Ivory.

- b. Generator or UPS power: Red.
 - 9. Duplex or simplex as indicated on the Drawings.
 - 10. Configuration: NEMA 5-20R.
 - 11. Standards: UL 498, UL 514A, NEMA WD 1, NEMA WD 6.
- B. Receptacle Type Specific Requirements:
- 1. Basic receptacles:
 - a. Weather-resistant when located in exterior locations or interior damp or wet areas as indicated on the Drawings.
 - 1) Identification: Letters “WR” on face of receptacle.
 - 2. Ground Fault Circuit Interrupter (GFCI):
 - a. Specification Grade.
 - b. Class A protection.
 - c. Feed through type.
 - d. Test and reset buttons.
 - e. Self-testing.
 - f. Visual indicator light.
 - g. Weather-resistant when located in exterior locations or interior damp or wet areas as indicated on the Drawings.
 - 1) Identification: Letters “WR” on face of receptacle.
 - h. Tamper resistant (TR) when indicated on the Drawings.
 - i. Additional standards: UL 943.
- C. Exterior Locations Specific Requirements:
- 1. Coverplate:
 - a. Extra-duty rated, weatherproof (NEMA 3R) while in use, gasketed, stainless steel hardware, copper-free aluminum, 3.2 IN minimum cover depth for #12 AWG cord.
- D. Corrosive and Wet or Damp Area Specific Requirements:
- 1. Corrosion resistant nickel plated metal parts.
 - 2. Receptacle body color: Gray.
 - 3. Weather-resistant.
 - a. Identification: Letters “WR” on face of receptacle.
 - 4. Coverplate for use on metallic outlet boxes:
 - a. Extra-duty rated, weatherproof (NEMA 3R) while in use, gasketed, stainless steel hardware, copper-free aluminum, 3.2 IN minimum cover depth for #12 AWG cord.
- E. Hazardous and Wet or Damp Area Specific Requirements:
- 1. Rated for Class I, Division 1 and 2, Groups C and D; and Class II, Division 1 and 2 areas, Groups E, F, and G.
 - 2. Assembly consists of outlet box and a combination receptacle/switch and housing.
 - a. NEMA 7 rated.
 - 3. Outlet box (EDS Type):
 - a. Cast aluminum, natural, lacquer, or factory painted finish.
 - 4. Receptacle/switch and housing:
 - a. Receptacle and switch enclosed in a factory sealed chamber and approved for installation without additional external sealing fittings.
 - b. Insertion of “interchanger” plug and plug rotation will close the switch to energize receptacle and lock plug into the receptacle.
 - c. “Interchanger” plug to be compatible with other manufacturers hazardous receptacle and work in ordinary convenience receptacles.
 - d. Ordinary equipment plugs will not active the hazardous receptacle.
 - e. Housing:
 - 1) Cast iron alloy, stainless steel hardware, galvanized and factory painted finish.
 - 2) Cast aluminum, stainless steel hardware, natural, lacquer, or factory painted finish.
 - 3) Spring-loaded door seats against neoprene gasket. Stainless steel spring.
 - 5. Ground Fault Circuit Interrupter (GFCI):

- a. Mount in same type of outlet box as receptacle.
 - b. Enclosed in factory sealed chamber.
 - c. Cover cast aluminum, stainless steel hardware, natural, lacquer, or factory painted finish.
 - d. Buttons stainless steel and gasketed.
 - 6. "Interchanger" plug:
 - a. Aluminum housing.
 - b. 30 PCT Glass-reinforced thermoplastic polyester housing.
 - c. Provide five plugs for Owners use.
 - 7. Standards: UL 894 and 1010.
- F. Hazardous and Corrosive or Highly Corrosive and Dry, Wet or Damp Area Specific Requirements:
- 1. Rated for Class I, Division 1 and 2, Groups C and D; and Class II, Division 1 and 2 areas, Groups E, F, and G.
 - 2. Assembly consists of outlet box and a combination receptacle/switch and housing.
 - a. NEMA 7 rated.
 - 3. Outlet box (EDS Type):
 - a. Cast iron alloy, galvanized and factory painted finish.
 - 4. Receptacle/switch and housing:
 - a. Receptacle and switch enclosed in a factory sealed chamber and approved for installation without additional external sealing fittings.
 - b. Insertion of "interchanger" plug and plug rotation will close the switch to energize receptacle and lock plug into the receptacle.
 - c. "Interchanger" plug to be compatible with other manufacturers hazardous receptacle and work in ordinary convenience receptacles.
 - d. Ordinary equipment plugs will not active the hazardous receptacle.
 - e. Housing:
 - 1) Cast iron alloy, stainless steel hardware, galvanized and factory painted finish.
 - 2) Cast aluminum, stainless steel hardware, natural, lacquer, or factory painted finish.
 - 3) Spring-loaded door seats against neoprene gasket. Stainless steel spring.
 - 5. Ground Fault Circuit Interrupter (GFCI):
 - a. Mount in same type of outlet box as receptacle.
 - b. Enclosed in factory sealed chamber.
 - c. Cover cast aluminum, stainless steel hardware, natural, lacquer, or factory painted finish.
 - d. Buttons stainless steel and gasketed.
 - e. Standards: UL 943.
 - 6. Standards: UL 894 and 1010.

2.4 MISCELLANEOUS WIRING DEVICES

- A. Manual Motor Starters: Horsepower rated with or without thermal overloads, see Specification Section 26 24 19.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Mount devices where indicated on the Drawings and as scheduled in Specification Section 26 05 00.
- C. See Specification Section 26 05 33 for device outlet box requirements.
- D. Where more than one receptacle is installed in a room, they shall be symmetrically arranged.

E. Provide blank plates for empty outlets.

END OF SECTION

SECTION 26 28 00
OVERCURRENT AND SHORT CIRCUIT PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Low voltage circuit breakers.
 - 2. Low voltage fuses.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
 - 3. Section 26 05 00 - Electrical: Basic Requirements.
 - 4. Section 26 08 13 - Acceptance Testing.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - a. 242, Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems (Buff Book).
 - b. 399, Recommended Practice for Industrial and Commercial Power Systems Analysis (Brown Book).
 - c. C37.13, Standard for Low-Voltage AC Power Circuit Breakers Used in Enclosures.
 - d. C37.16, Low-Voltage Power Circuit Breakers and AC Power Circuit Protectors - Preferred Ratings, Related Requirements, and Application Recommendations.
 - e. C37.17, Trip Devices for AC and General Purpose DC Low Voltage Power Circuit Breakers.
 - 2. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code (NEC).
 - 3. Underwriters Laboratories, Inc. (UL):
 - a. 248-1, Low-Voltage Fuses - Part 1: General Requirements.
 - b. 248-4, Low-Voltage Fuses - Part 4: Class CC Fuses.
 - c. 248-8, Low-Voltage Fuses - Part 8: Class J Fuses.
 - d. 489, Standard for Safety Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.
 - e. 943, Standard for Safety for Ground-Fault Circuit-Interrupters.
 - f. 1066, Standard for Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 - 2. Product technical data including:
 - a. Provide submittal data for all products specified in PART 2 of this Specification Section.
 - b. See Specification Section 26 05 00 for additional requirements.
- B. Contract Closeout Information:
 - 1. Operation and Maintenance Data:
 - a. See Specification Section 01 33 04 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
- C. Informational Submittals:

1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
2. Reports:
 - a. Short circuit study report.
 - b. Protective coordination study report.
 - c. Arc Flash Hazard Report and Arc Flash Hazard labels.
 - d. As-left condition of all circuit breakers that have adjustable settings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 1. Circuit breakers:
 - a. Eaton.
 - b. General Electric Company.
 - c. Square D Company.
 - d. Siemens.
 2. Fuses:
 - a. Eaton Bussmann, Inc.
 - b. Littelfuse, Inc.
 - c. Mersen
- B. Submit request for substitution in accordance with Specification Section 01 25 13.

2.2 CIRCUIT BREAKERS

- A. Molded Case Type:
 1. General:
 - a. Standards: UL 489.
 - b. Unit construction.
 - c. Over-center, toggle handle operated.
 - d. Quick-make, quick-break, independent of toggle handle operation.
 - e. Manual and automatic operation.
 - f. All poles open and close simultaneously.
 - g. Three (3) position handle: On, off and tripped.
 - h. Molded-in ON and OFF markings on breaker cover.
 - i. One-, two- or three-pole as indicated on the Drawings.
 - j. Current and interrupting ratings as indicated on the Drawings.
 - k. Bolt on type.
 2. Thermal magnetic type:
 - a. Inverse time overload and instantaneous short circuit protection by means of a thermal magnetic element.
 - b. Frame size 150 amp and below:
 - 1) Non-interchangeable, non-adjustable thermal magnetic trip units.
 - c. Frame sizes 225 to 400 amp (trip settings less than 400A):
 - 1) Interchangeable and adjustable instantaneous thermal magnetic trip units.
 - d. Ground Fault Circuit Interrupter (GFCI) Listed:
 - 1) Standard: UL 943.
 - 2) One- or two-pole as indicated on the Drawings.
 - 3) Class A ground fault circuit.
 - 4) Trip on 5 mA ground fault (4-6 mA range).
 - e. Ground Fault Equipment Protective Circuit Interrupter (GFEPIC) Listed (for pipe heat tracing cable system):
 - 1) Standard: UL 1053.
 - 2) Trip on 30 mA ground fault (6-50 mA range).

3. Solid state trip type:
 - a. Inverse time overload, instantaneous short circuit and ground fault protection by means of a solid state trip element, associated current monitors and flux shunt trip mechanism.
 - b. Frame size 400 amp to 1200 amp (trip settings between 400 and 1200A):
 - 1) Standard rating.
 - 2) Interchangeable current sensor or rating plug.
 - 3) Adjustable long time pick-up setting.
 - a) Adjustable from 50 to 100 PCT of the current sensor or rating plug.
 - 4) Adjustable short time pick-up setting.
 - 5) Adjustable instantaneous pick-up.
 - 6) Fixed ground fault pick-up, when indicated on the Drawings.
4. Motor circuit protector:
 - a. Adjustable instantaneous short circuit protection by means of a magnetic or solid state trip element.
 - b. Sized for the connected motor.

2.3 FUSES

- A. UL Class L fuses:

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Current and interrupting ratings as indicated on the Drawings.
- B. Series rated systems not acceptable.
- C. Devices shall be ambient temperature compensated.
- D. Circuit Breakers:
 1. Molded case circuit breakers shall incorporate the following, unless indicated otherwise on the Drawings:
 - a. Frame sizes 400 amp and less with trip setting less than 400A shall be thermal magnetic type.
 - b. Frame sizes 400 amp and larger shall be solid state trip type.
 - c. Frame sizes 1000 amp and above shall include integral ground fault protection, when indicated on the Drawings.
 - d. Motor circuit protectors sized for the connected motor.
- E. Fuses:
 1. UL Class J: Use for feeder devices 600 amps and smaller.

3.2 FIELD QUALITY CONTROL

- A. Coordinated Power System Protection:
 1. Prepare a study to demonstrate that the equipment and system constructed, meet the specified requirements for equipment ratings, coordination and protection.
 2. Perform the studies in accordance with IEEE 242 and IEEE 399.
 3. Include the name of the software developer, software package and software version number in the computer generated studies.
 4. System short circuit study report:
 - a. Begin the study at the main service electrical gear and extend down the system through all buses.
 - 1) Perform a balanced three-phase fault, bolted line-to-line fault and line-to-ground fault study.
 - b. Prepare a one-line diagram to show the electrical system buses, transformers and all sources of fault current including generators and motors.
 - c. Utilize manufacturer's data for the actual proposed equipment (e.g., transformer impedance).

- d. Coordinate the available utility fault current with the power utility company.
- e. Show input data in tabular form in the report and/or on the one-line diagram.
- f. Input data shall include but is not limited to:
 - 1) Utility fault current or MVA and X/R ratio.
 - 2) Bus voltages.
 - 3) Conductor sizes and type of conduit.
 - 4) Generator and motor sizes and contributions.
 - 5) Transformer sizes and impedances.
- g. Show available fault current at each bus in tabular form in the report and/or on the one-line diagram.
- h. Perform studies for both normal power and emergency/standby power scenarios.
- 5. System protective coordination study report:
 - a. Begin the study at the main service electrical gear and extend down the system through all buses as required to ensure a coordinated power system.
 - b. Demonstrate that the maximum possible degree of selectivity has been obtained between devices specified for the protection of equipment and conductors from damage from overloads and fault conditions.
 - 1) Where necessary, an appropriate compromise shall be made between system protection and service continuity.
 - 2) Consider system protection and service continuity to be of equal importance.
 - c. Prepare a one-line diagram to show the electrical system buses, transformers and protective devices.
 - d. Utilize manufacturer's data for the actual proposed protective devices.
 - e. Summarize the coordination study, conclusions and recommendations.
 - f. As a minimum, include the following:
 - 1) The manufacturer's information used to prepare the study.
 - 2) Assumptions made during the study.
 - 3) Recommended taps and settings of all adjustable devices in tabulated form.
 - g. Composite coordination time-current curves on log-log paper showing:
 - 1) That the settings for each protective device will provide protection and selectivity.
 - 2) Identify each curve.
 - 3) Cable and equipment damage points.
 - 4) Circuit interrupting device operating and interrupting times.
 - 5) One-line sketch of the part of the system being investigated.
 - 6) Include as many curves as possible on a graph while maintaining readability.
 - h. Position time-current curves for each device to provide for maximum selectivity to minimize system disturbances during fault clearing.
 - i. Advise the Engineer of potential coordination problems discovered during the study and include recommendations to resolve the problem.
 - j. Provide time-current curves for the "as found" and "proposed" conditions for upgrade/retrofit projects.
 - k. Submit the report for approval 90 days prior to equipment energization.
- B. Adjustable Circuit Breakers:
 - 1. Set all circuit breaker adjustable taps as defined in the coordination study, except adjust motor circuit protectors per the motor nameplate and NFPA 70 requirements.
- C. Testing:
 - 1. Acceptance testing: See Specification Section 26 08 13.

END OF SECTION

SECTION 26 28 16

SAFETY SWITCHES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Safety switches.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
 - 3. Section 26 05 00 - Electrical - Basic Requirements.
 - 4. Section 26 28 00 - Overcurrent and Short Circuit Protective Devices.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - b. KS 1, Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum).
 - 2. Underwriters Laboratories, Inc. (UL):
 - a. 98, Enclosed and Dead-Front Switches.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 - 2. Product technical data:
 - a. Provide submittal data for all products specified in PART 2 of this Specification Section.
 - b. Provide a Summary Table or use Exhibit A that associates the safety switch features with connected equipment tag number. Exhibit A indicates minimum data required.
 - c. See Specification Section 26 05 00 for additional requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following safety switch manufacturers are acceptable:
 - 1. Eaton.
 - 2. General Electric.
 - 3. Square D by Schneider Electric.
 - 4. Siemens Corporation.
 - 5. Appleton by Emerson Electric Co.
 - 6. Crouse-Hinds by Eaton.
 - 7. Killark by Hubbell.

2.2 SAFETY SWITCHES

- A. General:
 - 1. Non-fusible or fusible as indicated on the Drawings.
 - 2. Suitable for service entrance when required.
 - 3. NEMA Type HD heavy-duty construction.
 - 4. Switch blades will be fully visible in the OFF position with the enclosure door open.

5. Quick-make/quick-break operating mechanism.
 6. Deionizing arc chutes.
 7. Manufacture double-break rotary action shaft and switchblade as one common component.
 8. Clear line shields to prevent accidental contact with line terminals.
 9. Operating handle (except NEMA 7 rated enclosures):
 - a. Red and easily recognizable.
 - b. Padlockable in the OFF position.
 - c. Interlocked to prevent door from opening when the switch is in the ON position with a defeater mechanism.
- B. Ratings:
1. Horsepower rated of connected motor.
 2. Voltage and amperage: As required per application and in compliance with NFPA 70 (NEC).
 3. Short circuit withstand:
 - a. Non-fused: 10,000A.
 - b. Fused: 200,000A.
- C. Accessories, when indicated in PART 3 of this Specification Section:
1. Neutral kits.
 2. Ground lug kits.
 3. Auxiliary contact kits:
 - a. Opens before main switch.
 - b. Rated 10A at 125/250 VAC.
 - c. One N.O. and one N.C. contact.
- D. Enclosures:
1. NEMA 4X rated (metallic):
 - a. Body and cover: Type 304 or 316 stainless steel.
 - b. No knockouts, external mounting flanges, hinged and gasketed door.
 2. NEMA 7 rated:
 - a. Cast gray iron alloy or copper-free aluminum with manufacturer's standard finish.
 - b. Drilled and tapped openings or tapered threaded hub.
 - c. Gasketed cover bolted-down with stainless steel bolts.
 - d. External mounting flanges.
 - e. Operating handle padlockable in the OFF position.
- E. Overcurrent and short circuit protective devices:
1. Fuses.
 2. See Specification Section 26 28 00 for overcurrent and short circuit protective device requirements.
- F. Standards: NEMA KS 1, UL 98.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install as indicated and in accordance with manufacturer's instructions and recommendations.
- B. Install switches adjacent to the equipment they are intended to serve unless otherwise indicated on the Drawings.
- C. Provide auxiliary contact kit on local safety switches for motors being controlled by a variable frequency drive.
 1. The VFD is to be disabled when the switch is in the open position.
- D. Permitted uses of NEMA 4X metallic enclosure:
 1. Surface mounted in areas designated as wet and/or corrosive.

- E. Permitted uses of NEMA 7 enclosure:
1. Surface mounted in areas designated as Class I hazardous.
 2. Provide PVC coating in corrosive and highly corrosive areas when PVC coated conduit is used.

END OF SECTION

EXHIBIT A

Safety Switch Summary Table					
Equipment Tag	Switch Model Number	Rated Amps	Fused / Non-fused	Enclosure Type	Accessories
Example	Per MFR	60A	NF	NEMA 4X non-metallic	Ground lug, Aux Contact

SECTION 26 50 00
INTERIOR AND EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Material and installation requirements for:
 - a. Interior building and exterior building mounted luminaires.
 - b. Exterior and site luminaires.
 - c. LEDs.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
 - 3. Division 03 - Concrete.
 - 4. Section 26 05 00 - Electrical - Basic Requirements.
 - 5. Section 26 05 19 - Wire and Cable - 600 Volt and Below.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American National Standards Institute (ANSI):
 - a. C78.377, Specification for the Chromaticity of Solid State Lighting Products.
 - 2. Federal Communications Commission (FCC):
 - a. Code of Federal Regulations (CFR), 47 CFR 18, Industrial, Scientific and Medical Equipment.
 - 3. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - a. C62.41, Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
 - 4. Illuminating Engineering Society of North America (IESNA):
 - a. LM-79, Electrical and Photometric Measurements of Solid-State Lighting Products.
 - b. LM-80, Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays and Modules.
 - 5. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - b. 410, Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts.
 - c. LE 4, Recessed Luminaires, Ceiling Compatibility.
 - 6. National Electrical Manufacturers Association/American National Standards Institute (NEMA/ANSI):
 - a. SSL 1, Electronic Drivers for LED Devices, Arrays or Systems.
 - 7. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code (NEC).
 - b. 101, Life Safety Code.
 - 8. Underwriters Laboratories, Inc. (UL):
 - a. 248-4, Low-Voltage Fuses - Part 4: Class CC Fuses.
 - b. 844, Standard for Luminaires for Use in Hazardous (Classified) Locations.
 - c. 924, Standard for Emergency Lighting and Power Equipment.
 - d. 1012, Power Units Other Than Class 2.
 - e. 1310, Standard for Class 2 Power Units.
 - f. 1598, Luminaires.
 - g. 8750, Standard for Light Emitting Diode (LED) Equipment for Use in Lighting Products.
 - 9. United States Department of Energy (USDOE):
 - a. EPart, the National Energy Policy Act.

1.3 DEFINITIONS

- A. Useful Life for LED luminaire light sources:
 - 1. The operating hours before reaching 70 PCT of the initial rated lumen output (L70) with no catastrophic failures under normal operating conditions.
 - 2. This is also known as 70 PCT "Rated Lumen Maintenance Life" as defined in IESNA LM-80.

1.4 SUBMITTALS

- A. Shop Drawings:
 - 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 - 2. Product technical data:
 - a. Provide submittal data for all products specified in PART 2 of this Specification Section.
 - b. Identify luminaire by Luminaire Schedule designation.
 - c. Luminaire data sheet:
 - 1) Name of manufacturer.
 - 2) Complete order information (catalog number).
 - 3) Description of construction and optics.
 - 4) Total input wattage.
 - 5) Luminous efficacy (lumens/Watt).
 - 6) Photometric performance data including candlepower distribution and coefficient of utilization (CU) table.
 - 7) Dimensional size.
 - 8) Weight.
 - 9) UL nameplate data for luminaires used in Class 1, Division 1 and 2 areas.
 - 10) Effective Projected Areas (EPA) for pole mounted luminaires.
 - d. Solid state Luminaire additional data:
 - 1) Voltage.
 - 2) Initial and IES L70 lumens.
 - 3) Luminous efficacy (lumens/Watt).
 - 4) Correlated Color Temperature (CCT).
 - 5) Color Rendering Index (CRI).
 - 6) Total Harmonic Distortion (THD).
 - 7) Lamp life.
 - 8) Driver manufacturer and model number.
 - 9) Driver life.
 - 10) Driver type (0-10V, constant voltage, constant current).
 - 11) Dimming range and control device compatibility.
 - 12) Remote driver: Maximum wire length to luminaire.
 - 13) Emergency battery driver:
 - a) Compatibility with lighting module.
 - b) Lumen output of lighting module in emergency operation.
 - c) Battery life.
 - d) Description of testing.
 - e) Ambient operating temperature.
 - 14) Toxicity Characteristic Leaching Procedure (TCLP) compliance.
 - 15) Design Lights Consortium (DLC) Listing.
 - 16) Warranty information.
 - e.
 - 3. Test Reports:
 - a. IESNA LM-79 Test Report for Solid-State Luminaire.
 - b. IESNA LM-80 Test Report Solid-State Light Source.
 - 4. Certifications: Solid-state Luminaire Useful Life Certificate.

- B. Contract Closeout Information:
 - 1. Operation and Maintenance Data:
 - a. See Specification Section 01 33 04 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
 - b. Submittal data for each component covered by warranty.
 - c. Warranty.

1.5 WARRANTY

- A. Minimum of a five year Warranty from date of manufacture against failure for solid-state luminaire including LED arrays, LED drivers and integral control devices. The solid-state product is considered defective if more than 15 PCT of the individual light emitting diodes fail to illuminate.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. Provide LED luminaires to illuminate areas where new odor control system pipes and ducts create dark spots. Provide 40 foot-candles on floor with uniformity factor of 3 to 1
 - 2. Solid State Light Sources:
 - a. Cree.
 - b. Xicato.
 - c. Luminaire manufacturer's proprietary system.
 - 3. LED Driver: Luminaire manufacturer's standard.
 - 4. Emergency ballasts:
 - a. Iota Engineering.
 - b. Philips Bodine.
 - 5. Emergency transfer devices: Philips Bodine.

2.2 GENERAL REQUIREMENTS

- A. Luminaires complete with LED modules and drivers.
- B. Rated for area classification as indicated on the Drawings.
 - 1. In Class I, Division 1 and 2 areas, the temperature rating of the luminaires LED combination shall not exceed the auto-ignition temperature of the atmosphere in which the Luminaire is used.
- C. No live parts normally exposed to contact.
- D. When intended for use in wet areas: Mark luminaire "Suitable for wet locations."

2.3 LUMINAIRES

- A. Standards and Listings:
 - 1. Design Lights Consortium (DLC).
 - 2. UL 1598.
 - 3. UL 844 for hazardous locations.
- B. Castings:
 - 1. Uniform quality, free from imperfections affecting strength and appearance.
 - 2. Exterior surfaces, if not receiving a finish coat, shall be smooth and match adjacent surfaces. At least one coat of clear methacrylate lacquer shall be applied unless a painted finish is specified.
- C. Fasteners:
 - 1. Aluminum or steel luminaires: Cadmium-plated or an equivalent.

2. Stainless steel luminaires: Stainless steel.
 3. Bronze luminaires: Bronze or stainless steel.
 4. Non-metallic luminaires: Stainless steel.
- D. Finishes:
1. Painted surfaces:
 - a. Manufacturer's standard metal pretreatment and baked or air-dried, light-stabilized enamel finish; acrylic, alkyd, epoxy, polyester or polyurethane.
 - b. White finishes shall have minimum 85 PCT reflectance.
 2. Unpainted surfaces:
 - a. Interior: Clear anodic coating, satin finish.
 - b. Exterior: Clear anodic coating.
- E. Gaskets:
1. Gaskets at face plates or frames of recessed luminaires which serve as ceiling trim and which allow interior access.
 2. Moisture seal gaskets at exterior locations and in other designated wet areas.
 3. Secure frames to luminaire bodies with screws or other means, to result in tight installation, without light leaks.
- F. Ventilation:
1. Ventilation openings of adequate size and quantity to permit operation of fixture without affecting rated output or life expectancy. Include wire mesh screens.
- G. Wiring:
1. Factory-wired to be compatible with the project electrical and controls systems.
- H. Mounting Accessories:
1. Provide appropriate mounting accessories for each luminaire, compatible with various structural conditions encountered.
 2. All luminaires with adjustable beam angles shall have a locking device to ensure that the beam distribution is not effected during cleaning.
 3. Luminaire Suspension Material:
 - a. Unfinished Spaces:
 - 1) 1/2 IN minimum diameter swivel stem, unless otherwise noted.
 - 2) Safety chain on high bay type.
 - 3) For high bay and low bay LEDs fixtures:
 - a) Use stems suspended from swivel shock-absorbing fittings.

