

DRAFT 90% DELIVERABLE BID DOCUMENTS
AND TECHNICAL SPECIFICATIONS FOR
REVIEW ONLY

For the:

**CENTER COMMUNITY DECENTRALIZED
WASTEWATER TREATMENT AND DISPOSAL SYSTEM**

CWSRF ID: RF1-340-2.0

for the

Town of Montgomery, Vermont

December 2024

Prepared by:



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MONTGOMERY CENTER COMMUNITY DECENTRALIZED WASTEWATER TREATMENT AND DISPOSAL SYSTEM

FINAL DESIGN TECHNICAL SPECIFICATIONS DRAFT 90% DELIVERABLE BID DOCUMENTS AND TECHNICAL SPECIFICATIONS FOR REVIEW ONLY TABLE OF CONTENTS

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Section 000111

CENTER COMMUNITY DECENTRALIZED WASTEWATER TREATMENT AND DISPOSAL SYSTEM
for the
TOWN OF MONTGOMERY, VERMONT

ADVERTISEMENT FOR BIDS

Sealed Bids for the construction of the Montgomery Center Community Decentralized Wastewater Treatment And Disposal System will **ONLY** be received and **accepted via online electronic bid service** through <https://www.questcdn.com> until **1:00 P.M.** local time on **____, 2024**, at such time the Bids received will be opened **online**. **Anyone interested in witnessing the public bid opening over the phone or internet is to contact Hoyle Tanner for a link to the open conference call. Please contact Donna Akerley, dakerley@hoyletanner.com, 603-669-5555, x-185 for meeting information at least five (5) days prior to the scheduled bid opening. The 5-day lead time is required in case the bid opening time changes.**

The Project consists of the decommissioning of existing septic tanks, installation of new septic tanks, constructing a new Water Resource Recovery Facility (WRRF), new effluent pump stations, new small diameter HDPE gravity effluent sewer and effluent force mains, and other associated work as described in the bid documents.

Bids will be received for a single prime Contract. Bids shall be on a unit price and lump sum basis, as indicated in the Bid Form.

For all technical questions regarding this project should be directed by email to Laura Clements at lclements@hoyletanner.com.

Complete digital Bidding Documents may be obtained after 12:00 PM, **____, 2024 at the following website: <https://www.questcdn.com>. You must set up your free membership under the “Log In” tab before downloading documents. If you need assistance setting up your free membership registration, downloading, or working with this digital project information, please contact QuestCDN at (952) 233-1632 or info@questcdn.com. You may download the digital Bidding Documents for \$50 by selecting Request on the QuestCDN Page, input the eBidDoc# **XXXXXXX**.**

To bid on this project and be considered a plan holder the Bidder MUST download the digital project bidding documents from QuestCDN and pay the download delivery fee. Neither Owner nor Engineer will be responsible for full or partial sets of Bidding Documents, including Addenda if any, obtained from sources other than the QuestCDN.

Bidder shall submit a bid via online electronic bid service through <https://www.questcdn.com> (See Instructions to Bidders). An optional pre-bid conference will be held virtually at 1:00 pm local time on **____, 2024. Bidders must contact Donna Akerley, dakerley@hoyletanner.com, 603-669-5555, x-185 if they wish to receive an invitation to the pre-bid conference containing phone and computer call-in instructions. All interested bidders are encouraged to attend in order to prepare acceptable bid submissions. Attendance at the pre-bid conference is highly encouraged but is not mandatory.**

A bid must be accompanied by Bid security made payable to Owner in an amount of 5% of Bidder’s maximum bid price and in the form of a certified check or Bid bond issued by surety meeting the requirements of the General Conditions. No bid may be withdrawn for at least 60 days after receipt of

bids unless released by the Owner.

This contract is funded in part by the State of Vermont Department of Environmental Conservation (DEC) Clean Water State Revolving Loan Fund (CWSRF) program, American Rescue Plan Act (ARPA) grant funding, Community Recovery and Revitalization Program (CRRP) grant funding, Congressionally Directed Spending (CDS) grant funding and USDA Rural Development (RD). Consequently, the following provisions apply to this WORK (more detail for each of these provisions can be found in Instruction to Bidders):

1. Bid security in accordance with the Instructions to Bidders
2. Disadvantaged Business Enterprise (DBE) requirements
3. Performance BOND and Payment BOND each in the amount of 100% of the contract price
4. 'AIS' (American Iron and Steel) provisions of P.L. 113-76, Consolidated Appropriations Act
5. Federal Wage Rates as determines under the Davis-Bacon Act
- 6. Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment**

The provisions of the Build America, Buy America (BABA) Act are not applicable to this contract.

The contractor must comply with the Disadvantaged Business Enterprises (DBE) SRF special requirements (more detail for this provision can be found in the Instructions to Bidders). Failure of the successful bidder to complete the pre-award requirements of this program may result in finding that the bidder is non-responsible and therefore not entitled to award of this contract.