2.4 SOLID-STATE LUMINAIRES - ADDITIONAL REQUIREMENTS

- A. Standards:
1. IESNA LM-79, IESNA LM-80.
 2. NEMA SSL 1.
 3. UL 1012, 1310, and 8750.
 4. UL 844 for hazardous locations.
- B. Solid state modules and driver to be provided and warranted by luminaire manufacturer.
- C. Solid-State Modules:
1. Uniform color temperature of 4000K unless otherwise noted on the Luminaire schedule.
 - a. Color temperature measurement shall have a maximum 3 SDCM on the MacAdam Ellipse for frosted lensed luminaires, and 2 SDCM for other luminaire types (ANSI C78.377).
 2. Minimum color rendering index (CRI) of 80.
 3. LED module light output and efficacy: Measured in accordance with IESNA LM-79 standards.
 4. LED useful life and lumen maintenance: Measured in accordance with IESNA LM-80 standards.
 5. Driver and LED module: Minimum useful life of 50,000 HRS (L70).

6. Individual LEDs connected such that a failure of one LED will not result in a light output loss of the entire luminaire.

D. Driver:

1. Compatible with solid-state modules and control devices specified.
2. Operate from 60 Hz input source of 120V through 277V with sustained variations of ± 10 PCT (voltage and frequency).
3. Input current Total Harmonic Distortion (THD): Less than 20 PCT when operated at nominal line voltage.
4. Power Factor: Greater than 0.90.
5. Avoid interference with infrared devices and eliminate visible flicker.
6. Comply with ANSI C62.41 Category A for Transient protection.
7. Comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47 CFR part 18, Non-Consumer (Class A) for EMI/RFI (conducted and radiated).
8. Control device must be compatible with type of driver, and coordinated prior to submission of Shop Drawings.
9. Operating temperature range must be suitable for site temperature conditions within exterior and gasketed luminaires.

E. Emergency Battery Driver:

1. UL 924.
2. Confirm compatibility with LED modules utilized.
3. Consist of a high temperature, maintenance-free nickel cadmium battery, charger and electronic circuitry.
4. A solid state charging indicator light to monitor the charger and battery.
5. Single-pole test switch.
6. The following product family shall be selected based on coordination with LED lamp type:
 - a. Philips Bodine "BSL23C": can operate up to 4.5W at 410mA.
 - b. Philips Bodine "BSL26C": can operate up to 5.1W at 265mA.
 - c. Philips Bodine "BSL722 IN": can operate up to 23W at 770mA.
 - d. Philips Bodine "BSL23C": can operate up to 23W at 770mA in operating conditions ranging from -20 DEGC (-4 DEGF) to 60 DEGC (140 DEGF).
 - e. Alternate manufacturer: Iota.

F. Luminaire properly heat sunk to assure LED junction temperature ratings are not exceeded.

1. Provide ambient operating temperature range for which product is warranted.

2.5 EXIT SIGNS AND EMERGENCY LIGHTING UNITS

A. Standards:

1. UL 924.
2. NFPA 101.
3. Local State or City requirements.

B. Exit Signs:

1. Housing and finish: As indicated in the Luminaire Schedule.
2. LED illuminated with integral driver.
3. AC powered or AC and battery powered: As indicated in the Luminaire Schedule.
4. Battery powered units:
 - a. Battery type: As indicated in the Luminaire Schedule.
 - b. Self-testing/self-diagnostic.
 - 1) Electronic circuitry automatically test emergency lighting for a minimum of 30 seconds every 30 days and 90 minutes once a year.
 - c. Consist of batter, charger and electronic circuitry.
 - d. Solid state charging indicator light to monitor the charger and battery.
 - e. Single-pole test switch.

- f. A user selectable audible alarm. The alarm shall be engaged unless noted otherwise on the Drawings.
- C. Emergency Lighting Units:
- 1. Housing: As indicated in the Luminaire Schedule.
 - 2. Lamps: As indicated in the Luminaire Schedule.
 - 3. Battery type: As indicated in the Luminaire Schedule.
 - 4. Self-testing/self-diagnostic.
 - a. Electronic circuitry automatically test emergency lighting for a minimum of 30 seconds every 30 days and 90 minutes once a year.
 - 5. Consist of batter, charger and electronic circuitry.
 - 6. Solid state charging indicator light to monitor the charger and battery.
 - 7. Single-pole test switch.
 - 8. A user selectable audible alarm. The alarm shall be engaged unless noted otherwise on the Drawings.
- D. Emergency Circuit Transfer Device:
- 1. Transfer device permits emergency lights to be switched under normal conditions and automatically transfers to unswitched emergency circuit upon power interruption.
 - 2. Multiple luminaire switching:
 - a. Up to 20A.
 - b. Mounting as indicated on the Drawings.
 - c. Acceptable product family:
 - 1) Philips Bodine GTD20A or equal.
 - 3. Individual luminaire switching:
 - a. Mount on top of luminaire or in ballast channel.
 - b. Acceptable product family:
 - 1) Philips Bodine GTD or equal.
 - c.
 - d.

2.6 MAINTENANCE MATERIALS

- A. Furnish a minimum of 2 or 10 PCT of total of each type and wattage of LED fixtures, whichever is greater.
- B. Furnish a minimum of 10 PCT of total of each type and amperage of fuses for fixtures indicated to be fused.
- C. Spare parts are to be stored in a box clearly labeled as to its contents.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Coordinate Luminaire Types with Ceiling Construction:
 - 1. Provide mounting hardware for the ceiling system in which the luminaire is to be installed.
- B. Fasten luminaires supported by suspended ceiling systems to ceiling framing system with hold down clips.
- C. Provide mounting brackets and/or structural mounting support for wall-mounted luminaires.
 - 1. Do not support luminaire from conduit system.
 - 2. When luminaire is supported from outlet boxes, install per NFPA 70.
 - 3. Supports for luminaire mounted on exterior walls shall not be attached to exterior face of the wall.
- D. Support surface mounted luminaires from the building structure and not from the ceiling suspension system.

1. Luminaires up to 4 FT wide and 4 FT long: A minimum of four supporting points, one at each corner.
 2. Luminaires smaller than 2 FT in length: A minimum of two supporting points.
- E. Provide pendant luminaires with swivel hangers which will allow luminaire to swing in any direction but will not permit stem to rotate.
1. Provide hangers with enclosure rating (NEMA 1, 4, or 7) equal to enclosure requirements of area in which they are installed.
 2. Swivel hangers for luminaires in mechanical equipment areas: Shock absorbing type.
 3. Secure low and high bay luminaires with safety chain or safety aircraft cable to the building structure.
 - a. Chain or cable to prevent luminaire from falling more than 3 IN before the luminaire is caught by the chain or cable.
- F. Mount luminaire at heights to avoid interference with ductwork and pipes and not lower than 10 ft. above finish floor.
- G. Install exterior luminaires so that water cannot enter or accumulate in the wiring compartment.

3.2 ADJUST AND CLEAN

- A. See Specification Section 01 74 13.
- B. Replace all inoperable fixtures with new fixtures prior to final acceptance.
- C. Aim all emergency lighting units, so that, the path of egress is illuminated.

END OF SECTION

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DIVISION 40

PROCESS INTERCONNECTIONS



SECTION 40 05 00
PIPE AND PIPE FITTINGS – BASIC REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Process piping systems.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
 - 3. Section 10 14 00 - Identification Devices.
 - 4. Section 40 05 07 - Pipe Support Systems.
 - 5. Section 40 05 51 - Valves: Basic Requirements.
 - 6. Section 40 10 16 - Odor Control Duct and Accessories.
 - 7. Section 40 41 13 - Heat Tracing Cable.
 - 8. Section 40 42 00 - Pipe, Duct and Equipment Insulation.
 - 9. Section 40 73 00 - Pressure Instrumentation.
 - 10. Section 40 91 10 - Primary Meters and Transmitters.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American Society of Mechanical Engineers (ASME):
 - a. B40.100, Pressure Gauges and Gauge Attachments.
 - 2. ASTM International (ASTM):
 - a. D1785, Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
 - b. D2466, Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
 - c. D2467, Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
 - 3. International Plumbing Code (IPC).
 - 4. Underwriters Laboratories, Inc. (UL).
- B. Coordinate flange dimensions and drillings between piping, valves, and equipment.

1.3 DEFINITIONS

- A. PVDF: Polyvinylidene fluoride.
- B. For the purposes of this Section, FA and TA ductwork shall be considered process piping.

1.4 SYSTEM DESCRIPTION

- A. Piping Systems Organization and Definition:
 - 1. Piping services are grouped into designated systems according to the chemical and physical properties of the fluid conveyed, system pressure, piping size and system materials of construction.
 - 2. See PIPING SPECIFICATION SCHEDULES in PART 3.

1.5 SUBMITTALS

- A. Shop Drawings:
 - 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 - 2. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.

- b. Copies of manufacturer's written directions regarding material handling, delivery, storage and installation.
- c. Separate schedule sheet for each piping system scheduled in this Specification Section showing compliance of all system components.
 - 1) Attach technical product data on gaskets, pipe, fittings, and other components.
- 3. Fabrication and/or Layout Drawings:
 - a. Interior and exterior above grade piping drawings (minimum scale 1/8 IN equals 1 FT) with information including:
 - 1) Dimensions of piping from column lines or wall surfaces.
 - 2) Centerline dimensions of piping.
 - 3) Centerline elevation and size of intersecting ductwork, conduit/conduit racks, or other potential interferences requiring coordination.
 - 4) Location and type of pipe supports and anchors.
 - 5) Locations of valves and valve actuator type.
 - 6) Details of fittings, tapping locations, equipment connections, flexible expansion joints, connections to equipment, and related appurtenances.
 - 7) Acknowledgement of valve, equipment and instrument tag numbers.
 - 8) Provisions for expansion and contraction.
 - 9) Line slopes and air release vents.
 - 10) Rough-in data for plumbing fixtures.
 - b. Schedule of interconnections to existing piping and method of connection.
- B. Contract Closeout Information:
 - 1. Operation and Maintenance Data:
 - a. See Specification Section 01 33 04 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
- C. Informational Submittals:
 - 1. Qualifications of lab performing disinfection analysis on water systems.
 - 2. Test reports:
 - a. Copies of pressure test results on all piping systems.
 - b. Reports defining results of dielectric testing and corrective action taken.
 - c. Disinfection test report.
 - d. Notification of time and date of piping pressure tests.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect pipe coating during handling using methods recommended by manufacturer.
 - 1. Use of bare cables, chains, hooks, metal bars or narrow skids in contact with coated pipe is not permitted.
- B. Prevent damage to pipe during transit.
 - 1. Repair abrasions, scars, and blemishes.
 - 2. If repair of satisfactory quality cannot be achieved, replace damaged material immediately.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. Insulating unions:
 - a. "Dielectric" by Epco.
 - 2. Dielectric flange kit:
 - a. PSI.
 - b. Maloney.
 - c. Central Plastics.
- B. Submit request for substitution in accordance with Specification Section 01 25 13.

2.2 PIPING SPECIFICATION SCHEDULES

- A. Piping system materials, fittings and appurtenances are subject to requirements of specific piping specification schedules located at the end of PART 3 of this Specification Section.

2.3 COMPONENTS AND ACCESSORIES

- A. Insulating Components:
 - 1. Dielectric flange kits:
 - a. Flat faced.
 - b. 1/8 IN thick dielectric gasket, phenolic, non-asbestos.
 - c. Suitable for 175 PSI, 210 DEGF.
 - d. 1/32 IN wall thickness bolt sleeves.
 - e. 1/8 IN thick phenolic insulating washers.
 - 2. Dielectric unions:
 - a. Screwed end connections.
 - b. Rated at 175 PSI, 210 DEGF.
 - c. Provide dielectric gaskets suitable for continuous operation at union rated temperature and pressure.
- B. Reducers:
 - 1. Furnish appropriate size reducers and reducing fittings to mate pipe to equipment connections.
 - 2. Connection size requirements may change from those shown on Drawings depending on equipment furnished.
- C. Pressure Gages:
 - 1. See Specification Section 01 61 03 and Specification Section 40 91 10.
- D. Valves:
 - 1. See schematics and details for definition of manual valves used in each system under 4 IN in size.
 - a. See Drawings for damper locations, sizes and actuation type.
 - 2. See Specification Section 40 05 51.

PART 3 - EXECUTION

3.1 INTERIOR AND EXPOSED EXTERIOR PIPING INSTALLATION

- A. Install piping in vertical and horizontal alignment as shown on Drawings.
- B. Alignment of piping smaller than 4 IN may not be shown; however, install according to Drawing intent and with clearance and allowance for:
 - 1. Expansion and contraction.
 - 2. Operation and access to equipment, doors, windows, hoists, moving equipment.
 - 3. Headroom and walking space for working areas and aisles.
 - 4. System drainage and air removal.
- C. Enter and exit through structure walls, floor and ceilings using penetrations and seals specified in Specification Section 01 73 20 and as shown on the Drawings.
- D. Install vertical piping runs plumb and horizontal piping runs parallel with structure walls.
- E. Pipe and Duct Support:
 - 1. Use methods of piping and duct support as required in Specification Section 40 05 07.
 - 2. Where pipes run parallel and at same elevation or grade, they may be grouped and supported from common trapeze-type hanger, provided hanger rods are increased in size as specified for total supported weight.
 - a. The pipe in the group requiring the least maximum distance between supports shall set the distance between trapeze hangers.
 - 3. Size pipe supports with consideration to specific gravity of liquid being piped.

- F. Locate and size sleeves and castings required for piping system.
 - 1. Arrange for chases, recesses, inserts or anchors at proper elevation and location.
- G. Use reducing fittings throughout piping systems.
 - 1. Bushings will not be allowed unless specifically approved.
- H. Equipment Drainage and Miscellaneous Piping:
 - 1. Provide drip pans and piping at equipment where condensation may occur.
 - 2. Hard pipe stuffing box leakage to nearest floor drain.
 - 3. Avoid piping over electrical components such as motor control centers, panelboards, etc.
 - a. If piping must be so routed, utilize 16 GA, 316 stainless steel drip pan under piping and over full length of electrical equipment.
 - b. Hard pipe drainage to nearest floor drain.
 - 4. Collect system condensate at drip pockets, traps and blowoff valves.
 - 5. Provide drainage for process piping at locations shown on Drawings in accordance with Drawing details.
 - 6. For applications defined above and for other miscellaneous piping which is not addressed by a specific piping service category in PART 1, provide 304 stainless steel piping and fittings.
 - a. Size to handle application with 3/4 IN being minimum size provided.
 - 7. Install all chemical drains (CD) with a 2 PCT slope (in horizontal) to drain point.
- I. Unions:
 - 1. Install in position which will permit valve or equipment to be removed without dismantling adjacent piping.
 - 2. Additional flange unions are not required at flanged connections.
- J. Install expansion devices as necessary to allow expansion/contraction movement.
- K. Provide full face gaskets on all systems.
- L. Anchorage and Blocking:
 - 1. Block, anchor, or harness exposed piping subjected to forces in which joints are installed to prevent separation of joints and transmission of stress into equipment or structural components not designed to resist those stresses.
- M. Equipment Pipe Connections:
 - 1. Equipment - General:
 - a. Exercise care in bolting flanged joints so that there is no restraint on the opposite end of pipe or fitting which would prevent uniform gasket pressure at connection or would cause unnecessary stresses to be transmitted to equipment flanges.
 - b. Where push-on joints are used in conjunction with flanged joints, final positioning of push-on joints shall not be made until flange joints have been tightened without strain.
 - c. Tighten flange bolts at uniform rate which will result in uniform gasket compression over entire area of joint.
 - 1) Provide tightening torque in accordance with manufacturer's recommendations.
 - d. Support and match flange faces to uniform contact over their entire face area prior to installation of any bolt between the piping flange and equipment connecting flange.
 - e. Permit piping connected to equipment to freely move in directions parallel to longitudinal centerline when and while bolts in connection flange are tightened.
 - f. Align, level, and wedge equipment into place during fitting and alignment of connecting piping.
 - g. Grout equipment into place prior to final bolting of piping but not before initial fitting and alignment.
 - h. To provide maximum flexibility and ease of alignment, assemble connecting piping with gaskets in place and minimum of four (4) bolts per joint installed and tightened.
 - 1) Test alignment by loosening flange bolts to see if there is any change in relationship of piping flange with equipment connecting flange.
 - 2) Realign as necessary, install flange bolts and make equipment connection.
 - i. Provide utility connections to equipment shown on Drawings, scheduled or specified.

2. Plumbing and HVAC equipment:
 - a. Make piping connections to plumbing and HVAC equipment, including but not limited to installation of fittings, strainers, pressure reducing valves, flow control valves and relief valves provided with or as integral part of equipment.
 - b. Furnish and install sinks, fittings, strainers, pressure reducing valves, flow control valves, pressure relief valves, and shock absorbers which are not specified to be provided with or as integral part of equipment.
 - c. For each water supply piping connection to equipment, furnish and install union and gate or angle valve.
 - 1) Provide wheel handle stop valve at each laboratory sink water supply.
 - 2) Minimum size: 1/2 IN.
 - d. Furnish and install "P" trap for each drain system as shown on the Drawings.

N. Provide insulating components where dissimilar metals are joined together.

- O. Instrument Connections:
1. See Drawing details.

3.2 PRESSURE GAGES

- A. Provide at locations shown on the Drawings and specified.
- B. See Specification Section 01 61 03 and 40 73 00.

3.3 FIELD QUALITY CONTROL

- A. Pipe Testing - General:
 1. Test piping systems as follows:
 - a. Test exposed, non-insulated piping systems upon completion of system.
 - b. Test exposed, insulated piping systems upon completion of system but prior to application of insulation.
 - c. Test concealed interior piping systems prior to concealment and, if system is insulated, prior to application of insulation.
 2. Utilize pressures, media and pressure test durations as specified in the PIPING SPECIFICATION SCHEDULES.
 3. Isolate equipment which may be damaged by the specified pressure test conditions.
 4. Perform pressure test using calibrated pressure gages and calibrated volumetric measuring equipment to determine leakage rates.
 - a. Select each gage so that the specified test pressure falls within the upper half of the gage's range.
 - b. Notify the Engineer 24 HRS prior to each test.
 5. Completely assemble and test new piping systems prior to connection to existing pipe systems.
 6. Acknowledge satisfactory performance of tests and inspections in writing to Engineer prior to final acceptance.
 7. Bear the cost of all testing and inspecting, locating and remedying of leaks and any necessary retesting and re-examination.
- B. Pressure Testing:
 1. Allowable leakage rates:
 - a. Hazardous gas systems, all exposed piping systems, and all pressure piping systems which are hydrostatically pressure tested shall have zero leakage goal at the specified test pressure throughout the duration of the test.
 - b. Non-hazardous gas and air systems which are tested with air shall have a maximum pressure drop of 5 PCT of the specified test pressure throughout the duration of the test.
 - c. Foul Air and Treated Air systems shall be tested per Section 40 10 16.
 - d. For low pressure (less than 25 PSIG) air testing, the acceptable time for loss of 1 PSIG of air pressure shall be:

PIPE SIZE (IN DIA)	TIME, MINUTES/100 FT
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PIPE SIZE (IN DIA)	TIME, MINUTES/100 FT
4	0.3
6	0.7
8	1.2
10	1.5
12	1.8
15	2.1
18	2.4
21	3.0
24	3.6
27	4.2
30	4.8
33	5.4
36	6.0
42	7.3
48	7.6

2. Hydrostatic pressure testing methodology:
 - a. General:
 - 1) All joints, including welds, are to be left exposed for examination during the test.
 - 2) Provide additional temporary supports for piping systems designed for vapor or gas to support the weight of the test water.
 - 3) Provide temporary restraints for expansion joints for additional pressure load under test.
 - 4) Isolate equipment in piping system with rated pressure lower than pipe test pressure.
 - 5) Do not coat or insulate exposed piping until successful performance of pressure test.
 - b. Soil, waste, drain and vent systems:
 - 1) Test at completion of installation of each stack or section of piping by filling system with water and checking joints and fittings for leaks.
 - 2) Eliminate leaks before proceeding with work or concealing piping.
 - 3) Minimum test heights shall be 10 FT above highest stack inlet.
3. Air testing methodology:
 - a. General:
 - 1) Assure air is ambient temperature.
 - 2) See Section 40 10 16 for additional requirements for FA and TA systems.
 - b. Low pressure air testing:
 - 1) Place plugs in line and inflate to manufacturer's designated seal pressure.
 - 2) Check plugs for proper sealing.
 - 3) Introduce low pressure air into sealed line segment until air pressure reaches 4 PSIG greater than ground water or allowable limits of ASTM F1417.
 - a) Use test gage conforming to ASME B40.100 with 0 to 15 PSI scale and accuracy of 1 PCT of full range.
 - 4) Allow 2 minutes for air pressure to stabilize.
 - 5) After stabilization period (3.5 PSIG minimum pressure in pipe) discontinue air supply to line segment.
 - 6) Record pressure at beginning and end of test.

3.4 CLEANING, DISINFECTION AND PURGING

- A. Cleaning:
1. Clean interior of piping systems thoroughly before installing.
 2. Maintain pipe in clean condition during installation.
 3. Before jointing piping, thoroughly clean and wipe joint contact surfaces and then properly dress and make joint.
 4. At completion of work and prior to Final Acceptance, thoroughly clean work installed under these Specifications.
 - a. Clean equipment, fixtures, pipe, valves, and fittings of grease, metal cuttings, and sludge which may have accumulated by operation of system, from testing, or from other causes.
 - b. Repair any stoppage or discoloration or other damage to parts of building, its finish, or furnishings, due to failure to properly clean piping system, without cost to Owner.

3.5 PIPE INSULATION

- A. Insulate pipe and pipe fittings in accordance with Specification Section 40 42 00.

3.6 GASKET MATERIAL SCHEDULE

3.7 PIPING SYSTEM SCHEDULES

A. SYSTEMS AND SCHEDULES

Name	Abbreviation	System
Foul Air	FA	See Specification 40 10 16
Treated Air	TA	See Specification 40 10 16
Chemical Drain	CD	7

B. SPECIFICATION SCHEDULE - SYSTEM 7

1. General:
 - a. Piping symbol and service:
 - b. Test requirements pressure lines:
 - 1) Test medium: Water.
 - 2) Pressure: no more than 0.5 PSI.
 - 3) Duration: 6 HRS.
 - c. Gaskets and O-rings:
 - 1) PTFE.
2. System components:
 - a. Pipe size 12 IN and smaller:
 - 1) Exposed service:
 - a) Material: PVC, Type 1, Grade 1, Schedule 80. See Section 40 05 31.
 - b) Reference: ASTM D1785.
 - c) Lining: None.
 - d) Coating: None.
 - e) Fittings: Solvent welded socket type complying with ASTM D2467.
 - f) Joints: Solvent welded with unions at valves, penetrations through structures and equipment connections for pipe 2 IN and less and flanges at those locations for pipe above 2 IN.
 - g) Installation: Slope pipe to low point as required per this Section.

END OF SECTION

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SECTION 40 05 07
PIPE SUPPORT SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Pipe and Duct Support and Anchor Systems.
 - 2. Design of Pipe and Duct Support Systems as specified.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
 - 3. Section 01 81 10 – Wind and Seismic Design Criteria
 - 4. Section 03 15 19 - Anchorage to Concrete.
 - 5. Section 40 42 00 - Pipe, Duct and Equipment Insulation.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American Society of Mechanical Engineers (ASME):
 - a. B31.1, Power Piping.
 - b. B31.3, Process Piping.
 - 2. ANVIL International (ANVIL).
 - 3. ASTM International (ASTM):
 - a. A36, Standard Specification for Carbon Structural Steel.
 - b. A276, Standard Specification for Stainless Steel Bars and Shapes.
 - c. A575, Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades.
 - d. A576, Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality.
 - e. A917, Standard Specification for Steel Sheet, Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface (General Requirements).
 - f. A918, Standard Specification for Steel Sheet, Zinc-Nickel Alloy Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface.
 - g. B633, Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
 - 4. American Welding Society (AWS):
 - a. D1.1, Structural Welding Code - Steel.
 - b. D1.6, Structural Welding Code – Stainless Steel.
 - 5. Manufacturers Standardization Society of the Valve and Fittings Industry Inc. (MSS):
 - a. SP-58, Pipe Hangers and Supports - Materials, Design and Manufacture.
 - b. SP-69, Pipe Hangers and Supports - Selection and Application.
 - 6. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):
 - a. HVAC Duct Construction Standards
 - b. Round Industrial Duct Construction Standards
 - c. Seismic Restraint Manual – Guidelines for Mechanical Systems
- B. Responsibility:
 - 1. Design complete support systems for all piping and ductwork.
 - 2. Provide all labor, materials, equipment and incidentals as shown, specified and required to design, furnish and install the system of hangers, supports, guidance, anchorage and appurtenances.
- C. Each type of pipe hanger or support shall be the product of one manufacturer.

D. Qualifications:

1. Pipe support designer:
 - a. Licensed Professional Engineer registered in the state of Alaska.
 - b. Minimum of 5 years experience designing pipe supports for projects of similar size and complexity.

1.3 SUBMITTALS

A. Shop Drawings:

1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
2. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's installation instructions.
 - c. Itemized list of wall sleeves, anchors, support devices and all other items related to pipe support system.
 - d. Scaled drawings showing location, installation, material, loads and forces, and deflection of all hangers and supports.
 - e. Anchorage type and details.
 - f. Include concrete support pad design as required to accommodate pipe support system.
3. System Design and Calculations:
 - a. Analysis of each pipe and duct system for all loads and forces on hangers and supports and their reaction forces to the structure to which they are fastened.
 - b. Duct and pipe support calculations for all applicable loads including dead load, live load, wind load, snow load, seismic forces and thermal expansion and contraction loads.
 - c. Calculations and design shall be sealed by a Professional Engineer registered in the state of Alaska.
4. Certifications.
 - a. Support designer qualifications.
 - b. Support system approval from pipe or duct manufacturer.
 - 1) All support system designs shall include written documentation from the pipe or duct manufacturer that the support design is acceptable for the specified pipe or duct.

1.4 DEFINITIONS

- A. This section applies to both pipe and ductwork systems. The requirements noted for "pipe" shall also apply to ductwork unless explicitly indicated otherwise in this Section.
- B. Corrosive Areas: for the purpose of this specification section, all interior areas of the project are considered corrosive.
- C. Hazardous Areas: Areas shown in the Contract Documents as having a Class I area classification.
- D. Wet/Washdown Areas: for the purpose of this specification section, all areas of the project (interior and exterior) are considered wet areas.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the manufacturers listed in the applicable Articles below are acceptable.
- B. Submit request for substitution in accordance with Specification Section 01 25 13.

2.2 MANUFACTURED UNITS

A. General:

1. Materials listed in Part 2.2 of this Section represent standard galvanized supports for non-corrosive, wet area service.
 - a. Equivalent components made from the same manufacturer, but of corrosion resistant material as defined in this Section, shall be substituted as required by Part 2.3.
2. Galvanized components:
 - a. Hot-dipped galvanized components: See Specification Section 05 50 00.
3. Dissimilar metals protection:
 - a. Galvanized-to-galvanized and galvanized-to-aluminum: No protection required.
 - b. All other galvanized-to-dissimilar metal connections: Neoprene or nylon pads, shims, grommets, etc.

B. Hanger Rods:

1. Material:
 - a. ASTM A36.
 - b. ASTM A575, Grade M1020.
 - c. ASTM A576, Grade 1020.
 - d. Minimum allowable tensile stress of 12,000 PSI at 650 DEGF per MSS SP-58.
2. Continuously threaded.
3. Electro-galvanized or cadmium plated after threads are cut.
4. Load limit:

NOMINAL ROD DIAMETER	MAXIMUM SAFE LOAD, (LBS)
3/8 IN DIA (min)	610
1/2 IN DIA	1,130
5/8 IN DIA	1,810
3/4 IN DIA	2,710
7/8 IN DIA	3,770
1 IN DIA	4,960

C. Hangers:

1. Materials: Cadmium plated or galvanized.
2. Hanger type schedule:

APPLICATION	PIPE SIZE	HANGER TYPE
All except noted	4 IN and less	ANVIL Figure 108 with Figure 114
All except noted	Over 4 IN	ANVIL Figure 590
Service in chemical storage areas and as indicated on drawings for corrosion resistance	All	CorPro CP - Hanger or equal

D. Concrete Inserts for Hanger Rods:

1. Continuous slots: Unistrut #P1000.
2. Individual inserts: ANVIL Figure 281.
3. See Specification Section 03 15 19, mechanical anchors.

E. Beam Clamps for Hanger Rods:

1. Heavy duty.

2. ANVIL Figure 134.
- F. Trapeze Hangers for Suspended Piping:
1. General:
 - a. Material: Steel.
 - b. Galvanized.
 - c. Angles, channels, or other structural shapes.
 - d. Curved roller surfaces at support point corresponding with type of hanger required.
 2. In chemical storage and feed areas and as indicated on the drawings:
 - a. Materials: FRP.
 - b. Unistrut fiberglass channel or equal.
- G. Vertical Pipe Supports:
1. At base of riser.
 2. Lateral movement:
 - a. Clamps or brackets.
- H. Pipe Support Saddle:
1. For pipe located 3 FT or less from floor elevation, except as otherwise indicated on Drawings.
 2. ANVIL Figure 264.
- I. Pipe Support Risers:
1. Schedule 40 pipe.
 2. Galvanized.
 3. Size: As recommended by saddle manufacturer.
- J. Pipe Support Base Plate:
1. 4 IN larger than support.
 2. Collar 3/16 IN thickness, circular in shape, and sleeve type connection to pipe.
 3. Collar fitted over outside of support pipe and extended 2 IN from floor plate.
 4. Collar welded to floor plate.
 5. Edges ground smooth.
 6. Assembly hot-dipped galvanized after fabrication.
- K. Pipe Covering Protection Saddle:
1. For insulated pipe at point of support.
 2. ANVIL Figure 167, Type B.
- L. Wall Brackets:
1. For pipe located near walls and 8 FT or more above floor elevation or as otherwise indicated on the Drawings.
 2. ANVIL Figure 199.
- M. Channels:
1. 1-5/8 IN wide x 1-5/8 IN deep.
 2. 12 gauge minimum.
 3. Powerstrut, Unistrut, or approved equal.

2.3 DESIGN REQUIREMENTS

- A. Materials of Construction:
1. Exterior: 304 SST or hot dip galvanized.
 2. Building #1 Interior:
 - a. 316 SST.
 3. Building #2 Interior:
 - a. 316 SST.
- B. Site specific support requirements:
1. All support designs shall assume material in duct or pipe is hazardous.

2. Interior supports used for Building #1 or #2 that attach to the floor slab shall utilize non-shrink grout under base plates per Section 03 09 00.
3. Exterior supports anchored at grade shall include concrete support pads designed per the exterior concrete slab details shown in the Contract Drawings.
4. Attachments to existing wall or roof panels is not permitted.
5. Permissible load attachments to existing Building #1 and #2:
 - a. Longitudinal loading on purlins:
 - 1) Distributed loading: 2.5 plf.
 - 2) Concentrated loading: 25 lbs.
 - b. Longitudinal loading on frame beams:
 - 1) Distributed loading: 20 plf.
 - 2) Concentrated loading: 600 lbs.
- C. Seismic, wind and snow load bracing shall be provided for all pipe and duct per Section 01 81 10.
- D. Design all pipe supports accounting for internal pressure and thrust of piping system during service and testing conditions.
- E. Support anchorage per Section 03 15 19.
- F. Pipe supports and anchor points shall be located to avoid conflicting with plant processes or access required by operators for maintenance, control, or safety. Supports that prevent access to systems or equipment, or otherwise would limit safe access by the operations staff, will not be permitted.
- G. Use of existing supports for new pipe systems is permitted as long the pipe support design per this sections demonstrates that the existing support can accommodate both the existing and new loads.
- H. Minimize deflection to 0.5 percent of the pipe diameter or per the manufacturer's recommendations, whichever is less.
- I. Duct (HVAC duct, FA and TA systems) support design shall comply with the SMACNA Seismic Restraint Manual, SMACNA HVAC Duct Construction Standards and Round Industrial Duct Construction Standards.
- J. Supports capable of supporting the pipe for all service and testing conditions.
 1. Provide 5 to 1 safety factor.
- K. Support type and design shall be approved in writing by the manufacturer of the pipe or duct. Use of supports not explicitly approved by the pipe/duct system manufacturer is prohibited.
- L. Supports for FA and TA ductwork shall be supported at the base by a saddle extending a minimum of 120 degrees along the invert.
 1. Saddle width shall be a minimum of 4 inches.
- M. Allow free expansion and contraction of the piping to prevent excessive stress resulting from service and testing conditions or from weight transferred from the piping or attached equipment.
- N. Hangers are to be securely fastened to avoid vibration and care shall be taken to install hangers so as to avoid creating conditions of stress in the finished installation.
- O. Design supports and hangers to allow for proper pitch of pipes.
- P. For chemical and waste piping, design, materials of construction and installation of pipe hangers, supports, guides, restraints, and anchors:
 1. ASME B31.3.
 2. MSS SP-58 and MSS SP-69.
 3. Except where modified by this Specification.
 4. Accommodate pipe slope as needed.

- Q. Check all physical clearances between piping, support system and structure.
 - 1. Provide for vertical adjustment after erection.
- R. Support vertical pipe runs in pipe chases at base of riser.
 - 1. Support pipes for lateral movement with clamps or brackets.
- S. Place hangers are to be installed on outside of pipe insulation.
 - 1. Use a pipe covering protection saddle for insulated pipe at support point.
 - 2. Insulated piping 1-1/2 IN and less:
 - a. Provide a 9 IN length of high density perlite or high density calcium silicate at saddle.
 - b. See Specification Section 40 42 00.
 - 3. Insulated piping over 1-1/2 IN: Provide a 12 IN length of high density perlite or high density calcium silicate at saddle.
- T. Provide 20 GA galvanized steel pipe saddle for fiberglass and plastic support points to ensure minimum contact width of 4 IN.
- U. Pipe Support Spacing:
 - 1. General:
 - a. Factor loads by specific weight of liquid conveyed if specific weight is greater than water.
 - b. Maximum span shown shall be used only if permitted by the pipe/duct manufacturer. If a shorter span is required by the manufacturer, the manufacturer's requirements shall dictate.
 - c. Locate pipe supports at maximum spacing scheduled unless indicated otherwise on the Drawings.
 - d. Provide at least one (1) support for each length of pipe at each change of direction and at each valve, damper, filter and on each side of an expansion joint.
 - 2. Steel, stainless steel, cast-iron pipe or duct support schedule:

PIPE SIZES - IN	MAXIMUM SPAN - FT
1-1/2 and less	5
2 thru 4	10
5 thru 8	12
10 and greater	12

- 3. Copper pipe support schedule:

PIPE SIZES - IN	MAXIMUM SPAN - FT
2-1/2 and less	5
3 thru 6	10
8 and greater	15

- 4. PVC pipe support schedule:

PIPE SIZES - IN	MAXIMUM SPAN - FT
1-1/4 and less	3
1-1/2 thru 3	4
4 and greater	5

* Maximum fluid temperature of 120 DEGF.

5. Support each length and every fitting:
 - a. Bell and spigot piping:
 - 1) At least one (1) hanger.
 - 2) Applied at bell.
 - b. Mechanical coupling joints:
 - 1) Place hanger within 2 FT of each side of fittings to keep pipes in alignment.
6. Space supports for soil and waste pipe and other piping systems not included above every 5 FT.
7. Provide continuous support for nylon tubing.
8. For PVC piping:
 - a. Provide Unistrut Unicushion wrap of pipe at each support.

PART 3 - EXECUTION

3.1 DESIGN

- A. Project Engineer's Bidding Drawings contain information on duct routing relative to the existing structures. Duct support design shall be the responsibility of the Duct supplier and Contractor. Sealed layout drawings are to be provided for review and approval prior to fabrication and installation.
- B. Coordinate final location of supports with existing utilities (process piping, conduit, lighting, etc.) and field verify clearances before submitting layout shop drawings.

3.2 INSTALLATION

- A. Provide piping systems exhibiting pulsation, vibration, swaying, or impact with suitable constraints to correct the condition.
 1. Included in this requirement are movements from:
 - a. Trap discharge.
 - b. Water hammer.
 - c. Similar internal forces.
- B. Weld Supports:
 1. AWS D1.1.
 2. Weld anchors to pipe in accordance with ASME B31.3.
- C. Locate piping and pipe supports as to not interfere with open accesses, walkways, platforms, and with maintenance or disassembly of equipment.
- D. Inspect hangers for:
 1. Design offset.
 2. Adequacy of clearance for piping and supports in the hot and cold positions.
 3. Guides to permit movement without binding.
 4. Adequacy of anchors.
- E. Inspect hangers after erection of piping systems and prior to pipe testing and flushing.
- F. Anchorage to Concrete- reference Section 03 15 19.
- G. Install individual or continuous slot concrete inserts for use with hangers for piping and equipment.
 1. Install concrete inserts as concrete forms are installed.
- H. Welding:
 1. Welding rods: ASTM and AWS standards.
 2. Integral attachments:
 - a. Include welded-on ears, shoes, plates and angle clips.
 - b. Ensure material for integral attachments is of good weldable quality.
 3. Preheating, welding and postheat treating: ASME B31.3, Chapter V.

4. Field welding of SST shall include post-welding grinding and passivation to remove heat damage and fully establish corrosion resistance of the SST.
 - a. Follow all applicable requirements and standards of AWS D1.6 for SST welding.
 - b. Welding connections directly to any SST pipe or duct shall not be permitted.

END OF SECTION

SECTION 40 05 31
PIPE - PLASTIC

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Plastic pipe.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
 - 3. Section 40 05 00 - Pipe and Pipe Fittings: Basic Requirements.

1.2 QUALITY ASSURANCE

- A. See Specification Section 40 05 00.
- B. Referenced Standards:
 - 1. ASTM International (ASTM):
 - a. PVC (polyvinyl chloride) materials:
 - 1) D1784, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
 - 2) D1785, Standard Specification for Poly(Vinyl Chloride) PVC Plastic Pipe, Schedules 40, 80 and 120.
 - 3) D2467, Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
 - 4) F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

1.3 SUBMITTALS

- A. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
- B. See Specification Section 40 05 00.

PART 2 - PRODUCTS

2.1 PVC PRESSURE PIPING (EXPOSED)

- A. General:
 - 1. Provide Schedule 80 pipe with Schedule 80 fittings and appurtenances to locations shown on Drawings.
 - 2. Furnish materials in full compliance to following material specifications:
 - a. Manufacture pipe, fittings and appurtenances from polyvinyl chloride (PVC) compound which meets the requirements of Type 1, Grade 1 (12454-B) Polyvinyl Chloride as outlined in ASTM D1784.
 - b. Manufacture pipe, fittings and valves from materials that have been tested and approved for conveying potable water by the NSF.
- B. Pipe:
 - 1. Furnish pipe meeting requirements of ASTM D1785.
 - 2. Pipe 2 IN and less to be solvent welded.
 - a. Pipe joint primer and solvent cement: IPS-70 primer and IPS-724 solvent cement.
 - 3. Pipe larger than 2 IN may be either flanged or solvent welded unless shown otherwise on Drawings.

- C. Fittings: Provide ASTM D2467 PVC socket type fittings having the same pressure and temperature rating as the pipe.
- D. Flanges/Unions:
 - 1. Furnish flanges and unions at locations shown on Drawings.
 - 2. Provide either flanges or unions at valves, penetrations through structures and equipment connections.
 - 3. For pipe larger than 2 IN, provide 150 LB socket type PVC flange.
 - 4. For pipe 2 IN and less, provide socket type PVC union with Buna O-rings.
 - 5. Use flat, full faced natural rubber gaskets at flanged connections.
 - a. Furnish heavy hex head bolts, each with one (1) heavy hex nut, ASTM F593 Type 316 stainless steel.
 - 6. Use spacers supplied by pipe manufacturer when mating raised-faced flanges to other flanges.

2.2 PVC TUBING

- A. General: Provide nylon tubing with fittings and appurtenances as shown on Drawings.
- B. Materials:
 - 1. Furnish clear outer braided tubing with braid outside the walls.
 - 2. Have tubing manufactured of nylon with working temperatures from 5 to 180 DEGF.
 - 3. Design tubing with a minimum safety factor of 4 to 1 ratio of burst pressure to working pressure at maximum temperature.
 - 4. Provide tubing with working pressure of 75 PSI at 180 DEGF.
 - 5. Ensure that tubing is self-extinguishing and fire resistant.
- C. Fittings:
 - 1. Nylon fittings and connectors.
 - 2. Use barbed type adapters with stainless steel worm gear clamps.
 - 3. Provide fittings capable of withstanding temperatures from a -70 to 250 DEGF.
 - 4. Ensure fittings have the same pressure and temperature rating as the tubing.

PART 3 - EXECUTION

3.1 IDENTIFICATION

- A. Identify each length of pipe clearly at intervals of 5 FT or less.
 - 1. Include manufacturer's name and trademark.
 - 2. Nominal size of pipe, appurtenant information regarding polymer cell classification and critical identifications regarding performance specifications when applicable.

3.2 PVC PRESSURE PIPING

- A. Installation:
 - 1. Field threading PVC will not be permitted.
 - a. Perform required threaded connections or attachments by the use of factory molded socket by threaded adapters.
 - b. Female adapters are not acceptable.
 - 2. Perform installation procedures, handling, thrust blocking, connections, and other appurtenant operations in full compliance to the manufacturer's printed recommendations and in full observance to plan details when more stringent.
 - 3. Employ installation and pipe support practices and solvent welding all in compliance to the manufacturer's printed recommendation.
 - a. For vertical piping, band the pipe at intervals to rigidly support load of twice vertical load.
 - b. Do not clamp PVC tightly or restrict movement for expansion and contraction.
 - c. Slope pipe as required per the Contract Documents.

END OF SECTION

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SECTION 40 05 51
VALVES - BASIC REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Valving, actuators, and valving appurtenances.
- B. Related Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
 - 3. Section 01 61 03 - Equipment: Basic Requirements.
 - 4. Section 40 05 00 - Pipe and Pipe Fittings: Basic Requirements.
 - 5. Section 40 05 63 - Ball Valves.
 - 6. Section 40 10 16 – Odor Control Duct and Accessories.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American Society of Mechanical Engineers (ASME):
 - a. B1.20.1, Pipe Threads, General Purpose.
 - b. B16.1, Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
 - c. B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
 - 2. ASTM International (ASTM):
 - a. A126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 - b. D256, Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
 - c. D638, Standard Test Method for Tensile Properties of Plastics.
 - d. D648, Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.
 - e. D695, Standard Test Method for Compressive Properties of Rigid Plastics.
 - f. D2240, Standard Test Method for Rubber Property-Durometer Hardness.
 - 3. American Water Works Association (AWWA):
 - a. C207, Standard for Steel Pipe Flanges for Waterworks Service - Sizes 4 IN through 144 IN.
 - b. C504, Standard for Rubber-Seated Butterfly Valves.
 - c. C550, Standard for Protective Coatings for Valves and Hydrants.
 - d. C606, Standard for Grooved and Shouldered Joints.
 - 4. American Water Works Association/American National Standards Institute (AWWA/ANSI):
 - a. C111/A21.11, Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - 5. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - b. MG 1, Motors and Generators.
 - 6. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code (NEC).

1.3 DEFINITIONS

- A. The following are definitions of abbreviations used in this Specification Section or one (1) of the individual valve sections:
 - 1. CWP: Cold water working pressure.

2. SWP: Steam working pressure.
3. WOG: Water, oil, gas working pressure.
4. WWP: Water working pressure.

1.4 SUBMITTALS

- A. Shop Drawings:
 1. See Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 2. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's installation instructions.
 - c. Valve pressure and temperature rating.
 - d. Valve material of construction.
 - e. Special linings.
 - f. Valve dimensions and weight.
 - g. Valve flow coefficient.
 - h. Wiring and control diagrams for electric or cylinder actuators.
 - i. Short Circuit Current Rating (SCCR) nameplate marking per NFPA 70. Include any required calculations per Section 01 61 03.
 3. Test reports.
- B. Contract Closeout Information:
 1. Operation and Maintenance Data:
 - a. See Section 01 33 04 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
- C. Informational Submittals:
 1. Verification from valve actuator manufacturer that actuators have been installed properly, that all limit switches and position potentiometers have been properly adjusted, and that the valve actuator responds correctly to the valve position command.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, refer to individual valve Specification Sections for acceptable manufacturers.

2.2 MATERIALS

- A. Refer to individual valve Specification Sections.

2.3 VALVE ACTUATORS

- A. Valve Actuators - General:
 1. Provide actuators as shown on Drawings or specified.
 2. Counter clockwise opening as viewed from the top.
 3. Direction of opening and the word OPEN to be cast in handwheel or valve bonnet.
 4. Size actuator to produce required torque with a maximum pull of 80 LB at the maximum pressure rating of the valve provided and withstand without damage a pull of 200 LB on handwheel or chainwheel or 300 FT-pounds torque on the operating nut.
- B. Exposed Valve Manual Actuators:
 1. Provide for all exposed valves not having electric or cylinder actuators.
 2. Provide lever actuators for ball valves 3 IN DIA and smaller and for dampers.
 - a. Lever actuators for dampers shall have a minimum of 5 intermediate lock positions between full open and full close.
 - b. See Section 40 10 16 for damper actuators.

- c. Provide at least two (2) levers for each type and size of valve furnished.
- C. Valve Lockout Devices:
 - 1. Device manufactured from same material as valve operator, preventing access to valve operator, to accept lock shackle.

2.4 FABRICATION

- A. End Connections:
 - 1. Provide the type of end connections for valves as required in the Piping Schedules presented in Section 40 05 00 or as shown on the Drawings.
 - 2. Comply with the following standards:
 - a. Threaded: ASME B1.20.1.
 - b. Flanged: ASME B16.1, Class 125 unless otherwise noted or AWWA C207.
 - c. Soldered: ASME B16.18.
 - d. Grooved: Rigid joints per Table 5 of AWWA C606.
- B. Refer to individual valve Specification Sections for specifications of each type of valve used on Project.
- C. Nuts, Bolts, and Washers:
 - 1. Wetted or internal to be bronze or stainless steel.
 - a. Exposed to be zinc or cadmium plated.
- D. On Insulated Piping: Provide valves with extended stems to permit proper insulation application without interference from handle.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Support exposed valves and piping adjacent to valves independently to eliminate pipe loads being transferred to valve and valve loads being transferred to the piping.
- C. For grooved coupling valves, install rigid type couplings.
- D. Install electric actuators above or horizontally adjacent to valve and gear box to optimize access to controls and external handwheel.
- E. For threaded valves, provide union on one (1) side within 2 FT of valve to allow valve removal.
- F. Install valves accessible for operation, inspection, and maintenance.

3.2 ADJUSTMENT

- A. Adjust valves, actuators and appurtenant equipment to comply with Section 01 75 00.
 - 1. Operate valve, open and close at system pressures.

END OF SECTION

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SECTION 40 05 63
BALL VALVES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Ball valves.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
 - 3. Section 40 05 51 - Valves: Basic Requirements.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. ASTM International (ASTM):
 - a. D1784, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
 - 2. Manufacturers Standardization Society of the Valve and Fittings Industry Inc. (MSS):
 - a. SP-110, Ball Valves; Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

1.3 DEFINITIONS

- A. PVC: Polyvinyl Chloride.
- B. PTFE: Polytetrafluoroethylene.

1.4 SUBMITTALS

- A. Shop Drawings:
 - 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 - 2. See Specification Section 40 05 51.
- B. Contract Closeout Information:
 - 1. Operation and Maintenance Data:
 - a. See Specification Section 01 33 04 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the manufacturers listed in the applicable Articles below are acceptable.
- B. Submit request for substitution in accordance with Specification Section 01 25 13.

2.2 PLASTIC BALL VALVES: 1/2 IN TO 4 IN DIA

- A. Acceptable Manufacturers:
 - 1. Hayward.
 - 2. ASAHI/America.
- B. Materials:
 - 1. Body, stem, ball, handle, end connectors:

- a. PVC ASTM D1784-12454B.
 2. Ball Seat: Teflon.
 3. O-rings: PTFE encapsulated fluorocarbon.
- C. Design Requirements:
1. Rated at 150 PSI at 75 DEGF.
 2. Double or "true union" design.
 3. Blocks both directions, upstream and downstream.
 4. Union nut capable of compensating for seat wear.
 5. Body with mounting pad for actuators where required.
 6. Capable of being disconnected at downstream end under full line pressure.
 7. Actuator:
 - a. Integral with valve.
 - b. Handle with UV inhibitor.
 - c. Lock-out plate.

2.3 ACCESSORIES

- A. Refer to Drawings and valve schedule for type of actuators.
 1. Furnish actuator integral with valve.
- B. Refer to Specification Section 40 05 51 for actuator requirements.

2.4 SOURCE QUALITY CONTROL

- A. Furnish record of test.
- B. Product Testing: MSS SP-110.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. See Specification Section 40 05 51.
- B. Install per manufacturer's recommendations.

END OF SECTION

SECTION 40 10 16
ODOR CONTROL DUCT AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Stainless Steel (SST) ductwork and accessories for foul air systems.
 - 1. SST duct with interior corrosion resistant lining.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements
 - 3. Section 23 31 00 – HVAC - Ductwork
 - 4. Section 40 05 00 – Pipe and Pipe Fittings: Basic Requirements
 - 5. Section 40 05 07 – Pipe Support Systems
 - 6. Section 44 31 43 – Ultraviolet Odor Control System

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. Air Movement and Control Association (AMCA).
 - 2. American National Standards Institute (ANSI).
 - 3. American Society of Mechanical Engineers (ASME).
 - 4. ASTM International (ASTM):
 - a. E84, Standard test Method for Surface Burning characteristics of Building Materials.
 - b. E477, Standard Test Method for Measuring Acoustical and Airflow Performance of Duct Liner Materials and Prefabricated Silencers
 - 5. Sheet Metal and Air-Conditioning National Contractors Association (SMACNA):
 - a. HVAC Duct Construction Standards
 - b. Round Industrial Duct Construction Standards
 - c. Seismic Restraint Manual – Guidelines for Mechanical Systems
- B. Manufacturer's Qualifications:
 - 1. SST lined ductwork Manufacture must show evidence of a minimum of five installations and five years experience in the design and manufacturer of SST duct of similar size and type as specified herein.
- C. Provide, coordinate, service, and guarantee duct and duct accessories specified in this Section.
- D. Except where shown in the Contract Documents, the manufacturer is responsible for locating flexible connections and expansion joints to accommodate installation and thermal expansion, respectively and locations and type of support systems consistent with the drawings.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 - 2. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Raw material technical data sheets.
 - c. All illustrations, detailed drawings, and instructions necessary for installing, operating, and maintenance repair.
 - d. Ductwork pressure, vacuum, and temperature ratings.
 - e. Structural design calculations for ductwork stamped and signed by a professional engineer.