The contractor must comply with all Federal Requirements per the CWSRF Supplementary Conditions.

The contractor must comply with Davis-Bacon (DB) and Davis-Bacon Related Acts (DBRA) as stated in the CWSRF Supplementary Conditions. All laborers and mechanics employed by the contractor and subcontractors on this project shall not be paid less than the prevailing wage rates contained in the wage determination published in the bidding documents. Any laborers and mechanics not listed in the wage determination shall be paid at least as much as the lowest wage rate for other similar trade classifications already contained in the wage determination published in the bidding documents.

SECTION 000200
INSTRUCTIONS TO BIDDERS

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.~~ **Not Used**

ARTICLE 2 – COPIES OF BIDDING DOCUMENTS

2.01 Complete sets of the Bidding Documents may be obtained from **Hoyle Tanner’s portal at <https://www.questcdn.com> as stated in the advertisement for bids.**

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. **Prospective bidders must be on the plan holders list through QuestCDN for bids to be accepted. Bidders shall furnish all the information required by the solicitation.**

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 all required additional information as contained on the “Qualifications Statement” (EJCDC Document C-451) immediately following this Information to Bidders.

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. These reports and drawings are not part of the Contract Documents, but the Technical Data contained therein upon whose accuracy Bidder is entitled to rely, as provided in the General Conditions, has been identified and established in the Supplementary Conditions. 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 contiguous 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.

4.03 *Site Visit and Testing by Bidders*

- A. Bidder shall conduct the required project area visit during normal working hours and shall not disturb any ongoing property owners at the project area.
- B. Bidder is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions.
- C. On request, and to the extent Owner has control over the project area, and schedule permitting, the Owner will provide Bidder access to the project area to conduct such additional examinations, investigations, explorations, tests, and studies as Bidder deems necessary for preparing and submitting a successful Bid. Owner will not have any obligation to grant such access if doing so is not practical because of existing operations, security or safety concerns, or restraints on Owner's authority regarding the project area.
- D. Bidder shall comply with all applicable Laws and Regulations regarding excavation and location of utilities, obtain all permits, and comply with all terms and conditions established by Owner or by property owners or other entities controlling the project area with respect to schedule, access, existing operations, security, liability insurance, and applicable safety programs.
- E. Bidder shall fill all holes and clean up and restore the project area to its former condition upon completion of such explorations, investigations, tests, and studies.

4.04 *Owner's Safety Program*

- A. Project area visits and work at the project area may be governed by an Owner safety program. As the General Conditions indicate, if an Owner safety program exists, it will be noted in the Supplementary Conditions.

4.05 *Other Work at the Site*

- A. Reference is made to Article 8 of the Supplementary Conditions for the identification of the general nature of other work of which Owner is aware (if any) that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) and relates to the Work contemplated by these Bidding Documents. If Owner is party to a written contract for such other work, then on request, Owner will provide to each Bidder access to examine such contracts (other than portions thereof related to price and other confidential matters), if any.

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 pre-Bid conference will be held at the time and location stated in the advertisement to bid. 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 (5%) of Bidder's maximum 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. **The Bidder shall upload an electronic copy of the Bid Bond to Hoyle Tanner's portal at <https://www.questcdn.com> and send the original hard copy of the Bid Bond to the Engineer no later than 3 business days after the bid opening date.** No bid may be withdrawn for at least 60 days after receipt of bids unless released by the Owner.

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 The number of days within which, or the dates by which, Milestones are to be achieved and the Work is to be substantially completed and ready for final payment are set forth in the Agreement.

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.

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 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 in the case of a proposed substitute and 5 days prior in the case of a proposed "or-equal." 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.

- 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.
- 11.03 If an award is made, Contractor shall be allowed to submit proposed substitutes and "or-equals" in accordance with the General Conditions.

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 If required by the bid documents, 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 Work.

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 shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom Contractor has reasonable objection.
- 12.06 The Contractor shall not award work to Subcontractor(s) in excess of the limits stated in SC 7.06.
- 12.07 A preselection process has been completed to identify the suppliers for the following Bid Items:

Packed Bed Media Filter (PBMF) Secondary + Treatment System: Orenco Systems, Inc.

Drip Dispersal System: Oakson, Inc.

Bidders are directed to the Bid Form indicating the allowance prices for each bid item. The Contractor shall be solely responsible for coordination with these approved suppliers.