- f. Flexible Connections and Expansion Joints: Expansion and contraction characteristics and limits.
 - g. Dampers: Drawings showing connections and operator details.
 - 3. System Design:
 - a. Ductwork damper information including leakage data, performance data, and calculations showing ultimate strengths on blade and actuator to blade fastening. Include copies of AMCA leakage rate test reports.
 - 4. Ductwork suppliers are responsible for the duct system including all duct, flex connections (those not provided by the fan supplier), silencers and dampers. Duct suppliers are to provide scaled installation Drawings for all the foul air duct systems shown on the Drawings which shall include the following minimum information:
 - a. Stationing.
 - b. Elevations (centerline).
 - c. Ductwork dimensions of subassemblies to be shipped.
 - d. Duct and joint locations and description.
 - e. Location of dampers and fittings.
 - f. Location of supports and support details
 - g. Location of expansion and contraction joints.
 - 5. Details of duct supports including design calculations, layout, and materials shall be submitted under Section 40 05 07.
- B. Samples of duct materials.
 - C. Manufacturer's Certificates as specified under Section 01 33 00.
 - D. Operations and maintenance manuals. See Section 01 33 04.

1.4 DEFINITIONS

- A. Lining – interior coating of duct. The terms “coating” and “lining” are used interchangeably in this Section and both refer to the coating of corrosion resistant material applied to the interior surfaces of the duct or accessory.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Stainless Steel Silencers:
 - 1. IAC America Type FCL.
 - 2. Approved Equal.
- B. Stainless Steel Lined Duct:
 - 1. FabTech Permshield.
 - 2. Viron International SSteelCoat.
- C. Stainless Steel Lined Dampers:
 - 1. FabTech.
 - 2. Viron International.

2.2 PERFORMANCE AND DESIGN REQUIREMENTS

- A. Temperature: -20 to 100 DegF.
- B. Design Operating Conditions:
 - 1. Prior to fans - negative 18 IN w.g.
 - 2. After fans - plus 18 IN w.g.
- C. Gases conveyed: Odorous Air.
- D. Relative humidity: 10 to 95 percent.
- E. Maximum velocity: 4,000 feet per minute.

F. Hydrogen sulfide: up to 50 ppm.

G. Ammonia: up to 10 ppm

2.3 SST LINED DUCTWORK COMPONENTS

A. Fluoropolymer-Lined Stainless Steel Ductwork:

1. General: Factory-fabricated system approved by Factory Mutual tested in accordance with ASTM E84, with flame-spread of zero (0) and smoke-developed rating of less than 25.
 2. Base Metal:
 - a. Material: Type 304 stainless steel with 2B exterior finish fabricated with gauges and reinforcing in accordance with the SMACNA Industrial Duct Construction Standards to meet designated system class and pressure class.
 - 1) Longitudinal Seams: Fusion-welded using no filler rod.
 - 2) Transverse Seams: Continuously welded.
 - 3) Seam Finishing: Ground/polish smooth.
 3. Lining System:
 - a. Acceptable Manufacturers and Products:
 - 1) ETFE fluoropolymer 532-6005 primer, 532-6012 top coat by E.I. DuPont DeNemours and Company, Wilmington, Delaware, or approved equal.
 - 2) HALAR-ECTFE Fluoropolymer by Ausimont, USA, Inc., Morristown, NJ, or approved equal.
 - b. Description:
 - 1) Electrostatically applied thermoplastic resin powder coating system. Ductwork interior applications shall be a minimum of 10 to 12 mils thick to provide complete and spark-free coverage.
 - 2) Prepare base metal surfaces and apply coating in accordance with coating manufacturer's requirements to ensure proper and complete adhesion of coating to base metal.
 - 3) Accessories: Prep and coat duct accessories, such as dampers and blast gates, in the same manner as the duct in which they are to be installed.
 - 4) Testing: Wet test the entire coated surface inside and out (where applicable) and edges, using a dc spark tester used at 250 volts per mil to detect flaws. Repair flaws and retest until all flaws are repaired.
 4. Fabrication:
 - a. Fittings:
 - 1) Elbows: Minimum centerline radius of 1-1/2 times the duct diameter whenever possible.
 - 2) Transitions: Limit taper angle to 30 degrees for contracting and to 20 degrees for expanding transitions.
 - 3) Branch Takeoff Connections: Unless specifically detailed otherwise, provide 45-degree laterals and 45-degree elbows.
 - 4) 90-Degree Branch Takeoffs: Shoe-tap-type tees.
 - 5) Joints: Flanged
 - a) Coating Only on Inside: Use companion flange (Van Stone) duct joints consisting of rolled or pressed SST angle rings, and GoreTex or envelope-style gaskets.
 - b) Flange Ring Materials: Type 304 stainless steel using SST angle rings for all connections.
- B. Dampers: Heavy-duty industrial butterfly dampers provided by the selected duct system manufacturer, unless otherwise shown on the Drawings, meeting the same design conditions as the ductwork described herein. Dampers shall be lined same as duct and provided by same supplier as the SST ductwork.
1. Maximum headloss at 2,000 fpm velocity (fully open): 0.1 IN w.g.
 2. Actuator handle shall allow the damper to be locked in any position and used for both isolation or balancing.

3. Permanently lubricated, liquid tight shaft seals and bearings.
4. Automatic actuators shall be provided in accordance with Section 23 31 00.

Damper Tag Number	Size	Actuator
DMP-101	10-FA	Manual
DMP-102	10-FA	Manual
DMP-103	4-FA	Manual
DMP-110	8-FA	Manual
DMP-111	8-FA	Manual
DMP-112	12-FA	Manual
DMP-113	22-FA	Manual

C. Stainless Steel Silencers

1. Equipment Schedule:

EQUIPMENT NO.	DESCRIPTION	DUCT DIAMETER (IN)
SIL-101	Building #1 Exhaust Silencer	22

2. Silencers for foul or treated air systems shall consist of the following:
 - a. Inline conic-flow design.
 - b. Type 316 stainless steel construction.
 - c. Suitable for Service Requirements.
 - d. Flanged inlet and outlet connection matching the diameter of the associated ductwork.
 - e. Maximum silencer length: 36 inches.
 - f. Maximum pressure drop at 2,000 fpm face velocity: 0.05 inches w.c.
 - g. Rated for duct pressures up to 20 inches w.c.
 - h. Performance results tested in accordance with ASTM E477.

3. Silencer performance criteria:

OCTAVE BAND CENTER FREQUENCY (HZ)	6 3	12 5	25 0	50 0	100 0	200 0	400 0	800 0
Minimum Insertion Loss, dB ¹	7	13	21	26	34	25	21	16
Maximum Self-Noise, dB ²	5 2	48	46	46	45	42	39	25

- ¹. Indicates the minimum dynamic insertion loss required for the silencer. May be substituted with a silencer of greater insertion loss per octave band.
- ². Maximum self-noise should include system effects including distance to fans, elbows and discharge outlet.

D. Acoustical Jacketing (sound attenuating cover):

1. Provide a sound attenuating wrap/blanket for all exterior ductwork between the OCU and the exhaust fan inlet and between the exhaust fan outlet and the silencer:
 - a. Inner Jacketing, Outer Jacketing, Gussets: 17-ounce per square yard Teflon impregnated fiberglass cloth.
 - b. Liner: 16.5-ounce per square foot mass loaded acoustical septum. Provide double layer separated by air gap.
 - c. Insulation: Minimum 3-inch thick combination of No. 11 density needled fiberglass, No. 6 density needled fiberglass, and No. 3 density ET blanket fiberglass.
 - d. Thread: Teflon-coated fiberglass thread.
 - e. Attachments: Teflon cloth belts with stainless steel double O-rings. Hook and loop seam fastener.
 - f. Minimum fan radiated noise reduction of 20 dBA at 5-feet.
 - g. Suitable for exterior exposure.

- h. Wrap shall be easily removable for maintenance and not permanently adhered to the duct.
 - i. Provide access accommodations for instruments, sample ports and actuators.
 - j. Manufacturer and Product:
 - 1) Advance Thermal Corp (Acoustirap).
 - 2) North Atlantic Associates (Quiet Cover).
- E. Miscellaneous Materials:
- 1. Nuts and Bolts: Type 316 stainless steel.
 - 2. Gasket Material:
 - a. Description: Form in place, fully expanded 100 percent PTFE gasket material, size as recommended by the manufacturer.
 - b. Acceptable Manufacturer: W.L. Gore and Associates, Inc., Elkton, Maryland.
 - 3. Drains and Sampling Ports:
 - a. Prior to lining, weld stainless steel couplings to the bottom (drains) or side (sample ports) of main and branch ducts that are trapped and/or where shown on the Drawings, to allow removal of condensed liquids. Predetermine locations of duct drains prior to manufacturer's fabrication.
 - 4. Pitot Tube and Differential Pressure Measuring Ports:
 - a. Provide Bulkhead fittings configured to prevent exposure of metal, located on the side or top of the duct. Bottom locations are prohibited.
 - b. Predetermine locations of pitot ports and differential pressure indicator ports prior to manufacturer's fabrication. At minimum, provide pitot ports in each major main duct, at each fan and OCU inlet and outlet, and at inlet and outlet of grease filters. Provide differential pressure ports at upstream and downstream side of grease filters and fans. Coordinate mounting location of differential pressure indicators with fan and grease filter manufacturers.
 - 5. Duct Support Materials: See Section 40 05 07.

2.4 ACCESSORIES

- A. Extra Tappings:
- 1. Test port tapings shall be positioned as necessary for air balancing. Manufacturer shall ensure tapping points are accessible for measurement.
- B. Expansion (Flexible) Joints:
- 1. Flanged flexible couplings/connectors shall be provided at locations indicated in the Drawings or listed in this Section:
 - a. Flexible joints for the inlet and outlet of each exhaust fan are specified in Section 44 11 10. Other flexible joints in the duct system shall be per this Section.
 - b. Material: EPDM or neoprene, with integral flange suitable for service with duct.
 - c. Unless otherwise indicated in the Drawings, shall be circular (cylindrical) construction:
 - d. Backing Rings: 3/8-inch thick, 2-inch wide, Type 316 stainless steel.
 - e. Minimum total expansion/contraction: 4-inches:
 - 1) Joint shall be field set based on ambient temperature at the time of installation to provide for the complete range of thermal expansion and contraction required for the Service Requirements.
 - 2) Manufacturer shall submit recommended setting for review by the Project Representative.
 - f. Minimum allowable lateral deflection: Five degrees.
 - g. Thickness: 1/4-inch, minimum.
 - 2. Durometer value: 40 or less.
- C. Hangers and Supports:
- 1. See Section 40 05 07.

2.5 FABRICATION

- A. Duct shall be supplied in the largest possible fabricated sections, allowing as few field joints as possible while assuring maximum quality control.
 - 1. Manufacturer shall shop spool duct and fittings as much as possible.
- B. Reinforcing shall be factory installed with spacing between reinforcing located to avoid all hangers and support saddles.

2.6 SOURCE QUALITY CONTROL

- A. Factory Inspection: Inspect fabrications for required construction, intended function, and conformance with referenced standards.
- B. Inspection of products is required prior to shipment, unless specifically waived in writing by Engineer.
- C. All ductwork shall be spark tested for lining integrity prior to shipment.
- D. Notify Engineer one (1) week prior to the estimated date of factory inspection.
- E. Engineer has the option to test duct materials and inspect the manufacturing facility at any time to assure compliance with specifications.

PART 3 - EXECUTION

3.1 INSTALLATION GENERAL

- A. The duct layout shown in the Drawings is approximate. Contractor shall confirm routing in the field, including any adjustments or modifications that may be required to avoid conflicts, prior to submitting shop drawings for approval.
 - 1. Contractor shall include an additional 10 percent (minimum) contingency in the ductwork bid cost to account for additional fittings and spools necessary to field adjust routing from what is shown in the Contract Drawings.
- B. Install duct systems as shown on Drawings and in accordance with manufacturer's instructions.
 - 1. The manufacturer shall have a qualified employee at the job site to instruct the Contractor's personnel in proper installation procedures for a minimum of two (2) days.
 - 2. Instruction should include review of material safety data sheets as well as storage and handling of materials.
 - 3. Install to the lines and grades shown on the Drawings.
 - 4. Whenever duct laying is stopped, close open end of the duct with an end board closely fitting the end of the duct to keep foreign material out of the duct.
- C. Field assembly joints must be completed in a neat and orderly manner, in compliance with manufactures instructions.
- D. When the odorous air duct system is complete the duct manufacturer shall have a representative inspect the duct system and provide a written certification that it is installed properly and is ready for operation.
- E. Out-of-roundness after installation should be limited to plus or minus 1 percent of duct inside diameter or per the manufacturer's recommendation, whichever is less.

3.2 SST DUCT INSTALLATION

- A. Examine areas and conditions under which duct are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to installer. Use personnel trained by the SST duct supplier providing field installation guidance by the pipe supplier.

- B. Assemble and install lined stainless steel duct while using extreme care not to scratch surface of lining (if scratched, immediately contact manufacturer for repair instructions) and in accordance with recognized industry practices which will achieve air-tight leakage. Install each run with a minimum number of joints. Align duct accurately at connections, with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers and anchors of type, which will hold in accordance with SMACNA Round Industrial Duct Construction Standards per Section 40 05 07.
- C. Duct inner lining must not be penetrated during installation. No fastening devices such as Tek-style screws, rivets, etc. are to be used on any part of a lined duct application. Test holes and slots for monitoring must be predetermined before fabrication and lining unless using approved Fab-Tech Field Modification Kits. Install lined stainless steel duct as shown on drawings and described herein, following applicable state and city codes, and per SMACNA HVAC Duct Construction Standards.
- D. Welding: Under no circumstances shall welding or a heat source greater than 300°F (150°C) be allowed on the stainless steel surface of the duct.

3.3 FIELD QUALITY CONTROL

- A. Engineer has option to test duct during construction to ensure compliance with the specifications.
- B. Inspect all duct prior to installation and note any damage to flange, lining or exterior surfaces.
- C. Testing:
 - 1. Pressure Testing:
 - a. Prior to testing, pressurize system to 0.5 psi and survey all joints for audible leaks.
 - b. Repair/seal as necessary to seal all audible leaks.
 - c. After all audible leaks have been eliminated, test duct system at 0.5 psi pressure with air for 2 HR.
 - d. Pressure drop during test shall be less than 1 percent.
 - e. Contractor to repair all leaks and repeat test.
 - f. Determine leakage by loss of pressure.
 - g. Lug or cap branch lines as required during testing.
 - h. All testing shall be at the expense of the Contractor.
 - 2. Spark Testing:
 - a. Ductwork, once installed, shall be spark tested as follows:
 - 1) Utilize testing method per the duct manufacturer and as outlined in Part 2.3 of this Section for factory testing.
 - 2) Conduct tests on all spools and fittings in which damage to the lining has been noted by the Owner or Contractor during inspection.
 - 3) Conduct tests on 20 percent of the remaining duct (measured on a linear foot basis).
 - a) Duct to be tested shall be selected by the Owner.
- D. Identification:
 - 1. Identify each shop fabricated duct section with a permanent marker on the inside near the ends.

END OF SECTION

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SECTION 40 27 06
MIST AND GREASE ELIMINATOR FILTERS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies duct-mounted dual element filters for removing grease and mist from foul air streams.

1.2 QUALITY ASSURANCE

- A. Referenced Standards: This Section incorporates by reference the latest revision of the following documents. These references are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of a listed document, the requirements of this Section shall prevail.
1. Air Movement and Control Association (AMCA):
 - a. 500-D, Laboratory Methods of Testing Dampers for Rating.
 2. American National Standards Institute (ANSI).
 3. American Society of Mechanical Engineers (ASME).
 - a. RTP-1, American Society of Mechanical Engineers, Reinforced Thermoset Plastic Corrosion-Resistant Equipment.
 4. ASTM International (ASTM):
 - a. C582, Standard Specification for Contact-Molded Reinforced Thermosetting Plastic (RTP) Laminates for Corrosion-Resistant Equipment.
 - b. D2310, Standard Classification for Machine-Made "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.
 - c. D2563, Standard Practice for Classifying Visual Defects in Glass-Reinforced Plastic Laminate Parts.
 - d. D2996, Standard Specification for Filament-Wound "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.
 - e. E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
 5. Sheet Metal and Air-Conditioning National Contractors Association (SMACNA):
 - a. Thermoset FRP Duct Construction Manual.

1.3 SUBMITTALS

- A. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
- B. Provide the following information.
1. Manufacturer's catalog and/or other data confirming conformance to specified design, material and equipment requirements.
 2. Mist and grease eliminator filter shop drawings, including dimensions, layout, elements of construction and support design.
 3. Predicted performance data and/or curves as applicable developed for the specific application, confirming conformance to specified design and operating requirements and characteristics.
 4. Weight of heaviest filter pad (dry and wet) to be removed for cleaning.
 5. Factory testing report.
 6. Structural support calculations.
- C. Operation and maintenance information: Section 01 33 04.

PART 2 - PRODUCTS

2.1 EQUIPMENT SCHEDULE

Equipment No.	Equipment Name	Type
GF-100	Building #1 OCU Mist and Grease Eliminator	Mist and Grease Combination Filter
PDI-100	Building #1 OCU Mist and Grease Eliminator Differential Pressure Gauge	Pressure/Differential

2.2 PERFORMANCE REQUIREMENTS

A. General:

1. Units specified in this Section shall be designed and selected for continuous operation with air containing corrosive and flammable vapors and gases generated from the treatment and conveyance of municipal wastewater.
2. Vapors and gases may be expected to include methane, hydrogen sulfide, chlorine gas, sulfur dioxide, gasoline vapors, ammonia, airborne grease, and water saturated air. The air stream may also be expected to contain droplets of dilute sulfuric acid.
3. Structurally capable of maximum flows of at least 1.5 times the rated capacity.
4. Air stream temperatures, humidity and constituents: see Section 40 10 16.
5. Pressure and Vacuum: operating range of 18 inches w.c. positive pressure through 18 inches w.c. vacuum.

B. Operating Requirements: The mist and grease eliminators shall comply with the following:

Equipment Number	Capacity, cfm	Operating Pressure drop ¹ , in-w.c.	Maximum Face Velocity fpm	Filter Size (total area)	Droplet Removal
GF-100	4,000	1.25	400	38 inch x 38 inch	99% >10 micron; 80% > 5 micron

Note 1: Pressure drop measured across the entire filter assembly, from inlet flange to outlet flange.

2.3 ACCEPTABLE MANUFACTURERS

- A. Spunstrand.
- B. ECS Environmental Solutions.
- C. Approved Equal.

2.4 EQUIPMENT FEATURES

- A. The grease filter and mist eliminator shall consist of two-stage filter pads housed inside a fiberglass reinforced plastic (FRP) enclosure.
 1. The first pad shall be a woven polypropylene pad 2 inches thick for grease removal.
 2. The second pad shall be woven polypropylene pad 4 inches thick for mist removal.
 3. Each pad shall have a uniform exterior frame that fully encompasses and encloses all sides of the pad.
 4. Each pad shall be separately removable (the first and second pads shall not be combined in a single frame) for cleaning.
 - a. Each pad shall have a maximum dry weight of 20 lbs.
- B. The housing shall have a hinged access door, with handle, to allow removal and replacement of the filter pads from the accessible side of the unit, as indicated in the Drawings:
 1. Housing door shall be held in place with toggle clamps.
 - a. Acceptable Manufacturers:
 - 1) Kakuta HH-300-S.
 - 2) McMaster-Carr.
 - 3) Approved Equal.

- C. The housing shall be transitioned and flanged for installation in the foul air ductwork.
- D. The flanges shall be drilled and gaskets shall be provided.
- E. A differential pressure gage shall be provided to measure the pressure drop across unit.
 - 1. See Section 40 73 00 for instrumentation piping and differential pressure gauge requirements.

2.5 MATERIALS

A. Materials shall be as follows:

Component	Material
Housing	FRP
Filter Support and Sliding Tracks	AISI 304 stainless steel
Grease Pads	AISI 304 stainless steel
Demister Pads	Polypropylene
Gaskets	Neoprene
Fasteners, Washers and Anchor Bolts	AISI 304 stainless steel

- B. Housing shall be constructed of FRP meeting the requirements of this Section and suitable for service with the foul air parameters outlined in Section 40 10 16.
- C. All internal components shall be structurally rated to meet the same pressure rating requirements as those listed for ductwork in Section 40 10 16.
- D. Fiberglass Fabrication:
 - 1. Filament-wound, exterior, structural layer and an internal corrosion barrier composed of a resin-rich inner surface followed by a layed-up interior layer.
 - 2. The internal corrosion barrier shall be in compliance with ASTM C582 and RTP-1.
 - 3. Resin:
 - a. Hetron 992FR, Derakane 510B.
 - b. Premium grade vinyl ester.
 - c. Shall not contain thixotropic agents or fillers unless specified.
 - d. Shall not contain dyes, pigments or colorants except in the exterior gel coats.
 - e. All resin shall achieve a Class I flame spread in accordance with ASTM E84.
 - 1) May contain up to 3 PCT antimony pentoxide in order to meet the class I flame spread rating per ASTM E84.
 - 4. Inner surface:
 - a. Minimum of 20 mils thick and consisting of a "C" glass surfacing veil with approximately 90 PCT resin content by weight.
 - 5. Interior layer:
 - a. Reinforced by not less than two plies of 1-1/2 OZ/SQ FT chopped strand mat with approximately 75 PCT resin and 25 PCT glass content by weight. Total thickness of inner surface and interior layer shall be at least 100 mils.
 - 6. Structural and Exterior layer:
 - a. The exterior layer or body of the laminate shall be of chemically resistant construction suitable for operating in the service conditions above and providing additional mechanical strength necessary to meet the tensile and flexural requirements.
 - b. Filament Wound Structural Wall Glass Content: 55 percent to 65 percent.
 - c. External layer: woven fiberglass cloth.
 - d. Woven roving: Type E glass, nominal 24 OZ per square yard, four by five weave, with silane type finish.
 - e. Continuous roving used in chopper gun for spray-up: Type E glass.
 - f. Continuous roving used in filament winding: Type E glass, with silane type finish.

- g. The exterior shall include an intumescent gelcoat that meets both a flame spread of 25 or less and a smoke development rating of 50 or less in accordance with ASTM E84.
 - 1) Two (2) coats of PPG Speedhide Flat Latex paint No. 42-7 or an Approved Equal product, in accordance with the manufacturer's recommendations.

E. Flanges:

- 1. Drill per to match duct connections.
 - a. Confirm drill pattern with duct manufacturer.
 - b. Resin seal all drilled or cut surfaces.
- 2. Spot-faced back, flat and parallel with the flange face, of sufficient diameter to accept a SAE metal washer under the bolt head or nut.
- 3. Provide full-faced, 1/8 IN thick, fabricated neoprene or Buna-N gaskets at each flanged connection.
- 4. Flat washers shall be provided on all flange back faces.

2.6 SOURCE QUALITY CONTROL

- A. Factory test (flow/pressure) mist and grease eliminator filters under the following conditions:
 - 1. Complete unit with all filters installed.
 - 2. Flow: 1.5 times the rated capacity listed in this Section.
 - 3. Pressure: Minimum 4 inches w.c. negative pressure at filter inlet.
 - 4. Medium: Clean air.
 - 5. Results: Record pressure loss and confirm no leakage at access doors or gauge ports.
 - 6. Duration: 2 hours.

2.7 SPARE PARTS

- A. Two extra filter pads of each size and type (grease filter and mist eliminator) shall be provided.
- B. Two extra sets of gaskets required for the access door.
- C. Spare components shall be stored in accordance with Section 01 65 50.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install each grease filter and mist eliminator as indicated in the Drawings and as recommended by the manufacturer.
- B. Provide adequate support for the unit such that there is no strain on the ductwork to which it is connected.
 - 1. Supports shall meet the requirements of Section 40 10 16 and be constructed of 316 SST.
 - 2. Design of supports, including structural calculations, prepared, stamped, dated and signed by a Professional Engineer registered in the state of Alaska.
- C. Provide P-trap for drain and route the drain pipe to a point of disposal as indicated in the Drawings.
- D. Temporarily mark (colored tap) the differential pressure gage during commissioning:
 - 1. Mark the low point as the initial clean filter pressure.
 - 2. Mark the high point at 1 inch w.c. above the clean filter pressure.

END OF SECTION

SECTION 40 41 13
HEAT TRACING CABLE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Heat tracing cable as required for heat tracing of pipes as indicated on the Drawings.
 - a. Outdoor Hazardous Location rated
- B. Related Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
 - 3. Section 26 05 00 - Electrical: Basic Requirements.

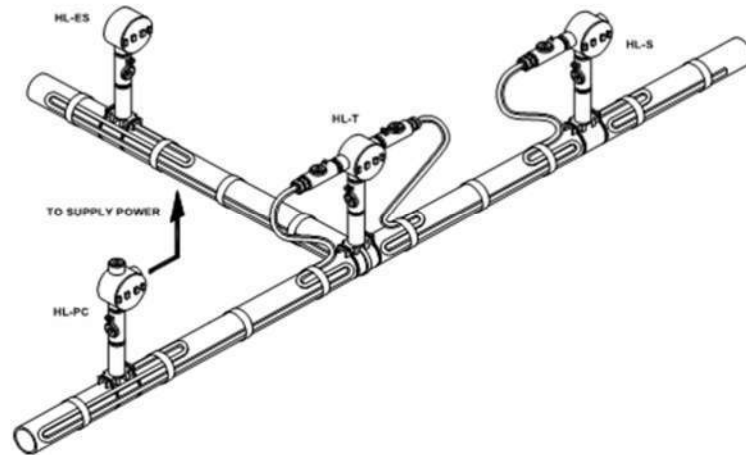
1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
- B. System Description
 - 1. Provide pipe heat tracing and thermal insulation on all above grade pipe for freeze protection.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 - 2. Product technical data:
 - a. Power requirements for each circuit based upon actual length of self-regulating medium temperature heat trace and maintained temperature.
 - b. Ground Fault Equipment Protection Circuit Interrupter (GFEPIC) Circuit breaker rating based upon inrush current at minimum expected start-up temperature.
 - c. Length of heat tape for each pipe size and run.
 - d. Coordinate and verify length and Watts/FT of heat tape required based upon pipe size and insulation thickness.
 - e. Include the calculations to support the heat tape output.
 - f. Submit all components of the heat tracing system and pipe thermal insulation:

1) Hazardous location connection kits:



- a) Power Connection Kit (explosion proof box providing electrical connection for one cable)
 - b) End Seal Kit (explosion proof box providing termination for one cable),
 - c) Splice Kit (Explosion Proof Box providing cable entry for two cables),
 - d) Tee Kit (explosion proof providing cable entry for three cables),
 - e) Signal Light Kit (explosion proof signal light kit with LED)
- 2) Heat Trace Freeze Protection Ambient Air Sensing Thermostat (0-150degF)
- 3) Temperature Controller
- 4) Caution Label
- g. See Section 26 05 00 for additional requirements.
3. Fabrication and/or layout drawings:
- a. Wiring diagrams showing physical locations of thermostats and heat trace power supply.
- B. Contract Closeout Information:
1. Operation and Maintenance Data:
 - a. See Specification Section 01 33 04 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
- C. Informational Submittals:
1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 2. Test reports: Megger test results.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Shall be stored such that they are not exposed to sunlight or other UV rays.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following Manufacturers are acceptable:
1. Thermon.
 2. Chemelex Division; Raychem Corp.

3. Chromalox.

B. Submit request for substitution in accordance with Specification Section 01 25 13.

2.2 HEAT TRACING

A. Design Parameters:

1. Pipe diameter, length and material: See Drawings and relevant piping Specifications.
2. Flange, valve, pipe support size: See Drawings and relevant piping Specifications.
3. Pipe insulation type and thickness: See Drawings and relevant piping Specifications.
4. Temperatures requirements:
 - a. Low ambient temperature for the specific location: 0 DEGF.
 - b. Start-up temperature (alarm thermostat set point):
 - 1) Water/wastewater lines: 40 DEGF.
 - c. Maintain temperature (power thermostat set point):
 - 1) Water/wastewater lines: 40 DEGF.
 - d. High temperature exposure with power off: 50 DEGF.
5. Wind factor for the specific location: 80 MPH.
6. Electrical requirements:
 - a. Voltage: 120 V.
 - b. Circuit breaker: Field coordinate if other than 20A GFEPIC type.
7. Safety factor: 10 PCT.

B. Self-regulating parallel circuit construction consisting of an inner core of conductive material between parallel copper bus wires, with inverse temperature - conductivity characteristics with metal overbraid.

C. Thermostats adjustable between 35 and 200 DEGF minimum with maximum differential range of 9 DEGF, furnished complete with NEMA 4X enclosures in all areas, stainless steel temperature bulb and capillary.

D. All necessary or required components and accessories, such as power connection boxes, end seals, straps, tape and fitting brackets.

E. In corrosive, hazardous and hydrocarbon locations insulation shall be Fluoropolymer (Teflon).

PART 3 - EXECUTION

3.1 PREPARATION

A. Install materials after piping has been tested and approved.

3.2 INSTALLATION

A. Thermal insulate and heat trace pipe systems as indicated on Drawings.

B. Install materials in accordance with manufacturer's instructions.

1. Each circuit shall not exceed the manufacturer's recommended maximum length.

C. For Metallic Piping:

1. Heat tracing shall be installed completely wired.
2. Cut heat trace to lengths as required and secure to pipe with glass or polyester fiber tape.

D. For Nonmetallic Piping:

1. Allow for extra heat trace output because nonmetallic pipe has a lower heat transfer.
 - a. Heat tracing shall be installed completely wired.
2. Cut heat trace to lengths as required and secure to pipe with aluminum tape throughout the length of the trace.

E. Protection and Control Requirements:

1. Protection by a GFEPIC circuit breaker.

- a. Breaker amperage rating shall be coordinated with Contractor when different than the Contract Drawings.
2. The alarm thermostat shall be placed on the opposite end of the circuit from the power thermostat or power connection to allow for annunciation of partial failure of a circuit or the loss of power from a tripped GFEPIC circuit breaker.
3. Provide a monitoring module that monitors the voltage (circuit breaker status) to each circuit.
4. The alarm from the alarm thermostat and monitor module shall be annunciated on the indicated control system.

3.3 TESTING

- A. Megger the cables at the manufacturers recommended voltage level three times.
 1. Before installation.
 2. After attachment to pipe but before insulation is installed.
 3. After pipe insulation is installed but before energization.
 4. Install caution label that reads "Energized High Voltage", refer to Drawing for Heat Tracing System detail.

END OF SECTION

SECTION 40 42 00
PIPE, DUCT AND EQUIPMENT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Insulation:
 - a. Piping insulation.
 - b. Duct insulation.
 - 2. Adhesives, mastics, sealants, and finishes.
 - 3. Grease and air ventilation duct wrap fire protection systems.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
 - 3. Section 40 05 07 - Pipe Support Systems.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. ASTM International (ASTM):
 - a. C177, Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of Guarded-Hot-Plate Apparatus.
 - b. C411, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
 - c. C423, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
 - d. C553, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
 - e. C612, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
 - f. E96, Standard Test Methods for Water Vapor Transmission of Materials.
 - g. F25, Standard Test Method for Sizing and Counting Airborne Particulate Contamination in Cleanrooms and Other Dust-Controlled Areas.
 - 2. National Fire Protection Association (NFPA):
 - a. 255, Standard Method of Test of Surface Burning Characteristics of Building Materials.
 - 3. Underwriters Laboratories, Inc. (UL):
 - a. 723, Standard for Test for Surface Burning Characteristics of Building Materials.
 - 4. National Commercial and Industrial Insulation Standards (2013 seventh edition).
 - a. Published by Midwest Insulation Contractors Association (MICA).
 - b. Endorsed by National Insulation Association (NIA).
 - c. MICA plate numbers listed in this specification reference this document.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 - 2. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's installation instructions.
 - c. Submit complete specification of insulation materials, adhesives, cement, together with manufacturer's recommended methods of application and coverage for coatings and adhesives.

3. Submit itemized schedule by building of proposed insulation systems showing density, thermal conductivity, thickness, adhesive, jackets and vapor barriers.
4. Certifications: Products will meet the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 1. Fiberglass insulation:
 - a. CertainTeed Corporation.
 - b. Johns Manville.
 - c. Owens Corning.
 - d. Knauf.
 2. Ductwork insulation:
 - a. CertainTeed.
 - b. Johns Manville.
 - c. Owens Corning.
 3. High density perlite:
 - a. Johns Manville.
 - b. Industrial Insulation Group (LIC).
 4. High density calcium silicate:
 - a. Industrial Insulation Group (LIC).
 5. Adhesives, mastics, sealants, and finishes:
 - a. Foster Products.
 - b. Childers.
 - c. Dow Corning.
 - d. Johns Manville.
 - e. Knauf.
- B. Submit request for substitution in accordance with Specification Section 01 25 13.

2.2 PIPING INSULATION - FIBERGLASS

- A. Pipe and Fitting Insulation:
 1. Preformed fiberglass pipe insulation:
 - a. Density: 4 LBS/CF.
 - b. Temperature rated: 650 DEGF.
 - c. Average thermal conductivity not to exceed 0.23 (BTU-IN)/(HR-FT²-DEGF) at mean temperature of 75 DEGF.
 - d. Fire hazard rating:
 - 1) UL 723, ASTM E84, NFPA 255.
 - 2) Flame spread not exceeding 25 and smoke developed not exceeding 50.
 2. Moisture adsorption:
 - a. ASTM C553.
 - b. Not greater than 5 PCT moisture by volume when exposed to moisture laden air at 120 DEGF and 96 PCT RH.
 3. Fungi and bacteria resistance:
 - a. ASTM C665.
 - b. Does not breed or promote growth.
 - c. Flame attenuated glass fibers bonded with thermosetting resin.
 4. Piping jackets (general applications):
 - a. Aluminum: 16 MIL embossed aluminum.
 5. Provide minimum insulation thickness conforming to schedules or as shown on the Drawings.

2.3 PIPE INSULATION INSERTS AT HANGERS

- A. High Density Perlite:
 - 1. Pre-formed.
 - 2. Fire hazard rating:
 - a. UL 723, ASTM E84, NFPA 255.
 - b. Flame spread: Zero.
 - c. Smoke developed: Zero.
 - 3. Average density: 13 LBS/CUFT.
 - 4. Compressive strength: 80 PSI to produce 5 PCT compression.
 - 5. Maximum surface temperature: 1,200 DEGF.
- B. High Density Calcium Silicate:
 - 1. Pre-formed.
 - 2. Fire hazard rating:
 - a. UL 723, ASTM E84, NFPA 255.
 - b. Flame spread: Zero.
 - c. Smoke developed: Zero.
 - 3. Average density: 14 LBS/CUFT.
 - 4. Compressive strength: 100 PSI to produce 5 PCT compression.
 - 5. Maximum surface temperature: 1,200 DEGF.

2.4 DUCTWORK INSULATION: FIBERGLASS

- A. Flexible Insulation:
 - 1. Material: Commercial-grade fiberglass thermal insulation, formaldehyde free.
 - 2. Scheduled thickness and installed R-value. Installed R-value when compressed to a maximum of 25 PCT following recommended duct wrap stretch outs.
 - 3. Factory-applied foil scrim vapor barrier facing.
 - 4. Average thermal conductivity not to exceed 0.27 (BTU-IN)/(HR-FT²-DEGF) at a mean temperature of 75 DEGF (installed).
 - 5. Fungi and bacteria resistance:
 - a. ASTM C1338.
 - b. Does not breed or promote growth.
 - 6. Fire hazard classification:
 - a. UL 723, ASTM E84, NFPA 255.
 - b. Flame spread not exceeding 25 and smoke developed not exceeding 50.
 - 7. Basis of design: Johns Manville Microlite fiberglass duct wrap insulation.
- B. Semi-Rigid Insulation for Outdoor Installation:
 - 1. Scheduled thickness and R-value.
 - 2. Factory-applied foil scrim vapor barrier facing.
 - 3. Average thermal conductivity not to exceed 0.23 (Btu-IN)/(HR-FT²-DegF) at mean temperature of 75 DEGF.
 - 4. Minimum density: 3 LBS/CF.
 - 5. Fungi and bacteria resistance:
 - a. ASTM C1338.
 - b. Does not breed or promote growth.
 - 6. Basis of Design: Johns Manville #815 SPIN-GLASS fiberglass duct insulation.
- C. Weatherproof Duct Insulation Jacketing:
 - 1. Polymeric blend laminate jacketing.
 - 2. UV resistant.
 - 3. High puncture and tear resistance.
 - 4. Water resistance and water vapor transmission rate less than 0.02 perm per ASTM E96.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. General:
 - 1. Piping below ground covered with earth will not be insulated except as specified in Specification Section 40 05 25.
 - 2. Provide release for insulation application after installation and testing is complete.
 - a. Apply insulation on clean, dry surfaces after inspection.
 - 3. Provide insulation continuous through wall, roof and ceiling openings, pipe hangers, supports and sleeves.
 - 4. Provide insulation with vapor barrier for piping, ductwork and equipment where surfaces may be cooler than surrounding air temperatures.
 - a. Provide vapor barrier (0.17 perm-IN; ASTM C553) continuous and unbroken.
 - b. Hangers, supports, anchors, and related items that are secured directly to cold surfaces must be adequately insulated and vapor-sealed to prevent condensation.
 - 5. Apply specified adhesives, mastics and coatings at the manufacturer's recommended coverage per unit volume.
- C. Piping Insulation - Fiberglass:
 - 1. Apply over clean dry pipe.
 - a. Butt all joints together firmly.
 - 2. Seal joints, slits, miter-cuts and other exposed edges of insulation as recommended by the insulation manufacturer.
 - 3. Insulate fittings, valves, and flanges with insulation thickness equal to adjacent pipe.
 - 4. Aluminum pipe jacket:
 - a. Field-applied aluminum jacket with vapor-sealed longitudinal and butt joints.
 - b. Provide smooth and straight joint with a minimum 2 IN overlap.
 - c. Secure joints with corrosion-resistant screws spaced 0.25 to 0.50 IN back from edge.
 - d. Center spacing of screws 5 IN maximum or as required to provide smooth tight-fitted joints.
 - e. Place joints on least exposed side of piping to obtain neat appearance.
- D. Ductwork Insulation - Fiberglass:
 - 1. Flexible insulation:
 - a. Butt edges tightly.
 - 1) Secure insulation with Benjamin Foster 85-20 adhesive applied in 6 IN strips on 12 IN centers and/or pins, applied on not more than 18 IN centers so that the insulation conforms to the duct surfaces uniformly and firmly.
 - b. Seal joints with facing overlap or 4 IN wide strips of like facing material adhered and stapled in place.
 - c. Properly seal any penetration in vapor barrier facing with Benjamin Foster 85-20.
 - d. Cut insulation slightly longer than the perimeter of the duct to ensure full thickness at corners.
 - 2. Semi-rigid insulation:
 - a. Impaling over pins.
 - 1) Apply insulation with edges tightly butted.
 - 2) Apply insulation with mechanically welded fasteners to the duct and secured with speed clips.
 - 3) Clip pins off close to clip.
 - 4) Space pins as required to hold insulation firmly against duct surface but not less than one pin per 1.5 SQFT.
 - 5) Seal joints and speed clips with 3 IN wide strip of facing adhered with Benjamin Foster 85-20 adhesive.

- b. If the welded pin method is impossible, secure insulation to the duct with Benjamin Foster 85-20 adhesive.
 - 1) Cover the entire surface of duct with adhesive.
 - 2) Use corner metal angle to protect edge of insulation.
 - 3) Protect edge of insulation.
 - 4) Seal joints as above.
- c. For outdoor application finish with Benjamin Foster #4610 weatherproof mastic with white glass fabric membrane.

3.2 REPAIR

- A. Whenever any factory applied insulation or job-applied insulation is removed or damaged, replace with the same quality of material and workmanship.

3.3 SCHEDULES

- A. Pipe, Fittings and Valves:
 - 1. Fiberglass.

APPLICATION	PIPE SIZE	THICKNESS	JACKET
Condensate drains	All sizes	1 IN	Alum.

- B. Ductwork:
 - 1. Fiberglass.

DUCT SERVICE	INSULATION AND THICKNESS	MINIMUM R-VALUE (HR-FT ² -DEGF)/BTU
Foul air and exhaust air, outside building	2-1/2 IN semi-rigid or flexible fiberglass with weatherproof jacketing for outdoor installation	12.0
All other ductwork	Uninsulated	N/A

END OF SECTION

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SECTION 40 71 00
FLOW INSTRUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Flow Switches (Foul Air).
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
 - 3. Section 40 90 00 - Instrumentation for Process Control: Basic Requirements.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American Gas Association (AGA):
 - a. Gas Measurement Committee Report #3.
 - 2. American Society of Mechanical Engineers (ASME):
 - a. A126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 - b. A240, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - c. B16.5, Pipe Flanges and Flanged Fittings.
 - d. B626, Standard Specification for Welded Nickel and Nickel-Cobalt Alloy Tube.
 - e. PTC 19.5, Application of Fluid Meters, Part 2.
 - 3. ASTM International (ASTM):
 - a. A126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 - 4. American Water Works Association (AWWA).
 - 5. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - b. WD 1, General Color Requirements for Wiring Devices.
 - c. ICS 6, Industrial Control and Systems: Enclosures.
 - 6. National Sanitation Foundation (NSF).
 - 7. US Department of Interior Bureau of Reclamation (USDIBR):
 - a. Water Measurement Manual.
 - 8. International Society of Automation (ISA):
 - a. RP12.06.01-2003, Recommended Practice for Wiring Methods for Hazardous (Classified) Locations Instrumentation Part 1: Intrinsic Safety.
 - b. TR12.24.01-1998, Recommended Practice for Classification of Locations for Electrical Installations Classified as Class 1, Zone 0, Zone 1, or Zone 2.
 - c. TR71.02-1991, Environmental Conditions for Process Measurement and Control Systems: Power.
 - d. TR91.00.02-2003, Criticality Classification Guideline for Instrumentation.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 - 2. See Specification Section 40 90 00.
- B. Operation and Maintenance Manuals:

1. See Specification Section 01 33 04 for requirements for:
 - a. The mechanics and administration of the submittal process.
 - b. The content of Operation and Maintenance Manuals.

1.4 SYSTEM DESCRIPTION

- A. The instruments specified in this Specification Section are the primary element components for the control loops shown on the "Y" series Drawings and specified in Specification Section 40 90 05.
- B. These instruments are integrated with other control system components specified under Specification Section 40 90 00 series to produce the functional control defined in the Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the manufacturers listed in the Articles describing the elements are acceptable.
- B. Submit request for substitution in accordance with Specification Section 01 25 13.

2.2 FLOW SWITCHES

- A. Thermal Dispersion Air Flow Switches: Sense air flow or no air flow by responding only to velocity of air movement. Application: Foul Air Treatment Systems
 1. Acceptable manufacturer:
 - a. Fluid Components, FLT93 threaded insertion type.
 - b. Or approved equal.
 2. Materials:
 - a. All wetted surfaces: 316 stainless steel with all-welded construction. Insertion length:
 - 1) As recommended by manufacturer.
 - 2) No less than 1/3 and no greater than 1/2 of the indicated duct diameter.
 - b. Enclosure: For industrial hazardous environment applications requiring a NEMA 7 rated flow switch. Corrosion and weather resistant.
 3. Design and fabrication:
 - a. Setpoint range:
 - 1) Air/gas: 0.25 to 120 SFPS
 - b. Factory calibrated switch point accuracy.
 - c. Monitoring accuracy: Based on a measured output voltage over the entire flow range, an operating temperature range of ± 50 Deg F and an operating pressure range of ± 100 psig
 - 1) Gases $\pm 5\%$ reading or ± 2 SFPS, whichever is larger.
 - d. Repeatability: $\pm 0.5\%$ reading.
 - e. Two (2) SPDT field configurable switch contacts rated:
 - 1) 6 amp inductive at 24 Vdc.
 - 2) 6 amp inductive at 115 Vac.
 - 3) Alarm No. 1: Preset for flow and to de-energize with decreasing conditions.
 - f. Process connections: 1 IN female NPT.
 - g. Input Power: 115 Vac, ± 10 percent at 60 Hz. Heater power.
 - h. Output signal: analog DC voltage related to flow signal and proportional to temperature.
 - i. Operating Temperature Sensing Element: -40DegF to +350DegF
 - j. Control Circuit; -40DegF to +140DegF
 - k. Operating Pressure: Recommended operation service is 2350 psig at 500DegF
 - l. Rated for exterior (exposed to weather) service.

4. Schedule:

TAG NUMBER	SERVICE	FLOW RANGE (SCFM)	PROCESS			PIPE SIZE (IN)	NEMA (IP) RATING	LOW FLOW SETPOINT (SCFM)
			MEDIUM	TEMP	PRESSURE			
FS-101	FOUL AIR	1,000 – 5,000	Corrosive Air	0- 100 °F	-10 inches w.c. to 10 inches w.c.	22	NEMA 7	3,500

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

3.2 TRAINING

A. Provide on-site training in accordance with Specification Section 01 75 00.

END OF SECTION

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SECTION 40 73 00
PRESSURE INSTRUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Pressure Switches.
 - a. Electro-Mechanical.
 - 2. Pressure Indicators.
 - a. Pressure Gauges – Mechanical.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American Society of Mechanical Engineers (ASME):
 - a. B16.5, Pipe Flanges and Flanged Fittings
 - 2. ASTM International (ASTM):
 - a. A106/A106M, Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
- B. Operation and Maintenance Manuals:
 - 1. See Specification Section 01 33 04 for requirements for:
 - a. The mechanics and administration of the submittal process.
 - b. The content of Operation and Maintenance Manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the manufacturers listed in the Articles describing the elements are acceptable.
- B. Submit request for substitution in accordance with Specification Section 01 25 13.

2.2 PRESSURE SWITCHES AND PRESSURE DIFFERENTIAL SWITCHES, HAZARDOUS LOCATIONS

- A. Electro-Mechanical:
 - 1. Acceptable manufacturers:
 - a. Dwyer Series 1950G Integral Explosion-Proof Pressure Switches for foul air. Applies to PSL-101.
 - b. Dwyer Series 1950G Explosion-proof Differential Pressure Switch for foul air filter clogged detection, applies to PDI-100, PDI-110
 - c. Or approved equal.
 - 2. Materials:
 - a. Wetted switch elements: 316 stainless steel.

- b. Diaphragm seal housing: 316 stainless steel.
 - 1) Mounting orientation: Diaphragm in vertical position.
- c. Pressure snubber:
 - 1) Filter disc: 316 stainless steel.
 - 2) Housing: 316 stainless steel.
- 3. Accessories:
 - a. Provide ball valve to isolate pressure switch from source.
 - b. Utilize pressure snubber with porous metal discs to provide pulsation dampening on pressure switch as shown on schedule.
 - c. On applications where a pressure switch and a pressure gauge are used at the same location, it is permissible to utilize one (1) pulsation dampener and diaphragm seal to isolate both elements from the process fluid.
- 4. Design and fabrication:
 - a. Cold Weather application for temperature range 0 DEG F – 140 DEG F
 - b. Service: foul air and compatible combustible gases.
 - c. Utilize “Snap Action” type contact switches.
 - d. Power requirement: 120 VAC.
 - e. One (1) SPDT contact rated:
 - 1) 50 mA resistive at 125 VDC.
 - 2) 10 amps inductive at 120 VAC.
 - f. Switch set points:
 - 1) Adjustment screw type on top of housing.
 - 2) Below 1,000 PSI:
 - a) Set points between 30 and 70 PCT of switch rated working range.
 - (1) Pressure limits: 45 in w.c. continuous; 10 psig surge.
 - b) Operating pressure not to exceed 75 PCT of switch rated working range.
 - g. Accuracy: ± 1 PCT of full scale.
 - h. Process connection: Minimum of 1/8 IN female NPT.
 - i. Conduit connection: Minimum of 1/2 IN.
- 5. Schedule:

TAG NUMBER	SERVICE	LOW SETTING	HIGH SETTING	ENCLOSURE RATING	SNUBBER REQ'D
PDI-100	FOUL AIR	0	5 inches w.c.	NEMA 7	YES
PDI/PSL-101	FOUL AIR	0	15 inches w.c.	NEMA 7	YES
PDI-110	FOUL AIR	0	15 inches w.c.	NEMA 7	YES

2.3 ACCESSORIES

- A. Furnish all mounting brackets, hardware and appurtenances required for mounting primary elements and transmitters.
 - 1. Materials, unless otherwise specified, shall be as follows:
 - a. Bolts, nuts, washers, expansion anchors: 316 stainless steel.
 - b. Mounting brackets:
 - 1) Standard: 316 stainless steel.
 - c. Mounting plates, angles:
 - 1) Corrosive areas: 316 stainless steel.
 - d. Instrument pipe stands:
 - 1) Corrosive areas: 316 stainless steel.
- B. Tubing Support Angles and Brackets:
 - a. Type 316 stainless steel.

- C. Tubing Tray or Channel:
 - 1. Type 316 stainless steel. Provide dielectric material between tray or channel and tubing.
- D. Cable lengths between sensors and transmitters shall be continuous (without splices) and as required to accommodate locations as shown on Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install instrument mounting pipe stands level and plumb.
- C. Instrument Valves:
 - 1. Orient stems for proper operation.
 - 2. Install arrays orderly and neat in appearance with true horizontal and vertical lines.
 - 3. Provide a minimum of 2 IN clearance between valve handle turning radii where there are multiple valve handles appearing in a straight line.
 - 4. Valves shall have bonnets and any soft seals removed during welding or soldering into the line.
 - a. When cool, reassemble the valves.
 - 5. Support each valve individually.
 - a. The tubing system does not qualify as support for the valve.
- D. Locate instrument piping and tubing so as to be free of vibration and interference with other piping, conduit, or equipment.
- E. Keep foreign matter out of the system.
- F. Remove all oil on piping and tubing with solvent before piping and tubing installation.
- G. Plug all open ends and connections to keep out contaminants.
- H. Threaded Connection Seals:
 - 1. Use Tite-Seal or acceptable alternate.
 - 2. Use of lead base pipe dope or Teflon tape is not acceptable.
 - 3. Do not apply Tite-Seal to tubing threads of compression fittings.
- I. Instrument Mounting:
 - 1. Mount all instruments where they will be accessible from fixed ladders, platforms, or grade.
 - 2. Mount all local indicating instruments with face forward toward the normal operating area, within reading distance, and in the line of sight.
 - 3. Mount instruments level, plumb, and support rigidly.
 - 4. Mount to provide:
 - a. Protection from heat, shock, and vibrations.
 - b. Accessibility for maintenance.
 - c. Freedom from interference with piping, conduit and equipment.

3.2 TRAINING

- A. Provide on-site training in accordance with Specification Section 01 75 00.

END OF SECTION

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SECTION 40 90 00

INSTRUMENTATION FOR PROCESS CONTROL - BASIC REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Basic requirements for complete instrumentation system for process control.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
 - 3. Section 10 14 00 - Identification Devices.
 - 4. Section 26 05 19 - Wire and Cable - 600 Volt and Below.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. FM Global (FM).
 - 2. The International Society of Automation (ISA):
 - a. 7.0.01, Quality Standard for Instrument Air.
 - b. S5.1, Instrumentation Symbols and Identification.
 - c. S5.4, Standard Instrument Loop Diagrams.
 - d. S20, Standard Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves.
 - 3. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - 4. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code (NEC).
 - 5. National Institute of Standards and Technology (NIST).
 - 6. Underwriters Laboratories, Inc. (UL):
 - a. 913, Standard for Safety, Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous (Classified) Locations.
- B. Qualifications:
 - 1. Instrumentation subcontractor:
 - a. Experience:
 - 1) Have satisfactorily provided a control system for a minimum of five (5) projects of similar magnitude and function.
- C. Miscellaneous:
 - 1. Comply with electrical classifications and NEMA enclosure types shown on Drawings.