ARTICLE 13 – PREPARATION OF BID

- 13.01 ~~The Bid Form is included with the Bidding Documents.~~ **Bids for this project will ONLY be accepted via the online electronic bid service through Hoyle, Tanner’s portal at <https://www.questcdn.com>. To access the electronic bid form, download the project documents and click the online bidding button at the top of advertisement. Prospective bidders must be on the plan holders list through QuestCDN for bids to be accepted.**
- A. All blanks on the Bid Form **Worksheet** 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 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 official address of the firm shall be shown.
- 13.04 A Bid by an individual shall show the Bidder’s name and official address.
- 13.05 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 official address of the joint venture shall be shown.
- 13.06 All names shall be printed in ink below the signatures, **or electronically signed.**
- 13.07 ~~The Bid shall contain acknowledgement of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form.~~
- 13.08 Postal and e-mail addresses and telephone number for communications regarding the Bid shall be shown.
- 13.09 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 *Unit Price*

- A. Bidders shall submit a Bid on a unit price basis for each item of Work listed in the unit price section of the Bid Form.
- B. The "Bid Price" (sometimes referred to as the extended price) for each unit price Bid item will be the product of the "Estimated Quantity" (which Owner or its representative has set forth in the Bid Form) for the item and the corresponding "Bid Unit Price" offered by the Bidder. The total of all unit price Bid items will be the sum of these "Bid Prices"; such total will be used by Owner for Bid comparison purposes. The final quantities and Contract Price will be determined in accordance with Paragraph 13.03 of the General Conditions.
- C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

14.03 *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 Prior to submitting the Bid, the Bidder shall submit the completed Bid Form along with the Bid security ~~and through the Hoyle Tanner's portal at <https://www.questcdn.com>,~~
- 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 []~~.
- 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~~ **through the Hoyle Tanner's portal at <https://www.questcdn.com>** 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 and, unless obviously non-responsive, read aloud publicly. 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. For the determination of the apparent low Bidder when unit price bids are submitted, Bids will be compared on the basis of the total of the products of the estimated quantity of each item and unit price Bid for that item, together with any lump sum items.

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.

- A. The successful bidder must submit Liability and Property Insurance certificates to the Owner prior to contract award. Detailed information can be found in the General Conditions and the Supplementary Conditions.

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 Owner is exempt from Vermont state sales and use taxes on materials and equipment to be incorporated in the Work. Said taxes shall not be included in the Bid. Detailed information can be found in the General Conditions and the CWSRF Supplementary Conditions.

ARTICLE 23 – CONTRACTS TO BE ASSIGNED

- 23.01 Not Applicable

ARTICLE 24 – AMERICAN IRON AND STEEL (“AIS”) PROVISIONS

- 24.01 **“AIS” (American Iron and Steel) provisions of P.L. 113-76, Consolidated Appropriations Act of 2014, and all subsequent revisions and/or amendments including but not limited to the Water Resources Reform and Development Act (Clean Water Act §608), P.L. 113-25, Consolidated and Further Continuing Appropriations Act 2015, and P.L. 114-113, Consolidated Appropriations Act 2016, applies to this Contract. Bidders should refer to the Supplementary Conditions for these specific requirements. For further information on specific act requirements, including a current list of Approved National and/or Project Waivers visit: <http://www.epa.gov/cwsrf/state-revolving-fund-american-iron-and-steel-ais-requirement>.**

ARTICLE 25 – DISADVANTAGED BUSINESS ENTERPRISE (DBE) REQUIREMENTS

- 25.01 **It is the goal of US Environmental Protection Agency (EPA) to implement a fair and effective remedy to the under-utilization of Disadvantaged Business Enterprises (DBE) in the context of the unique EPA-grantee relationship. The EPA policy is established to achieve the desired result of increased DBE participation within the EPA grant/loan process and aids in the development of a viable DBE consultant and contracting community. The EPA goal for use of Disadvantaged Business Enterprises (DBE) is 8%. Current DBE Fair Share Objective/Goal of his contract has a negotiated Fair Share Objectives and Goals for DBE utilization of: 1.18% Minority Business Enterprises (MBE) and 3.66% Woman Business Enterprises (WBE)**
- 25.02 **Bidders are to familiarize themselves with the DBE six step good faith effort listed in 40 CFR, Part 33. Additional guidance can be found in Appendix B. Bidders are reminded that negotiation with DBEs not listed in the DBE addendum is also encouraged but is not required.**

- 25.03 A “DBE Addendum” will provide to all Bidders a list of DBEs that indicated an interest in this contract. Bidders are required to initiate contact and to negotiate material, supply, and services that may be used in preparing the Bid. This addendum will be transmitted to all plan-holders. Immediately upon receipt of the addendum, Bidders shall contact those DBE firms listed in the addendum by email with a return receipt request (the preferred method). The DBE firms must respond directly to the Bidder by certified mail, fax, phone, or e-mail no later than 5 calendar days prior to the Bid opening date, notifying the Bidder of their intent. If a DBE firm does not respond to the Bidder within five days of Bid opening, no further communication to the non-responding DBE is required of the Bidders.
- 25.04 All Bidders shall submit to the Owner a completed EPA Forms 6100-3 (DBE Subcontractor Performance Form) and 6100-4 (DBE Subcontractor Utilization Form) with the Bid to indicate that the DBEs listed in the addendum have been contacted prior to submitting their Bid. Failure to write in the DBE company name and value (including \$0 if no materials or services are to be provided) indicates to the Owner that the Bidder did not contact the DBEs listed in the addendum prior to Bid and is cause to render the Bid non-responsive. The apparent low Bidder is required to provide all DBE Subcontractors with EPA Form 6100-2 (DBE Subcontractor participation Form) within five calendar days after the Bid opening. The documentation of correspondence may include a certified mail receipt, fax record, or e-mail documentation.