1.3 DEFINITIONS

- A. Architecturally finished area: Offices, laboratories, conference rooms, restrooms, corridors and other similar occupied spaces.
- B. Non-architecturally Finished Area: Pump, chemical, mechanical, electrical rooms and other similar process type rooms.
- C. Hazardous Areas: Class I, II or III areas as defined in NFPA 70.
- D. Highly Corrosive and Corrosive Areas: Rooms or areas identified on the Drawings where there is a varying degree of spillage or splashing of corrosive materials such as water, wastewater or chemical solutions; or chronic exposure to corrosive, caustic or acidic agents, chemicals, chemical fumes or chemical mixtures.

- E. Outdoor Area: Exterior locations where the equipment is normally exposed to the weather and including below grade structures, such as vaults, manholes, handholes and in-ground pump stations.
- F. Instrument Air Header: The segment of air supply piping and tubing which transports air from the compressed instrument air source through the branch isolation valve of any takeoff (branch) line.
- G. Branch Line: The segment of air supply piping and tubing which transports air from the outlet of the air header branch isolation valve through an air user's isolation valve.
- H. Intrinsically Safe Circuit: A circuit in which any spark or thermal effect is incapable of causing ignition of a mixture of flammable or combustible material in air under test conditions as prescribed in UL 913.
- I. Calibrate: To standardize a device so that it provides a specified response to known inputs.

1.4 SYSTEM DESCRIPTION

- A. Control System Requirements:
 - 1. This Specification Section provides the general requirements for the instrument and control system.
 - 2. The instrument and control system consists of all primary elements, switches, indicators, panels, signal converters, signal boosters, amplifiers, special power supplies, special or shielded cable, special grounding or isolation, auxiliaries, wiring, and other devices required to provide complete control of the Ultraviolet odor control system and associated exhaust fan and motorized dampers as specified in the Contract Documents.
- B. Single Instrumentation Subcontractor:
 - 1. Furnish and coordinate instrumentation system through a single instrumentation subcontractor.
 - a. The instrumentation subcontractor shall be responsible for functional operations of all systems, performance of control system engineering, supervision of installation, final connections, calibrations, preparation of Drawings and Operation and Maintenance Manuals, start-up, training, demonstration of substantial completion and all other aspects of the control system.
 - 2. Ensure coordination of instrumentation with other work to ensure that necessary wiring, conduits, contacts, control relays, converters, and incidentals are provided in order to transmit, receive, and control necessary signals to other control elements, to control panels, and to receiving stations.
 - 3. Prior to Shop Drawing preparation, the Instrumentation Subcontractor shall inspect the Owner's existing equipment and as-constructed electrical documentation so as to be able to fully coordinate the interface of new and existing instrumentation and controls.
 - a. All costs associated with this Work shall be incorporated into the original bid.
 - b. Although such Work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, complete and compatible installation.

1.5 SUBMITTALS

- A. Shop Drawings:
 - 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 - 2. Submittals shall be original printed material or clear unblemished photocopies of original printed material.
 - a. Facsimile information is not acceptable.
 - 3. Limit the scope of each submittal to one (1) Specification Section.
 - a. Each submittal must be submitted under the Specification Section containing requirements of submittal contents.
 - b. Do not provide any submittals for Specification Section 40 90 00.

4. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Equipment catalog cut sheets.
 - c. Instrument data sheets:
 - 1) ISA S20 or approved equal.
 - 2) Separate data sheet for each instrument.
 - d. Materials of construction.
 - e. Minimum and maximum flow ranges.
 - f. Pressure loss curves.
 - g. Physical limits of components including temperature and pressure limits.
 - h. Size and weight.
 - i. Electrical power requirements and wiring diagrams.
 - j. NEMA rating of housings.
 - k. Submittals shall be marked with arrows to show exact features to be provided.
 - 5.
 6. Drawings, systems, and other elements are represented schematically in accordance with ISA S5.1 and ISA S5.3.
 - a. The nomenclature, tag numbers, equipment numbers, panel numbers, and related series identification contained in the Contract Documents shall be employed exclusively throughout submittals.
 7. All Shop Drawings shall be modified with as-built information/corrections.
 8. All panel and wiring drawings shall be provided in both hardcopy and softcopy.
 - a. Furnish electronic files on electronic pdf files stored in memory stick.
 - b. Drawings in AUTO CAD format.
 9. Provide a parameter setting summary sheet for each field configurable device.
 10. Certifications:
 - a. Documentation verifying that calibration equipment is certified with NIST traceability.
 - b. Approvals from independent testing laboratories or approval agencies, such as UL, FM or CSA.
 - 1) Certification documentation is required for all equipment for which the specifications require independent agency approval.
 11. Testing reports: Source quality control reports.
- B. Contract Closeout Information:
1. Operation and Maintenance Data:
 - a. See Specification Section 01 33 04 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
 2. Warranties: Provide copies of warranties and list of factory authorized service agents.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not remove shipping blocks, plugs, caps, and desiccant dryers installed to protect the instrumentation during shipment until the instruments are installed and permanent connections are made.

1.7 SITE CONDITIONS

- A. Unless designated otherwise on the Drawings, area designations are as follows:
 1. Outdoor area:
 - a. Wet.
 - b. Corrosive and/or hazardous when specifically designated on the Drawings or in the Specifications.
 - c. Below grade vaults and manholes:
 - 1) Subject to temporary submergence when specifically designated on the Drawings or Specifications.
 2. Architecturally finished area:
 - a. Dry.
 - b. Noncorrosive unless designated otherwise on the Drawings or in the Specifications.

- c. Nonhazardous unless designated otherwise on the Drawings or in the Specifications.
- 3. Non-architecturally finished area: As designated elsewhere on the Drawings or in the Specifications.

PART 2 - PRODUCTS

2.1 NEMA TYPE REQUIREMENTS

- A. Provide enclosures/housing for control system components in accordance with the following:
 - 1. Areas designated as wet and/or corrosive: NEMA Type 4X.
 - 2. Areas designated as Class I hazardous, Groups A, B, C, or D as defined in NFPA 70:
 - a. NEMA Type 7 unless all electrical components within enclosure utilize intrinsically safe circuitry.
 - 1) Utilize intrinsically safe circuits to the maximum extent practical and as depicted in the Contract Documents.

2.2 ACCESSORIES

- A. Provide identification devices for instrumentation system components in accordance with Specification Section 10 14 00.
- B. Provide corrosion resistant spacers to maintain 1/4 IN separation between equipment and mounting surface in wet areas, on below grade walls and on walls of liquid containment or processing areas such as Clarifiers, Digesters, Reservoirs, etc.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Wherever feasible, use bottom entry for all conduit entry to instruments and junction boxes.
- B. Install electrical components per the requirements of the Electrical design.
- C. Panel-Mounted Instruments:
 - 1. Mount and wire so removal or replacement may be accomplished without interruption of service to adjacent devices.
 - 2. Locate all devices mounted inside enclosures so terminals and adjustment devices are readily accessible without use of special tools and with terminal markings clearly visible.
- D. See Specification Section 26 05 19.

3.2 FIELD QUALITY CONTROL

- A. See Specification Section 01 75 00.
- B. Maintain accurate daily log of all startup activities, calibration functions, and final setpoint adjustments.
 - 1. Documentation requirements include the utilization of the forms located at the end of this Specification Section.
 - a. Loop Check-out Sheet.
 - b. Instrument Certification Sheet.
 - c. Final Control Element Certification Sheet.
- C. Instrumentation Calibration:
 - 1. Verify that all instruments and control devices are calibrated to provide the performance required by the Contract Documents.
 - 2. Calibrate all field-mounted instruments, other than local pressure and temperature gages, after the device is mounted in place to assure proper installed operation.
 - 3. Calibrate in accordance with the manufacturer's specifications.
 - 4. Bench calibrate pressure and temperature gages.
 - a. Field mount gage within seven (7) days of calibration.

5. Check the calibration of each transmitter and gage across its specified range at 0, 25, 50, 75, and 100 PCT.
 - a. Check for both increasing and decreasing input signals to detect hysteresis.
 6. Replace any instrument which cannot be properly adjusted.
 7. Stroke control valves with clean dry air to verify control action, positioner settings, and solenoid functions.
 8. Calibration equipment shall be certified by an independent agency with traceability to NIST.
 - a. Certification shall be up-to-date.
 - b. Use of equipment with expired certifications shall not be permitted.
 9. Calibration equipment shall be at least three (3) times more accurate as the device being calibrated.
- D. Loop check-out requirements are as follows:
1. Check control signal generation, transmission, reception and response for all control loops under simulated operating conditions by imposing a signal on the loop at the instrument connections.
 - a. Use actual signals where available.
 - b. Closely observe controllers, indicators, transmitters, HMI displays, recorders, alarm and trip units, remote setpoints, ratio systems, and other control components.
 - 1) Verify that readings at all loop components are in agreement.
 - 2) Make corrections as required.
 - a) Following any corrections, retest the loop as before.
 2. Stroke all control valves, cylinders, drives and connecting linkages from the local control station and from the control room operator interface.
 3. Check all interlocks to the maximum extent possible.
 4. In addition to any other as-recorded documents, record all setpoint and calibration changes on all affected Contract Documents and turn over to the Owner.
- E. Provide verification of system assembly, power, ground, and I/O tests.
- F. Verify existence and measure adequacy of all grounds required for instrumentation and controls.

END OF SECTION

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SECTION 40 91 10
PRIMARY METERS AND TRANSMITTERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Temperature components.
 - 2. Analytical components.
 - 3. Speed components.
 - 4. Pipe, tubing and fittings.
 - 5. Instrument valves.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
 - 3. Section 40 90 00 - Instrumentation for Process Control: Basic Requirements.
 - 4. Section 40 90 05 - Control Loop Descriptions.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American Iron and Steel Institute (AISI).
 - 2. American National Standards Institute (ANSI).
 - 3. American Society of Mechanical Engineers (ASME):
 - a. B16.5, Pipe Flanges and Flanged Fittings.
 - b. PTC 19.3, Instruments and Apparatus, Part 3 Temperature Measurement.
 - c. PTC 19.5, Application of Fluid Meters, Part 2.
 - 4. ASTM International (ASTM):
 - a. A106, Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service.
 - b. A126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 - c. A182, Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.
 - 5. Federal Communications Commission (FCC)
 - a. 47 CFR 15, Radio Frequency Devices.
 - 6. The International Society of Automation (ISA):
 - a. MC96.1, Temperature Measurement Thermocouples.
 - 7. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - 8. US Department of Interior Bureau of Reclamation (USDIBR):
 - a. Water Measurement Manual.

1.3 SYSTEM DESCRIPTION

- A. The instruments specified in this Specification Section are the primary element components shown on the "Y" series Drawings.
 - 1. These instruments are integrated with other control system components specified under Specification Section 40 90 00 series to produce the functional control defined in the Contract Documents.

1.4 SUBMITTALS

- A. Shop Drawings:
 - 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.

2. See Specification Section 40 90 00.
- B. Contract Closeout Information:
1. Operation and Maintenance Data:
 - a. See Specification Section 01 33 04 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the manufacturers listed in the Articles describing the elements are acceptable.
- B. Submit request for substitution in accordance with Specification Section 01 25 13.

2.2 ANALYTICAL ELEMENTS

- A. Combustible and Toxic Gas Detectors to perform in Cold Weather:
1. Acceptable manufacturers:
 - a. Bacharach.
 - b. MSA Instruments.
 2. Control unit:
 - a. Front mounted indication.
 - 1) Minimum three-digit display of gas concentration associated with each sensor.
 - 2) Alarm status indicators for each gas sensing channel:
 - a) Trouble.
 - b) High gas level detected.
 - c) High high gas level detected.
 - b. Alarm relay outputs:
 - 1) Separate contacts for each alarm or trouble condition associated with each gas sensing channel.
 - 2) Separate "system trouble" contact to indicate trouble in the event any of the following conditions are true:
 - a) System power loss.
 - b) Signal loss from any sensor.
 - c) Signal out of appropriate range.
 - d) Control module malfunction or removal.
 - 3) Each output contact shall be Form C, SPDT, rated for 3 amps resistive at 120 VAC.
 - c. Output signals: 4-20 mA signal representing gas concentration for each gas sensor.
 - d. Temperature range: 0 to 158 DEGF, Cold Weather conditions
 - e. Relative humidity range: 0-95 PCT non-condensing.
 3. Sensor and transmitter design and fabrication:
 - a. Sensor mounting type shall be as indicated on schedule: Either diffusion mounted, duct mounted, or sample draw mounted.
 - b. For sensors required by schedule to be sample draw type:
 - 1) Provide a compressed air aspirator or motorized pump to draw a sample past the sensor.
 - 2) Utilize a flow switch to provide annunciation of low sample flow rate to the sensor.
 - c. Duct mounted gas sensor shall be able to monitor gas flow rates up to 85 fps.
 - d. Combustible gas sensor shall be catalytic bead type with demonstrated resistance to poisoning by silicones and hydrogen sulfide gases.
 - e. Toxic gas sensor shall be the electrochemical type and shall not require the periodic addition of reagents.
 - f. Interconnect wiring from sensor to transmitter (if not integral) or control unit shall be 3 wire shielded cable.

- g. Sensing element shall have minimum useful life of one (1) year.
- h. Transmitter output: 4-20 mA signal proportional to measured gas level.
 - 1) Capable of driving 600 ohm load at 24 VDC supply voltage.
- i. Accuracy:
 - 1) Combustible gas detection:
 - a) +3 PCT LEL to 50 PCT full scale.
 - b) +5 PCT LEL, 50 to 100 PCT full scale.
 - 2) Toxic gas detection:
 - a) +10 PCT full scale or 2 PPM, whichever is greater.
- j. Environmental:
 - 1) Ambient operating temperature: -40 to 185 DEGF.
 - 2) Relative humidity: 0-95 PCT non-condensing.
- k. Housing: In accordance with the area classification shown on Drawings.
- l. Provide nonintrusive means of calibration.
- m. Local displays:
 - 1) 3-1/2 digit LCD or LED display of measured gas level.
 - 2) Fault LED.
- n. Standalone sensors and transmitters (without central control unit):
 - 1) Provide relay contacts rated at 1/2 amps at 120 VAC for each of the following conditions:
 - a) High gas level (warning level).
 - b) High high gas level (alarm level).
 - c) Sensor fault condition.
- o. Relay contacts shall be normally energized (normally closed); contacts shall open in the event of a warning, alarm or trouble condition.
- p. Minimum detector response time when exposed to 100 PCT LEL gas concentration:
 - 1) 10 seconds to 50 PCT LEL.
 - 2) 30 seconds to 90 PCT LEL.
- q. Store calibration data in nonvolatile memory or back up with battery.
- r. Safety approvals:
 - 1) CSA Certification.
 - 2) FM approved.
- 4. Provide one (1) calibration kit for each type of gas monitored.
 - a. Calibration kits shall be furnished complete with all tubing, regulators, fittings, communication devices, and accessories required to calibrate sensors.
 - b. Calibration kit shall utilize nonintrusive means of calibrating sensors/transmitters.
- 5. Provide two (2) full cylinders of each type of calibration check gas.
 - a. Cylinder size: 17 liters.
- 6. Provide the same quantity of zero air cylinders as the total required number of calibration check gas cylinders (of all types).
- 7. Schedule:

TAG NO	SERVICE	GAS	MOUNT TYPE	RANGE	SETPOINTS	
					WARN (HI)	ALARM (HI HI)
AE-101	FOUL AIR	METHANE, HYDROGEN SULFITE	DM IN OCU-101		10% LEL	20% LEL
AE-110	FOUL AIR	METHANE, HYDROGEN SULFITE	DM IN ENC-110		10% LEL	20% LEL

MOUNT TYPE: D - diffusion type, DM - duct mounted, SD - sample draw.

2.3 PIPE, TUBING, AND FITTINGS

- A. Acceptable Manufacturers:
 - 1. Tube fittings:
 - a. Parker CPI.
 - b. Swagelok.
- B. Instrument Tubing and Fittings:
 - 1. Material:
 - a. Tubing: ASTM A269, Grade TP 316 stainless steel.
 - b. Straight fittings: 316 stainless steel per ASME SA-479 or ASTM A276.
 - c. Shaped bodies: ASME SA-182 F316 stainless steel.
 - 2. Design and fabrication:
 - a. Tubing:
 - 1) Seamless.
 - 2) Fully annealed.
 - 3) Maximum hardness: 80 Rb.
 - 4) Free from surface scratches and imperfections.
 - 5) Diameter: 1/2 IN OD unless specified otherwise.
 - 6) Wall thickness:
 - a) Meet requirements of ASME B31.1, Paragraph 122.3.
 - b) Minimum 0.049 IN for 1/2 IN OD tubing.
 - b. Fittings:
 - 1) Flareless.
 - 2) Compression type.
- C. Instrument Piping:
 - 1. For applications where the instrument is supported solely by the sensing line, (e.g., pressure gauge directly mounted to process line) utilize piping as specified below.
 - a. Diameter: 1/2 IN unless specified otherwise.
 - b. Schedule 80.
 - c. 316 stainless steel

2.4 INSTRUMENT VALVES

- A. Process instrument multi-valve manifolds, isolation, vent and blow-down valves:
 - 1. Acceptable manufacturers:
 - a. Whitey Co.
 - b. Anderson-Greenwood USA, Inc.
 - 2. Materials:
 - a. Packing:
 - 1) 450 DEGF and above: Graphite.
 - 2) Below 450 DEGF: Graphite or Teflon.
 - b. Body: 316 stainless steel per ASTM A479.
 - c. Stem: 316 stainless steel per ASTM A276.
 - d. Ball: 316 stainless steel per ASTM A276.

- e. Support rings: 316 stainless steel per ASTM A276.
- f. Seats:
 - 1) Metal:
 - a) 316 stainless steel per ASTM A276.
 - 2) Soft:
 - a) Teflon, Delrin.
 - b) Only utilized on applications where manufacturer's temperature and pressure ratings exceed process design conditions.
- 3. Design and fabrication:
 - a. Either of the following:
 - 1) Ball valve with 1/4 turn activation.
 - 2) Free-swiveling ball stem.
 - b. Provide body wall thickness sufficient for process design conditions per ASME B31.1.
 - c. Temperature: Manufacturer's temperature rating for all components shall exceed process design conditions.

2.5 ACCESSORIES

- A. Furnish all mounting brackets, hardware and appurtenances required for mounting primary elements and transmitters.
 - 1. Materials, unless otherwise specified, shall be as follows:
 - a. Bolts, nuts, washers, expansion anchors: 316 stainless steel.
 - b. Mounting brackets:
 - 1) Standard: 316 stainless steel.
 - c. Mounting plates, angles:
 - 1) Corrosive areas: 316 stainless steel.
 - d. Instrument pipe stands:
 - 1) Corrosive areas: 316 stainless steel.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install instrument mounting pipe stands level and plumb.
- C. Instrument Valves:
 - 1. Orient stems for proper operation.
 - 2. Install arrays orderly and neat in appearance with true horizontal and vertical lines.
 - 3. Provide a minimum of 2 IN clearance between valve handle turning radii where there are multiple valve handles appearing in a straight line.
 - 4. Valves shall have bonnets and any soft seals removed during welding or soldering into the line.
 - a. When cool, reassemble the valves.
 - 5. Support each valve individually.
 - a. The tubing system does not qualify as support for the valve.
- D. Locate instrument piping and tubing so as to be free of vibration and interference with other piping, conduit, or equipment.
- E. Keep foreign matter out of the system.
- F. Remove all oil on piping and tubing with solvent before piping and tubing installation.
- G. Plug all open ends and connections to keep out contaminants.
- H. Tubing Installation:
 - 1. General:

- a. Install such that tube shows no sign of crumpling, bends of too short a radius, or flattening, etc.
 - b. Make tube runs straight and parallel or perpendicular to the floor, equipment and piping runs.
 - c. For liquid and steam applications, slope continuously from the process to the instrument with a minimum slope of 0.50 IN per foot.
 - d. For gas and air applications, slope continuously from the instrument to the process with a minimum slope of 0.50 IN per foot.
 - e. If the sensing line cannot be continuously sloped, install high point vents and low point drains.
 - f. Keep instrument tubing clean during all phases of work.
 - g. Blow out with clean, dry, oil-free air immediately before final assembly.
 - h. Cut by sawing only and debur.
2. Bending:
- a. Make each bend with tube bender of the correct size for the tube.
 - b. Make all bends smooth and continuous.
 - c. Rebending is not permitted.
 - d. Make bends true to angle and radius.
 - e. Maintain a true circular cross section of tubing without buckling or undue stretch of tube wall.
 - f. Allowable tolerance for flattening out of tubing bends: Maximum of 8 PCT of the OD for stainless steel tubing.
 - g. Minimum bending radius for stainless steel tubing:

TUBE OD, INCHES	MINIMUM BENDING RADIUS, INCHES
1/4	9/16
3/8	15/16
1/2	1-1/2

- h. Minimum bending radius for type L, hard (drawn) copper:

TUBE OD, INCHES	MINIMUM BENDING RADIUS, INCHES
3/8	1-3/4
1/2	2-1/2

3. Tubing support:
- a. Intermittently support by clamping to support angle.
 - b. Install supports to be self-draining, supported by hangers, or cantilevered from walls or structural beams.
 - c. Support at 5 FT-0 IN maximum spans for horizontal or vertical runs.
 - d. Use tubing trays in areas where spans between supports are greater than 5 FT and for all signal tubing support.
 - e. Support each tubing tray at 10 FT maximum spans.
 - f. Align tubing in orderly rows and retain in the tray by bolted clips.
 - 1) The use of spring or speed clips is not acceptable.
 - g. Maintain order of the tubing throughout the length of the tray.
 - h. Locate angle, channel and tray installation to protect tubing from spills and mechanical damage.
 - i. Locate support members to clear all piping, conduit, equipment, hatchways, monorails, and personnel access ways and allow access for equipment operation and maintenance.

- j. Support trays to prevent torsion, sway or sag.
 - k. Permanently attach supports to building steel or other permanent structural members.
 - l. Arrange supports and trays so that they do not become a trough or trap.
4. Routing and orientation:
 - a. Route to maintain a minimum headroom clearance of 8 FT.
 - b. Locate and orient valves and specialties so that they are accessible for operation and maintenance from the operating floor.
 - 1) Do not route through or over equipment removal areas, below monorails or cranes nor above or below hatches.
 5. Expansion and vibration provisions:
 - a. Provide horizontal expansion loops at the process connections.
 - b. Route tubing parallel to relative motion through sleeved supports that allow linear tube movement.
 - c. Cold springing of tubing to compensate for thermal expansion is prohibited.
 - d. Utilize flexible hoses to connect pneumatic tubing to air users which may move or vibrate.
- I. Air Supply:
1. Connect all instruments requiring air to air supply piping and tubing.
 2. Provide connections as follows:
 - a. Terminate branch supply line not more than 36 IN from the device with a 1/2 IN isolation valve.
 - b. For remaining line, use 1/4 or 3/8 IN tubing of a length to allow for normal equipment movement and vibration.
 - c. Use flexible hoses to connect pneumatic tubing to air users which may experience significant movement or vibration.
 - d. Make branch connections to individual instruments from the top of the supply header.
 - e. Purge instrument air piping of extraneous material by blowing clean, dry, oil-free air through the system prior to final connection.
- J. Threaded Connection Seals:
1. Use Tite-Seal or acceptable alternate.
 2. Use of lead base pipe dope or Teflon tape is not acceptable.
 3. Do not apply Tite-Seal to tubing threads of compression fittings.
- K. Capillary Tubing:
1. Route capillary tubing in tubing tray.
 2. Install capillary tubing with a 2 IN minimum bend radius which does not kink or pinch the capillaries.
 3. Do not cut or disconnect at any point.
 4. Coil excess capillary tubing and secure at the instrument.
- L. Temperature Elements:
1. Assemble in the following sequence:
 - a. Remove temperature sensor sheaths and terminal blocks from the head and nipple assembly.
 - b. Connect nipple and head to thermowell installed in the pipe.
 - c. Insert sheath and terminal block until it seats in the thermowell.
 - d. Connect to the head.
- M. Instrument Mounting:
1. Mount all instruments where they will be accessible from fixed ladders, platforms, or grade.
 2. Mount all local indicating instruments with face forward toward the normal operating area, within reading distance, and in the line of sight.
 3. Mount instruments level, plumb, and support rigidly.
 4. Mount to provide:
 - a. Protection from heat, shock, and vibrations.
 - b. Accessibility for maintenance.

- c. Freedom from interference with piping, conduit and equipment.

3.2 TRAINING

- A. Provide on-site training in accordance with Specification Section 01 75 00.

END OF SECTION



DIVISION 44

POLLUTION AND WASTE CONTROL EQUIPMENT



SECTION 44 11 10

CORROSION RESISTANT ODOR CONTROL FAN ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Scope: This Specification Section specifies installation of a centrifugal belt-driven odor control exhaust fan for corrosive air service. The exhaust fan is supplied by the Owner. This Specification Section covers the work necessary to install the exhaust fan complete with electric motor, spare parts, and acoustical enclosure. The acoustical enclosure and additional accessories specified herein shall be supplied by the contractor.
- B. Related Specification Sections include but are not limited to:
1. CSC Parts 1, 2, 3, 4, and 6.
 2. Specification Section 01 12 00 –Owner Furnished Equipment: Ultraviolet (Photoionization) Odor Control System.
 3. Specification Section 23 05 93 - HVAC Systems: Balancing and Testing.
 4. Specification Section 01 61 03 - Equipment: Basic Requirements.
 5. Specification Section 40 05 31 - Pipe: Plastic.
 6. Specification Section 40 05 63 - Ball Valves.
 7. Specification Section 40 91 10 - Primary Meters and Transmitters.
 - a. Toxic Gas Sensors.
 8. Specification Section 44 31 43 – Installation of Ultraviolet Odor Control System.

C. Equipment List (Supplied by Owner)

QUANTITY	ITEM	EQUIPMENT NO.
1	Building #1 Odor Control Fan	EF-101

D. Equipment List (Supplied by Contractor)

QUANTITY	ITEM	EQUIPMENT NO.
1	Building #1 Acoustical Walk-in Enclosure	ENC-110

- E. Definitions: Terminology used in this Specification Section conforms to the following definitions:
1. bHP: Brake horsepower.
 2. CFM: Cubic feet per minute.
 3. dB: Decibels.
 4. fps: Feet per second.
 5. FRP: Fiberglass reinforced plastic.
 6. H₂S: Hydrogen sulfide.
 7. WC: Water column.
 8. PPM: Parts per million.

1.2 QUALITY ASSURANCE

- A. Referenced Standards: This Specification Section incorporates by reference the latest revisions of the following documents. They are part of this Section. In case of conflict between the requirements of this Section and the listed documents, the Contractor shall point out the conflict to the Owner; lacking a definitive answer otherwise, the requirements of the Contract Specifications shall prevail:

<u>Reference</u>	<u>Title</u>
AMCA 300	Air Movement and Control Association, Reverberant Room Method for Sound Testing of Fans
ANSI S1.4	American National Standards Institute, Sound-Level Meters
ANSI S1.6	American National Standards Institute, Preferred Frequencies, Frequency Levels, and Band Numbers for Acoustical Measurements
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers: HVAC Applications Handbook
ASME PTC-36-2004	Measurement of Industrial Sound

- B. Unit Responsibility: The fan in this section shall be supplied by the Owner. The fan shall be provided by the manufacturer of the Ultraviolet (Photoionization) Odor Control System (Section 44 31 43). It shall be a coordinated, integral part of the Section 44 31 43 system. Associated appurtenances, such as the sound attenuating enclosure, flexible connections (inlet and outlet), instruments (differential pressure gauge), drain lines, and accessories as required shall be provided separately by the Contractor and coordinated with the fan supplier to ensure compatibility. The UV Odor Control System manufacturer is not required to provide these items directly.

1.3 SUBMITTALS

- A. Procedures: Section 01 33 00.
- B. Schedule:
1. Provide Installation schedule.
 2. Provide start-up and manufacturer's field services schedule.
 3. Provide schedules a minimum of 30 days prior to event.
- C. Produce technical data, fabrication drawings, layout drawings for piping and other structural items and accessories provided by Contractor.
- D. Items to be submitted for this Specification:
1. Submittals shall include the following for the acoustical enclosure:
 - a. Make, model, and weight, for acoustical enclosure.
 - b. Manufacturer's catalogue information, descriptive literature, specifications, and identification of materials of construction. Include complete resin system information.
 - c. Performance data, including curves showing sound attenuation levels over expected operating range.
 - d. Detailed structural, mechanical, and electrical drawings showing the equipment fabrications, dimensions, size, and locations as well as interface with other items and weights of associated equipment.
 - e. Shop and Field Painting Systems: Include manufacturer's descriptive technical catalogue literature and specifications.
 - f. Estimated sound attenuation performance and description of sound control measures to meet the specified sound levels.

- g. All exceptions to the applicable requirements and Specifications provided in these Contract Documents.
 - h. Certified foundation drawings showing anchor bolt layouts and locations.
 - i. Minimum clearance distances around equipment required to access equipment for service/repair/removal.
 - j. Outline drawings of all items that are shipped loose.
 - k. Detailed installation manuals.
 - l. Recommended procedure for the protection and handling of materials prior to installation.
2. Electrical Shop Drawings and Diagrams: Furnish complete information on all electrical wiring and equipment, including:
 - a. Connection diagrams showing all cables and terminals numbered and identified.
 3. Test Reports and Procedures:
 - a. Submit the following factory and laboratory test results, reports, and certifications, including:
 - 1) Inspection reports.
 - 2) Certified test reports for physical properties of standard laminates (if applicable for FRP structures).
 - 3) Certified sound level test reports for the acoustical enclosure.
 - 4) Certified fan vibration field test report.
 - 5) Fiberglass fabrication quality assurance procedures (if applicable for FRP structures).
 - 6) Certified fan performance field test report.
 - b. If equipment or material to be provided under this Specification Section is not specifically required to be tested in compliance with the requirements for this Specification Section, the Fan Supplier's standard test used for quality control of the equipment or material shall be conducted and test results submitted. The tests shall have been performed within two (2) years of submittal of the reports for approval.
 - c. Test reports shall be accompanied by the certificates from the Equipment Supplier certifying that the material and equipment proposed to be supplied under this Specification Section is of the same type, quality, manufacture, and make as that tested.
 4. Equipment Supplier's Field Report:
 - a. Submit Equipment Supplier's field report of inspections, tests, and observations for all items furnished under this Part.
 - b. Include copies of original test data collection forms.
 5. Review of the submittal for this Specification Section will only be done after receipt of the layout drawings for all associated duct work and piping connected to or otherwise affecting the fan.
 6. The Owner reserves the right to witness the tests specified herein and to inspect the fabrication procedures at any time during the fabrication of any odor control exhaust fan associated equipment.
 7. O&M Manuals: See Section 01 33 04.

1.4 SERVICE REQUIREMENTS

- A. Service Conditions:
 1. Location: Skagway, AK.
 2. Air Stream Temperature Range: See Section 40 10 16.
 3. Air Stream Contents: See Section 40 10 16.
- B. Operating Conditions:
 1. Relative Humidity: See Section 40 10 16.
 2. Approximate Elevation Above Sea Level: 0 feet.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS/PRODUCTS

- A. Exhaust Fan (provided by Owner):
 - 1. Aerovent.
- B. Acoustical Enclosure (provided by Contractor)
 - 1. dB Noise Reduction.
 - 2. Aeroacoustic Corp.
 - 3. VAW Systems.
 - 4. Plasti-Fab (FRP Option).
 - 5. Approved Equal.

2.2 EQUIPMENT LIST - PROVIDED BY OWNER

QUANTITY	ITEM	EQUIPMENT NO.
1	Building #1 Odor Control Exhaust Fan	EF-101
1	Building #1 Exhaust Fan Pressure Differential Indicator	PDI-101

2.3 EQUIPMENT LIST – PROVIDED BY CONTRACTOR

QUANTITY	ITEM	EQUIPMENT NO.
1	Building #1 Acoustical Walk-in Enclosure	ENC-110

2.4 PERFORMANCE AND DESIGN REQUIREMENTS – FURNISHED BY OWNER (FOR INFORMATION ONLY)

- A. Design Requirements:
 - 1. General:
 - a. Owner-supplied fan shall be designed and selected for continuous indoor or outdoor operation with air containing corrosive and flammable vapors and gases generated from the treatment and conveyance of municipal wastewater.
 - b. Vapors and gases may be expected to include methane, hydrogen sulfide, chlorine gas, sulfur dioxide, ammonia, gasoline vapors, ammonia, and water saturated air.
 - 2. Operating Requirements:
 - a. Select the fan to achieve the indicated operating capacity at no greater than 90 percent of maximum recommended RPM.
 - b. Fan shall be able to operate in a stable and quiet mode at the design flow (4,000 cfm for Building 1 and 4,500 cfm for Building 2) and up to the maximum motor RPM.
 - c. The fan shall be stable over the entire performance range.
 - d. Fan shall meet the operating point shown at an RPM no greater than the listed maximum operating RPM.
 - e. Fan shall be suitable for operation in Class I, Division 1 environment.
 - f. Belt drive.

B. Performance Criteria:

	Building 1 (EF-101)
Volume (SCFM)	4,000
Static pressure (in. wg)	9.0
AMCA arrangement number	4
Motor frequency (Hz)	60

Basis of design model (shown in Drawings for purpose of layout)	HDBI-160 (Cincinnati Fan)
Fan RPM (maximum)	2,500
Motor RPM	1800
Wheel description	backward inclined
Wheel width (%)	100
Inlet diameter (in) - approximate	18.00
Motor HP (maximum)	10.0
Static efficiency (%)	70.0
Pressure Rating (minimum)	18 inches w.g. (pressure and vacuum)

C. Sound Power Levels:

1. Values shown below are general design values. See the Owner furnished equipment shop drawings for specific fan sound information.
2. Octave band sound power levels, measured in accordance with ANSI S1.4, ANSI S1.6, and AMCA 300, shall not exceed the following values.
3. Octave Band Sound Power Level, dB re: 10⁻¹² Watts:

OCTAVE BAND CENTER FREQUENCY, HERTZ								
Element	63	125	250	500	1,000	2,000	4,000	8,000
Discharge/Inlet	108	106	92	86	83	81	79	75

4. The average free-field, A-weighted sound pressure level measured in four equal distant positions around the fan, at 5-foot distance from the fan housing shall average 70 dB(A) or less when measured in accordance with ASME PTC-36-2004 "Measurement of Industrial Sound".

D. Balance and Vibration:

1. Fan specified in this Specification Section shall be balanced at the factory to operate without vibration throughout the full operating range specified.

2.5 MATERIALS – FURNISHED BY OWNER (FOR INFORMATION ONLY)

A. Materials of construction shall be as specified herein and as listed below:

COMPONENT	MATERIAL
Wheel	316L Stainless Steel heavy gauge or Aluminum
Housing/Scroll	Aluminum or 316L Stainless Steel
Fan Shaft	Aluminum or 316L Stainless Steel
Shaft Seal	Teflon

2.6 FEATURES – FURNISHED BY OWNER (FOR INFORMATION ONLY)

A. Centrifugal Fan:

1. General:
 - a. Single-inlet fan.
 - b. Backward curved blade type wheel.
 - c. Scroll.
 - d. Inlet bellmouth and housing mounted on a steel bearing pedestal and support frame.
 - e. AMCA rated for capacity and sound. Fan shall bear the AMCA rating seal.
 - f. AMCA Type A rated for spark resistance.

- g. Extended lubrication tubes to allow for greasing of bearings from outside fan cover or housing (lubrication tube access shall be within fan walk-in acoustical enclosure per Part 2.6 of this Section).
- 2. Shaft:
 - a. Centerpunch fan shaft to accommodate tachometer readings.
 - b. Mount motor on adjustable motor brackets.
- 3. Ball Bearings:
 - a. Fan shall have anti-friction, self-aligning grease-packed pillow-block bearings.
 - b. Size for minimum life L-10 of over 40,000 hours, with average life L-50 of over 200,000 hours.
- 4. Construction:
 - a. Wheel: continuous welded, backward curved, anti-thrust vanes. Non-overloading performance. Statically and dynamically balanced.
 - b. Housing: Continuously welded construction. Structural reinforcement as necessary to reduce vibration.
 - c. Provide embedded grounding lugs in housing for connection to external ground connection.
 - d. Fan inlet and discharge to accommodate the connection of a flanged flexible connector supplied by fan manufacturer.
 - e. Curved scroll design with 1-inch NPT drain connection at the bottom of the scroll. Provide same size PVC ball valve and route drain with PVC Sch 80 pipe as shown on the Drawings.
 - f. Flanged and drilled connections on inlet and outlet. Flanges shall be constructed of 316 SST.
 - g. Position bearing support brackets to directly oppose belt tension forces.
 - h. AMCA Arrangement 9 or 10 fan configuration with discharge arrangement as indicated on Drawings.
- 5. Accessories:
 - a. Labyrinth type Teflon shaft seal.
 - b. Bolted access door.
 - c. Flanged Expansion Joints:
 - 1) Provide at inlet and discharge connections to fan as indicated on Drawings. Expansion joints shall be flanged type.
 - 2) Material: Buna-N.
 - 3) Flanged type expansion joints shall be W-design configuration, constructed with compound curve molded corners with arch pre-molded. Corners on rectangular expansion joints shall be completely molded and free of splices.
 - 4) Backing Rings: 3/8-inch thick, 2-inches wide, Type 316 stainless steel, ANSI/ASME B16.1, Class 25 diameter and drilling.
 - 5) Length: 6-inches, flange-to-flange:
 - a) Extension: 0.5-inch.
 - b) Compression: 2-inches.
 - c) Lateral Offset: 1-inch.
 - 6) Thickness: 1/4-inch, minimum.
 - 7) Flanges shall be a minimum of 3/4-inch thick.
 - 8) Manufacturer and Product: Holz Rubber Company, Inc.: Style 945 (flanged style), or Approved Equal.
 - d. Extended lubrication fittings.
- 6. Finishing: Prime and finish coat fan bearing pedestal, mounting frame, and motor with manufacturer's standard epoxy coating.

B. Motor:

- 1. Refer to Specification Section 01 61 03.
- 2. Motor shall be energy efficient and explosion proof.
- 3. Motor shall be inverter duty type.

- a. Provide fan motor with auxiliary contacts as required for interface to Ultraviolet odor control system control panel as shown on Drawings and Specification Section 44 31 43.

2.7 ACOUSTICAL ENCLOSURE – FURNISHED AND INSTALLED BY CONTRACTOR

A. Walk-in Fan Enclosure:

1. Acoustical enclosure specifications in Part 2.6 are based on a stainless steel fabrication (basis of design). Contractor may also submit a fiberglass reinforced plastic (FRP) equivalent alternative for approval at the discretion of the engineer.
 - a. Performance standards of FRP alternative shall match all requirements of this section minus materials of construction.
 - b. Fiberglass shall be corrosion resistant premium grade resin with a Class 1 flame spread rating of < 25 per ASTM E84.
 - c. Exterior of structure shall have UV protective gel coat.
 - d. Interior of structure shall be coated with intumescent paint for a Class 1 smoke rating per ASTM E84.
 - e. Plasti-Fab, or equal.
2. Double acoustical wall, free-standing frame of structural shapes with stationary and hinged locking door panels.
3. ENC-110.
4. Materials: Type 304 stainless steel.
5. The frame shall be designed for allow complete breakdown for shipment and be removable for servicing of equipment.
6. Weather tight construction.
7. Interior panels shall be perforated with a minimum of 2 inches of insulation behind.
8. Roof sloped a minimum 1/8 inch per foot away from the main entrance door to accommodate drainage.
9. Door panels shall be located on the side of the enclosure as indicated in the Drawings and allow for access to the fan belt and motor.
 - a. Size: single 6 ft wide double-door assembly.
10. Provide a fire extinguisher per Section 10 44 33 and mount inside the enclosure doorway as shown in Drawings.
11. Transparent plastic windows shall be provided on each side of the structure to allow for inspection of the fan from the exterior.
 - a. Size: 2 ft x 2 ft.
 - b. Locate as directed by the Project Representative to ensure a clear view of the fan and motor.
12. The wall panels shall accommodate penetrations of the ductwork at the locations indicated in the Drawings.
 - a. Penetrations shall be designed to provide vertical support of the duct and allow for thermal expansion and deflection of the duct.
 - b. Seal all penetrations weather tight.
13. Minimum of four stainless steel lifting eyes installed on the shelter to allow for lifting as a unit after construction.
14. Footprint: provide minimum interior clearances and dimensions as indicated in the Drawings.
15. Height:
 - a. As needed to accommodate odor control exhaust fan and interior equipment.
 - b. Minimum interior clearance from floor to ceiling: 8 FT.
16. Enclosure Exhaust Fan:
 - a. EF-110.
 - b. Fan shall remove heat from the enclosure and provide airflow for the drive motor.
 - c. Control Strategy.
 - 1) The fan will be operated through a local HOA switch on the motor starter and via the UV Odor Control System Local Control Panel.
 - 2) When the HOA is in Hand, the fan will turn on.

- 3) When the HOA is in Auto, the fan will be called to run by the UV Odor Control System Local Control Panel.
- d. Minimum flow of 6 air exchanges per hour (ACH) for enclosure interior while operating.
- e. Fan operational feedback to the control system shall be as indicated in the Drawings.
 - 1) Motor temperature switch (overheating) shall initiate a fan fail signal.
- f. Mount on the top or side of the enclosure in a baffled noise insulated enclosure.
- g. Supply duct and louvers shall be provided on the sides of the enclosure opposite the exhaust fan to allow for cooling air to pass through the enclosure and effectively sweep the space.
 - 1) Supply duct and louver shall be on the west or south side of ENC-110 and the east or south side of ENC-210.
- h. Duct and fan materials of construction shall be Type 304 stainless steel or aluminum.
- i. AMCA Class A spark-resistant construction.
- j. Motor:
 - 1) See Section 01 61 03.
 - 2) 120V, 1 PH.
 - 3) Rated for service in the interior of the enclosure (Class I, Division 2, Group D).
 - 4) Combination motor starter with overload protection.
 - 5) Temperature switch.
 - 6) Starter enclosed in a NEMA 250 Type 7 enclosure (with HOA control) mounted on the acoustical enclosure and prewired to fan motor.
 - 7) Provide disconnect per NEC.
- 17. The interior of the enclosure and all associated equipment shall be rated for a Class I, Division 2, Group D environment.
- 18. Noise Reduction:
 - a. Meet the following requirements under all operating conditions for noise generating equipment, accessories, and penetrations associated with the enclosure:
 - 1) Sound pressure not to exceed 50 dBA at 5 ft from the exterior wall of the enclosure.
- 19. Design Requirements:
 - a. Structural:
 - 1) Design in accordance with applicable Sections of the latest edit of the following:
 - a) AISC Specifications for Structural Steel Buildings.
 - b) AISI Specifications for the Design of Cold-Formed Steel Structural Members.
 - c) Metal Building Manufacturer's Association (MBMA) Low Rise Building Systems Manual.
 - d) AWS D1.6, Structural Welding Code – Stainless Steel.
 - 2) Loads:
 - a) Vertical live load: greater than 200 psf applied to horizontal projection of the roof.
 - b) Wind, Snow and Seismic Loads: as indicated in the Drawings. See Section 01 81 10.
 - c) Reduction of loads due to tributary loaded areas shall not be permitted. All distributing of equipment loads imposed on the building system shall be done in accordance with the MBMA Low Rise Building Systems Manual.
 - 3) Enclosure design shall be prepared, stamped, dated and signed by a Professional Engineer licensed in the state of Alaska.
 - b. Electrical:
 - 1) Provide interior lighting as indicated in the Drawings.
 - 2) Provide one exterior 20-amp, 120-volt, PVC toggle switch with a gasketed, spring-loaded, PVC cover for manual control of light fixtures. Wire switch to interior lighting.
 - 3) All wiring and conduit shall be in accordance with Division 26 and the Drawings.

- 4) Mount local control and equipment in accordance with Division 26 and the Drawings.
- c. Instrumentation:
 - 1) See Division 40 for instrumentation requirements.
 - 2) Field adjustable temperature switch, as required by this Section, to measure temperature within the enclosure and provide an alarm to the UV Odor Control System Local Control Panel.
 - 3) Fire detection instrumentation as indicated in the Drawings.
 - 4) Atmospheric monitoring equipment (LEL) shall be integrated with the enclosure as required in the Drawings (combustible gas sensor, AE-110A). Coordinate equipment mounting and penetrations to provide a fully operational system and maintain the integrity of the enclosure.
 - 5) All instrument mounting locations shall be approved by the Project Representative.

2.8 APPURTENANCES AND ACCESSORIES

- A. Differential Pressure Gauge/Indicator:
 1. See Specification Section 40 73 00.
- B. Atmospheric monitoring equipment:
 1. Same manufacturer and model number as those specified and supplied under Specification Section 40 91 10, no exception.
- C. Anchor Bolts: See Section 03 15 19.
 1. Sized by fan manufacturer.
 2. Furnished and installed by Contractor.
- D. Vibration Isolation Assemblies: The fan shall be equipped with vibration isolation assemblies that meet the requirements of Table 48, Chapter 47, ASHRAE HVAC Applications Handbook.
 1. Assemblies shall be stainless steel or epoxy coated. Uncoated or galvanized steel will not be permitted.
 2. Provided by fan manufacturer.
- E. Lifting Lugs: Provide suitably attached for all equipment assemblies and components weighing over 100 pounds.
 1. Provided by fan manufacturer.
- F. Equipment Identification Plate: 16-gauge stainless steel with 1/4-inch die-stamped equipment tag number securely mounted in a readily visible location.
 1. Provided by fan manufacturer.
- G. Scroll Housing Drain Piping and Valves: Comply with requirements set forth in Specification Section 40 05 31 and Specification Section 40 05 63.

2.9 SPARE PARTS – FURNISHED BY OWNER (FOR INFORMATION ONLY)

- A. Furnish the following spare parts for the fan:
 1. Two extra shaft seals.
 2. Two extra fan belts.
 3. Tag and store spare parts as directed by the Owner.

PART 3 - EXECUTION

3.1 GENERAL

- A. Installation:
 1. Installation of the fan and associated equipment shall be per the direction of the fan manufacturer.
 2. Pipe scroll drain connection through a ball valve as shown on the Drawings.

3. Install in accordance with design details and printed instructions and procedures and as approved by Owner.
4. Adjust fan assemblies such that driving units are properly aligned, plumb, and level with the driven units.
5. Connect inlet and discharge ductwork without imposing strain on fan flanges.
6. Anchor Bolts: Accurately place using equipment templates and as specified by the manufacturer.

3.2 TESTING

- A. Field Testing shall be performed by Fan Manufacturer’s Representative under separate contract with Owner. It shall be the Contractor’s responsibility to coordinate and schedule the services of the Manufacturer’s Representative based on the overall construction schedule and completion of the fan installation. Contractor shall assist the Manufacturer’s Representative with the field testing while on-site.
- B. Field Inspection: Factory trained representatives shall inspect the final installation and assist with all field functional tests of the equipment.
- C. Field Functional Testing: Prior to acceptance of fan installation, unit shall be run to demonstrate its ability to operate without overloading, or excessive vibration throughout its entire design flow range:
 1. Functional testing shall be conducted after the fan has been operated for a sufficient period to make corrections or adjustments. The fan shall be subject to field functional testing under actual operating conditions.
 2. Contractor shall furnish and submit complete field test reports using information provided by Manufacturer.
 3. Functional testing shall include the following:
 - a. Alignment: Test complete assemblies for correct rotation, proper alignment and connection, and quiet operation.
 - b. Vibration Test: Test with units operating under normal conditions and discharging to the duct system. Test at specified nominal design flow rate as well as at 70 percent and 85 percent of nominal design flow rate. Conducted by factory-trained technician or authorized representative. Measurements shall be taken at each bearing housing. Prepare record log. Balance the equipment and retest if peak-to-peak amplitude exceeds the following limits. Methods of balancing shall be in accordance with ASTM D4167, or as approved by Owner.

ROTATION SPEED (RPM)	VIBRATION AMPLITUDE (MICRONS)
300 to 600	65
600 to 900	50
900 to 1,200	40
1,200 to 1,800	25
1,800 to 3,000	15

- 1) If fan unit exhibits vibration in excess of the limits specified, adjust, or modify, as necessary. Unit which cannot be adjusted or modified to conform as specified shall be replaced.
- c. Flowrate and Static Pressure: Measure at specified nominal design flow rate as well as at 70 percent and 85 percent of nominal design flow rate and measure respective inlet and discharge static pressures. Prepare record log.
- d. Operating Temperatures: Monitor bearing areas on fan and motor for abnormally high temperatures beyond the normal operating temperatures defined by the manufacturers.

- D. Balancing: In addition to the field functional testing, the fan shall be balanced and set to the flow rate determined by the Engineer. The operating flow rate will be greater than the nominal design flow to accommodate the effect of grease filters fouling over time.
 - 1. Balanced flow rate shall be provided by the Engineer as part of the fan submittal review.
 - 2. Balance per Section 44 31 83.
 - a. Contractor to provide balancing services.
- E. Testing: In addition to any testing herein, perform all testing for this product or system consistent with applicable codes and the manufacturer's current Quality Assurance program.
- F. Functional testing required in this specification shall be coordinated with the system testing required in Section 01 75 00.

3.3 MANUFACTURER'S SERVICES

- A. Field Testing shall be performed by Fan Manufacturer's Representative under separate contract with Owner. It shall be the Contractor's responsibility to coordinate and schedule the services of the Manufacturer's Representative based on the overall construction schedule and completion of the fan installation. Contractor shall assist the Manufacturer's Representative with the field testing while on-site.
- B. Completion of manufacturer's Certificate of Installation Compliance.
- C. Operator's Training: As a minimum, provide the following training:
 - 1. An experienced representative shall provide 4-hours of classroom and hands-on instruction which will cover the theory of operation and actual operation of the fan unit.
 - 2. This training can be completed in parallel with the UV Odor Control System per Section 44 31 43 and does not need to be a separate training session.
- D. Maintenance Training: Provide 4-hours of classroom and hands-on training for electrical, instrumentation, and mechanical maintenance.

END OF SECTION

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SECTION 44 31 43

INSTALLATION OF ULTRAVIOLET (PHOTOIONIZATION) ODOR CONTROL SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. This section specifies the installation of the Owner-furnished Ultraviolet (Photoionization) System equipment for gas phase odor control. The Ultraviolet (UV) System is complete with unit housing, dust-filter, filter pressure control, ventilation monitoring, UV-compartment, catalyst, exhaust fan, control panel, components and accessories.
- B. The UV Odor Control System shall be supplied by the Owner as detailed in Section 01 12 00, complete with the Odor Control Unit (OCU), unit housing, dust-filter, filter pressure control, ventilation monitoring, UV-compartment, catalyst, exhaust fan (EF), and control panel (LCP).
- C. The Contractor shall provide all additional required miscellaneous equipment and materials, as shown on the Drawings and in accordance with these Specifications as detailed in Section 01 12 00. The Contractor shall furnish all additional equipment items, whether specified or not, as necessary to provide a complete, operable odor control system, including but not limited to the following:
 - 1. Equipment pad for Odor Control Unit and Exhaust Fan
 - 2. Exhaust Fan (EF) Acoustical Enclosure and miscellaneous instrumentation:
 - a. See Section 44 11 10.
 - 3. Isolation transformer
 - 4. Flow switch (FS-101):
 - a. See Section 40 71 00.
- D. Related Specification Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
 - 3. Section 01 12 00 – Owner Furnished Equipment: Ultraviolet Odor Control System.
 - 4. Section 10 14 00 - Identification Devices.
 - 5. Division 26 – ELECTRICAL
 - 6. Section 40 71 00 – Flow Instrumentation.
 - 7. Section 40 90 00 – Instrumentation for Process Control: Basic Requirements.
 - 8. Section 40 91 10 – Primary Meters and Transmitters.
 - 9. Section 44 11 10 –Corrosion Resistant Odor Control Fan Accessories
 - 10. Section 44 31 83 – Odor Control Equipment – Balancing and Testing

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. UIEEE 519, Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems.
 - 2. National Electrical Manufacturer's Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - b. MG 1, Motors and Generators.
 - 3. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code (NEC)
 - 4. Occupational Safety and Health Administration (OSHA).
 - 5. Underwriters Laboratory, Inc. (UL):
 - a. 508, Standard for Industrial Control Equipment.

- b. 508A, Standard for Industrial Control Panels.
- B. Unit Responsibility: All components required to provide a complete and functioning Ultraviolet (Photoionization) Odor Control System shall be provided by a single manufacturer. The Ultraviolet Odor Control System manufacturer shall be responsible for the exhaust fan (Section 44 11 10, minus auxiliary components noted within that Section), the LCP, and the OCU (with internal instrumentation). All other components (field instruments, fan enclosure (per 44 11 10), etc.) shall be provided and coordinated by Contractor for a complete system.

1.3 SUBMITTALS

- A. Schedule:
 - 1. Provide Installation schedule.
 - 2. Provide start-up and manufacturer's field services schedule.
 - 3. Provide schedules a minimum of 30 days prior to event.
- B. Produce technical data, fabrication drawings, layout drawings for piping and other structural items and accessories provided by Contractor.
- C. Provide submittals as detailed in section Section 44 11 10 for Acoustical Fan Enclosure.
- D. Compiled Field Test Report.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect equipment during shipment, storage and installation as required by the manufacturer.
- B. See Section 01 12 00 for contractor responsibility for delivery, off-loading, and handling.
- C. See Section 01 65 50.

1.5 WARRANTY – (FOR INFORMATION ONLY)

- A. Integrity of the odor treatment system, including equipment, controls, appurtenances and supports, shall be guaranteed by the equipment Manufacturer for 1 year after the date of Substantial Completion with a warranty against all defects in workmanship and materials.
- B. The guarantee period for UV lights and catalyst shall be 14,000 hours.
- C. Warranty shall include parts and labor for all necessary repairs within the warranty period. Repairs shall be made within 60 days after the Manufacturer is notified of a defect.

1.6 SITE AND SERVICE CONDITIONS:

- A. Location: exterior service in Skagway, Alaska.
 - 1. Treatment system and LCP will be located outside.
- B. Continuous operation.
- C. Ambient Temperature Range: See Section 40 10 16.
- D. Ambient Relative Humidity of Odorous Air: See Section 40 10 16.
- E. Approximate Elevation Above Sea Level: 0 feet.
- F. Exposure to low pH blow down due to oxidation of H₂S
 - 1. Able to handle sustained pH ranges from 2 to 7.
- G. Exposure to corrosive foul air:
 - 1. H₂S, reduced sulfur organic based odor compounds and other odorants, including ammonia, typical of municipal wastewater odor sources.
 - 2. See Section 40 10 16.

PART 2 - PRODUCTS

2.1 EQUIPMENT SCHEDULE

- A. Equipment for Building 1, (FURNISHED BY OWNER):
 - 1. Odor Control Unit: OCU-101
 - 2. Control Panel: LCP-101
 - a. Including VFD-101
 - 3. Miscellaneous Instrumentation:
 - a. AE-101 combustible gas sensor
 - b. PDS-101 pressure differential switch (high) – located as part of PDI.
 - c. PSL-102 low pressure switch
 - d. PDI-101
 - 4. Exhaust Fan:
 - a. Provided by UV Treatment System manufacturer per Section 44 11 10.
 - b. Includes TSH-101 (fan motor high temperature) and associated enclosure features.
- B. Equipment for Building 1, (FURNISHED BY CONTRACTOR):
 - 1. Equipment pad for Odor Control Unit and Exhaust Fan
 - 2. Exhaust Fan (EF) Acoustical Enclosure and miscellaneous instrumentation:
 - a. See Section 44 11 10.
 - 3. Isolation transformer
 - 4. Additional Instrumentation:
 - a. FS-101

2.2 ACCEPTABLE MANUFACTURERS

- A. The Owner-furnished odor control equipment shall be manufactured by Neutralox, as represented by Ambio Biofiltration.
- B. No substitutions.

2.3 EQUIPMENT SPECIFICATION AND PERFORMANCE CRITERIA (FOR INFORMATION ONLY)

- A. Schedule: Owner-Furnished Equipment
 - 1. Information shown is general design criteria. See Owner furnished equipment shop drawings for specific equipment data.

	BUILDING 1: OCU-101
Basis of design model	NOX 6800
Foul gas flow rate, design rate (scfm)	4,000
Unit dimensions, approx. (mm)	2,300 x 2,190 x 3,540
Number of units offered	One (1)
Filter class, dust filter	F5/G3, DP max. 200 Pa
Material of housing and LCP	Stainless steel AISI 304
Miscellaneous Hardware	Stainless steel AISI 316
Number of fan(s)	One (1)
Location of fan(s)	Non-integrated w/exterior enclosure
Number of control cabinet(s) – Local Control Panel(s)	One (1), remote mounted, NEMA 4X
Supply voltage	240 V, 60 Hz, 3 phase, 4W+G

Operation power demand (including treatment and fan)	78-10 kW
NComplete System Electrical Rating	Rated to process Class I, Division 2 foul air

B. Performance Criteria:

1. Type of odor contaminants
 - a. H₂S, reduced sulfur organic based odor compounds and other odorants, including ammonia, typical of municipal wastewater odor sources.
 - b. See Section 40 10 16.
2. Hydrogen sulfide
 - a. Average inlet concentration: 10 ppm
 - b. Peak inlet concentration: 50 ppm
 - c. Hydrogen sulfide removal: 99 PCT or not to exceed 0.1 ppm, whichever is greater
3. Reduced sulfur organic based compounds such as methyl mercaptan, dimethyl sulfide, carbonyl sulfide, dimethyl sulfide
 - a. Average totaling to 10 ppm
 - b. Reduce sulfur organic based compounds removal: 99 PCT or not to exceed 0.1 ppm whichever is greater
4. Ammonia
 - a. Average totaling to 5 ppm
 - b. Peak inlet concentration: 10 ppm
 - c. Ammonia removal: 99 PCT or not to exceed 0.1 ppm, whichever is greater
5. Total Odor:
 - a. Total Odor Units (OU) from the outlet of the UV Treatment System shall not exceed 500 OU/m³.
6. Performance Guarantee:
 - a. Manufacturer shall certify the above removal rates and provide, free of cost, any modifications to the system as necessary to achieve these removal levels if the unit fails to achieve the noted results within the first year of operation after Substantial Completion.

C. Headloss:

1. UV Treatment system total headloss from the inlet connection to the outlet connection, at the design rated flow, shall not exceed 2 inches w.c.

2.4 SYSTEM CONFIGURATION

- A. UV Photoionization odor treatment systems shall be a single pass treatment process:
 1. The unit shall consist of a housing, dust-filter, UV-compartment and catalyst. The housing shall be a double wall set-up with integrated insulation. Additional features and accessories as noted in this Section shall be integrated inside of the treatment unit.
- B. Unit shall be arranged exterior to Building 1 as shown in the Drawings.
 1. LCP and Exhaust Fan shall be remote mounted from the main treatment unit as shown in the Drawings.
- C. The photoionization odor treatment system shall have the following additional features and accessories:
 1. Dust filter
 2. Differential pressure gauge/switch and transmitter (internal to OCU)
 3. UV Compartment
 4. Catalyst media
 5. One (1) local control panel

6. Explosive gas detection system (internal to OCU)
7. Inlet and outlet duct connection points (flexible connections provided by Contractor).

2.5 SYSTEM COMPONENTS AND MATERIALS OF CONSTRUCTION

- A. General: Photoionization unit shall be of modular construction delivered as compact pre-mounted unit resulting in minimal installation requirements on site.
 1. Information shown below is for the Contractor's information only, unless explicitly noted that Contractor is to provide.
- B. Housing: The housing shall consist of a weather-proof, insulated double wall (sandwich build-up) construction, suitable for installation outdoors in any climate. The unit shall be easily accessible from the front and/or back side through removable maintenance doors.
 1. Maintenance doors shall be mechanically and electrically interlocked with the system to provide secure and safe access.
- C. Dust-filters shall be of appropriate design with a pressure loss of not more than 200 Pa and filter class G3 or F5. The filters shall protect the inside of the housing from particulates or any material the manufacturer would deem to be detrimental to the treatment system.
 1. Filter materials of construction shall be resistant to moisture and mold.
- D. Differential Pressure Gauge/Switch: An air pressure gauge and switch/transmitter for detection of the condition of the dust-filters shall be provided. The gauge and switch shall be differential pressure type suitable for the installed environmental conditions. The switch shall initiate a signal at a pre-set differential pressure indicating cleaning or replacement.
- E. Low Flow and Low Pressure Switch: An air pressure switch to measure pressure of incoming air and confirm blower operation before operating the OCU treatment system. Located inside the OCU. An additional low flow switch will be located outside the OCU in the surrounding ductwork to confirm fan minimum flow rate.
 1. FS-101 provided by Contractor.
- F. Ultraviolet (UV) lamp compartment: The UV compartment shall contain an appropriate number of UV lamps as determined by the equipment manufacturer based on design odor strength and constituents. Lamps shall have an electrical classification as required by the design criteria of this Section.
- G. Catalyst Media: Appropriate catalyst material shall be provided by the Manufacturer based on the odor compounds to be treated and the required exhaust air conditions. Media shall be accessible for replacement and shall have a minimum of one year of life between replacements.
 1. Manufacturer shall provide a guaranteed (not-to-exceed) price for the first replacement volume of media to the Owner.
- H. Exhaust Fan:
 1. The Odor Control Unit (OCU-101) will be furnished with an exhaust fan as outlined in Section 44 11 10.
 2. Contractor to provide enclosure and additional instrumentation as noted in Section 44 11 10.
- I. Gas Detection System: Manufacturer shall provide a combustible gas detection system (AE-101) to shut down the odor control unit in the event of LEL gas detection on the air stream to be treated. Refer to Specification Section 40 91 10 for combustible gas sensors requirements.
 1. Combustible gas detection for the exhaust fan enclosure shall be provided by the Contractor per Section 44 11 10.
- J. Lifting Lugs
 1. Suitable for installing or removing the unit as required by the manufacturer.
 2. Located on any sub-component weighing 100 lbs or more.

3. Typ 304 stainless steel.
- K. Anchor Bolts
1. Type 316 stainless steel, sized by equipment manufacturer.
 2. Furnished and installed by Contractor as specified in Section 03 15 19.

2.6 ELECTRICAL AND CONTROLS

- A. Control Strategy:
1. Building #1:
 - a. The owner-furnished UV Control System shall operate based on a single flow setpoint (not the same as the equipment rated flow) balanced at the VFD in conformance with Section 44 31 83.
 - 1) Flow Setpoint: 3,800 scfm (to be confirmed by Engineer).
 - b. Operation of the system will be manual. Operators will initiate the system from the local control panel and it will run continuously unless a fault or internal alarm stops the system.
 - c. Alarms and local panel indication shall be per this Section and as shown in the Drawings.
 - 1) Detection of explosive gas or a temperature alarm on the exhaust fan motor shall shut down the odor control system.
 - d. When the UV system exhaust fan is in operation, the internal Building #1 HVAC exhaust fan that is located in the NE corner (within the curtained space around the aerobic digesters) shall be manually turned off. The odor control exhaust fan will substitute flow for this existing HVAC exhaust fan, which should only be operated if the UV system is not operating.
- B. Local Control Panel (For Information Only):
1. The owner-furnished industrial control panel shall provide power and control for the odor control system and components. A single 240 VAC, 3 phase power supply shall be supplied to the panel to power the system and associated equipment as shown in the Drawings.
 2. Main incoming power circuit shall be protected with a thermal magnetic circuit breaker.
 3. Limit load to maximum of 80 percent of circuit breaker rating.
 4. Panel shall provide power and contain variable frequency drive (VFD) for the exhaust fan and associated enclosure.
 - a. Variable frequency drive (VFD): 6-pulse unit shall constitute a complete combination motor controller per NFPA 70, Article 430 and shall provide the following per the requirements of that article without the addition of any external components or devices: Motor control, Motor overload protection, Motor and motor branch circuit short circuit and ground fault protection, Motor and controller disconnecting means.
 - 1) Voltage rating:
 - a) Nominal: 240 Vac, 3 PH, 60 Hz.
 - b) Range for continuous full load operation: +/-10 % of nominal.
 - c) Voltage imbalance tolerance for full load operation: 3% minimum.
 - d) Efficiency 97% minimum, at full speed and full load. 93%, minimum at 1/2 speed and full load.
 - b. Displacement power factor 95%, minimum from 50% to 100% speed and load. Efficiency and power factor criteria apply from the input terminals to the output terminals of the VFD alone, excluding losses of input and output power circuit accessories.
 - 1) Frequency drift +0.5% of set frequency.
 - 2) Speed regulation (motor dependent): 3%.
 - 3) Speed range: 10:1.

- 4) Control type Volts/Hertz ratio; constant over the entire operating range of the VFD except when operating under voltage boost at frequencies over 60 Hz.
- c. VFD manufacturer shall provide a harmonic analysis of the distribution system based on their proposed specific equipment characteristics and mitigation techniques confirming that the specified levels are not exceeded. Analysis shall be based on the methodology of IEEE 519 and IEEE 399.
5. The control panel shall be UL 508A listed, in compliance with National Electrical Code Article 409, and labeled indicating the control panel name and tag number as follows:
 - a. LCP-101
6. The panel shall be mounted more than 3 FT away from the UV vessel and ductwork as shown in the Drawings.
7. The control panel enclosure shall be of 316 SS stainless steel construction and rated NEMA 4X for exterior installation. The panels shall be factory tested as a complete unit, with the UV Treatment System, prior to shipment. The panels shall be suitable for outside installation and operating temperatures at the conditions noted in Section 40 10 16.
8. The panel shall have the following components:
 - a. Main circuit breaker
 - b. HAND-OFF-AUTO (HOA) switch
 - c. E-Stop push button
 - d. UV ON indicator light (white) for UV bank
 - e. UV lamp FAIL indicator light (amber)
 - f. LEL ALARM indicator light (amber) for UV System
 - g. LEL ALARM indicator light (amber) for exhaust fan enclosure
 - h. Filter differential pressure ALARM indicator light (red)
 - i. Runtime meters for UV bank (group of 16-24 bulbs)
 - j. Flow Switch (low flow) ALARM indicator light (amber)
 - k. Pressure Switch (low flow) ALARM indicator light (amber)
 - l. Exhaust fan enclosure High Temp ALARM indicator light (amber)
 - m. Exhaust fan FAIL indicator light (amber)
 - n. Strobe that will operate when combustible gas or loss of flow/pressure is detected.
9. Manually operated controls and indicators shall be face mounted on door.
10. Main power disconnect shall be located on exterior of enclosure.
 - a. ON position will lock panel closed.
 - b. OFF position will allow panel to be opened.
 - c. The panel shall be lockable with a padlock.
11. The panel shall contain all devices as necessary to operate a complete and functional system. Power and control cables shall be pre-wired and pre-assembled to the greatest practical extent.
12. A 24VDC power supply and cabinet heater with temperature controller shall be provided for the panel.

2.7 SPARE PARTS – FURNISHED BY OWNER (FOR INFORMATION ONLY)

- A. For the OCU:
 1. Spare moisture resistant filter.
 2. Spare lamps amounting to 20% of the total installed.
 3. Two (2) spare ballasts.
 4. Any additional components or special tools recommended by the manufacturer or required for standard maintenance activities.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with the Drawings, these specifications, and the Manufacturer's recommendations.
 - 1. The OCU shall be delivered as a unit consisting of a housing, dust-filter, UV- compartment and catalyst.
 - a. The control panel, instruments, ducts, and other accessories shall be connected onsite.
 - b. UV bulbs and catalyst shall be shipped separately and installed when the unit is onsite.
 - c. Exhaust fan shall be shipped and installed separately per Section 44 11 10.

3.2 MANUFACTURER'S SERVICES

- A. Manufacturer's services shall be performed by the Manufacturer's Representative under separate contract with Owner. It shall be the Contractor's responsibility to coordinate and schedule the services of the Manufacturer's Representative based on the overall construction schedule and completion of the UV System installation. Contractor shall assist the Manufacturer's Representative with the field testing while on-site.
- B. Manufacturer's services shall conform to the requirements of Section 01 75 00 and the following:
 - 1. The Manufacturer shall furnish the services of a qualified representative at the jobsite for installation assistance, inspection and certification of the installation, equipment testing, startup assistance, and training of Owner's personnel.
 - a. Installation assistance and inspection:
 - 1) Minimum of one trip including two 8 hour days onsite, excluding travel time.
 - b. Equipment testing, startup and training:
 - 1) Minimum of one trip including two 8 hour days onsite, excluding travel time.
 - 2. A qualified Manufacturer's representative shall be one who has had at least 5 years experience in the installation of the type of odor control equipment specified.
 - 3. Startup services and training of Owner's personnel shall be at such times as requested by the Owner. Specific services to be performed shall include but not be limited to the following:
 - a. Be present during installation and alignment of equipment.
 - b. Direct initial startup and field test of equipment.
 - c. Provide training of Owner's operating and maintenance personnel in equipment operation, maintenance, and troubleshooting.
 - d. Submit a certification of proper installation and satisfactory performance as specified in Part 3 of these Specifications.
 - 4. If there are difficulties in operation of the equipment due to the Manufacturer's fabrication and programming or Contractor's installation, additional service shall be provided at no extra cost to the Owner.
 - 5. Manufacturer shall provide parts and qualified representative labor for the first replacement of lamps, catalyst, and filters. Cost of this service shall be included with the odor control unit. The Owner may request this service 12-24 months from the date of Substantial Completion.

3.3 START UP AND FIELD TESTING

- A. Field Testing shall be performed by the Manufacturer's Representative under separate contract with Owner. It shall be the Contractor's responsibility to coordinate and schedule the services of the Manufacturer's Representative based on the overall construction schedule and completion of the UV System installation. Contractor shall assist the Manufacturer's Representative with the field testing while on-site.
- B. Functional Test:

1. Manufacturer shall conduct testing on each piece of equipment in the system.
 2. Alignment: Test complete assemblies for proper alignment and operation.
 3. Test and demonstrate all alarms, field instruments, and indicators included in the factory testing.
 - a. Provide confirmation of control feedback and alarms for the exhaust fan over the full range of flows outlined in this Section.
 4. Demonstrate feedback and control from field instruments that were not available during factory testing.
 5. Balance the air flow according to Section 44 31 83.
 - a. Contractor to provide balancing services.
- C. Performance Testing:
1. Manufacturer shall conduct testing on each piece of equipment in the system.
 2. Demonstrate operation of the equipment over 2 days.
 - a. System shall operate at the design flow rate.
 - b. Measure hydrogen sulfide at the inlet of the OCU with an OdaLog field sensor or equivalent meter with an accuracy of 0.1 – 50 ppm H₂S.
 - c. Measure hydrogen sulfide at the outlet of the OCU with a Jerome field sensor or equivalent meter with an accuracy down to 0.01 ppm H₂S.
 - d. Measurements shall be continuous over the two day period.
 - e. Data outputs in Excel format shall be provided to the Owner.
 - f. Measure and verify headloss across the OCU at least three times during the testing period.
 3. If the system fails to meet the performance requirements, the guarantee provisions of these specifications shall apply and the Manufacturer shall provide a performance solution at no cost to the Owner and submit a Corrective Action Plan within five days of the failure.

3.4 FIELD TEST REPORT (PROVIDED BY CONTRACTOR)

- A. Compiled Field Test Report that includes start-up documents, field test data, and manufacturer's certification of proper installation and performance.
- B. Submission of report shall be required prior to Substantial Completion.
- C. Contractor shall furnish and submit Compiled Field Test Report using information provided by Manufacturer.

END OF SECTION

SECTION 44 31 83

ODOR CONTROL EQUIPMENT - BALANCING AND TESTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Adjusting, balancing, and testing of all odor control systems.
- B. Related Sections include but are not necessarily limited to:
 - 1. Division 00 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
 - 2. Division 01 - General Requirements.
 - 3. Section 01 12 00 – Owner Furnished Equipment: Ultraviolet Odor Control System.
 - 4. Section 23 05 93 – HVAC Systems-Balancing and Testing.
 - 5. Section 44 11 10 - Corrosion Resistant Odor Control Fan Accessories.
 - 6. Section 40 10 16 - Odor Control Duct and Accessories.
 - 7. Section 44 31 43 – Installation of Ultraviolet Odor Control Units.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. Associated Air Balance Council (AABC):
 - a. National Standards for Total System Balance.
 - 2. National Environmental Balancing Bureau (NEBB).
 - a. Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
- B. Qualifications:
 - 1. Work in this Section is to be accomplished by an independent testing and balancing firm hired by the Contractor and certified by one of the following:
 - a. Associated Air Balance Council (AABC).
 - b. National Environmental Balance Bureau (NEBB).
 - c. Other certification entity approved by Engineer.

1.3 SUBMITTALS

- A. See Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
- B. Certifications:
 - 1. Letter stating the name and qualifications of the firm proposed.
 - 2. Evidence that the relevant subcontractors have been notified of the requirement to coordinate balance and test elements in the work with the testing and balancing firm.
- C. Report forms:
 - 1. Procedures and forms to be used in calibrating of test instruments, balancing systems, and recording and reporting test data.
- D. Completed test reports and data forms upon completion of installation, balance and testing odor control systems:
 - 1. Insert recorded information on report forms required by specifications and approved for use on project.
 - 2. Additional written verification and other related information clearly identifying project, date and specifics of verification.
 - 3. Utilize reports forms similar to those shown in Section V of AABC Standard.
 - 4. Provide forms typed and signed by the testing and balancing firm.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PREPARATION

- A. Secure approved Shop Drawings of all odor control equipment.
- B. Procedures and Forms:
 - 1. Submit procedures and forms to be used in calibration of test instruments, balancing systems, recording and reporting test data.
 - 2. Obtain approval before beginning balancing and testing.
- C. Do not begin balancing and testing until odor control systems are complete and in full working order having passed functional testing.
 - 1. Place odor control systems into full operation and continue their operation during each working day of balancing and testing.
- D. Provide qualified Engineer(s) to supervise and perform balancing and testing.
- E. Review design Drawings, specifications, approved Shop Drawings and other related items to become thoroughly acquainted with the design of the odor control system.
- F. Check all installed systems against Contract Drawings, Specifications and Shop Drawings to see that the system is installed as required.
 - 1. Report deficiencies to the Engineer.
- G. Report deficiencies to the Contractor for remedial action including providing corrective measures required in the function of any part of system to complete balancing.
- H. Make necessary adjustment as required to balance the systems.

3.2 FIELD QUALITY CONTROL

- A. Balance and Test Odor Control System:
 - 1. See Section 44 11 10 for additional fan testing requirements.
 - 2. Complete balancing in conjunction with testing of the odor control unit per Section 44 31 43.
 - 3. Balance odor control fan within Building #1 in accordance with the control strategy listed in Section 44 31 43.
 - a. Balancing flows indicated in Section 44 31 43 are nominal. Confirm final balanced flow setpoints with Engineer based on submitted fan and installed system before proceeding with the work outlined in this Section.
 - b. Building #1 shall be balanced with all Building #1 HVAC fans in operation with the exception of the northeast exhaust fan (which shall be off).
 - 4. Measure internal pressure of Building #1 during each balancing scenario listed above and confirm that balanced flows provide approximately -0.1 inches w.c. negative pressure in the building. If negative pressure is not achieved, notify engineer for direction on adjustment of HVAC and/or Odor Control system as necessary to achieve balanced system flow.
 - a. Contractor shall be prepared to adjust existing HVAC equipment as necessary to achieve balanced flow if balancing of odor control system alone does not achieve the requirements of this Section within 10 PCT of the of the odor control fan design flow rate.
 - b. Follow protocols outlined in Section 23 05 93 for HVAC equipment.
 - 5. Adjust equipment RPM to design requirements.
 - 6. Report motor full load amperes.
 - 7. Obtain design CFM at fan. Make pitot tube traverse or hot wire measurements of main supply and exhaust ducts within 10 PCT.
 - 8. Test and record system static pressures, suction and discharge.
 - 9. Test and record entering air temperature.

10. Test and record leaving air temperature.
11. Adjust fan speed (via the VFD) to design CFM targeting within 10 PCT of the design flow (do not throttle dampers as primary means of balancing).
12. Identify and list size, type, and manufacturer of all odor control equipment.
 - a. Use manufacturer's ratings on equipment to make required calculations.
13. Adjust and ensure that the operation of automatically operated dampers is as specified. Check and calibrate controls.
14. Prepare and submit reports.

END OF SECTION

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