ARTICLE 26 – WAGE RATE REQUIREMENTS

- 26.01 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) apply.
- 26.02 Davis-Bacon and Related Acts apply to this Contract. The Contractor must comply with the minimum rates for wages for laborers and mechanics as determined by the Secretary of Labor in accordance with the Procurement requirements - Davis-Bacon Act 29 CFR Parts 1 through 7 and Related Acts.
- 26.03 The Bidder is responsible for checking the following link and using the most current General Wage Decision(s) for their Bid preparation ten calendar days prior to the Bid Opening Date: <http://www.wdol.gov/wdol/scafiles/davisbacon/vt.html>
- 26.04 The Bidder is encouraged to request guidance during the addendum period regarding missing classifications and minimum wage and fringe benefit rates in preparation of their Bid. Additional classifications and rates will only be issued to the winning Contractor upon submittal of a Wage Conformance Request (on SF 1444) by the Wage and Hour Division of the U.S. Department of Labor after the Contract is awarded.

ARTICLE 27 – PROHIBITION ON CERTAIN TELECOMMUNICATIONS AND VIDEO SURVEILLANCE SERVICES AND EQUIPMENT

- 27.01 This term and condition implements 2 CFR 200.216 and is effective for obligations and expenditures of EPA financial assistance funding on or after 8/13/2020. As required by 2 CFR 200.216, EPA recipients and subrecipients, including borrowers under EPA funded revolving loan fund programs, are prohibited from obligating or expending loan or grant funds to procure or obtain; extend or renew a contract to procure or obtain; or enter into a contract (or extend or renew a contract) to procure or obtain equipment, services, or systems that use covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. As described in Public Law 115-232, section 889, covered telecommunications equipment is telecommunications equipment

produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).

Recipients, subrecipients, and borrowers also may not use EPA funds to purchase:

a. For the purpose of public safety, security of government facilities, physical security surveillance of critical Page 4 of 29 infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).

b. Telecommunications or video surveillance services provided by such entities or using such equipment.

c. Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country. Consistent with 2 CFR 200.471, costs incurred for telecommunications and video surveillance services or equipment such as phones, internet, video surveillance, and cloud servers are allowable except for the following circumstances:

a. Obligating or expending EPA funds for covered telecommunications and video surveillance services or equipment or services as described in 2 CFR 200.216 to:

- (1) Procure or obtain, extend or renew a contract to procure or obtain;
- (2) Enter into a contract (or extend or renew a contract) to procure; or
- (3) Obtain the equipment, services, or systems. Certain prohibited equipment, systems, or services, including equipment, systems, or services produced or provided by entities identified in section 889, are recorded in the System for Award Management exclusion list.

ARTICLE 28 – CWSRF REQUIREMENTS

28.01 Clean Water State Revolving Loan Fund requirements will be included on this project. See the Bid Form and the Contract Specifications for additional detail.

A. Agency Not a Party

1. This contract is expected to be funded whole or in part by the State of Vermont Department of Environmental Conservation (DEC) Clean Water State Revolving Loan Fund (CSWRF) program and the USDA Rural Development (RD) program. Neither the State of Vermont nor any of its departments, agencies, or employees is or will be a party to this contract. The work “agency” in the contract documents refers to the DEP and all other involved funding agencies.

B. Performance and Payment Bonds

1. The successful bidder must submit Performance and Payment Bonds to the Owner prior to contract award. Detailed information can be found in the General Conditions.

C. American Iron and Steel

1. The Contractor shall comply with the Use of American Iron and Steel in accordance with Public Law 113-76, Section 436. The law and its requirements and guidance, including certification forms, can be found in the Contract supplementary conditions.
- D. SRF Disadvantaged Business Enterprise Program
1. The Contractor shall not discriminate on the basis of race, color, national origin or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 40 CFR part 33, Disadvantaged Business Enterprises (DBE), in the award and administration of subcontracts. Failure by the Contractor to carry out these requirements is a material breach of this contract which may result in the termination of this contract or other legally available remedies.
 - a. During the bidding period, the Contractor is required to make the good faith efforts as described in the CWSRF Supplementary Conditions if they will be awarding subcontracts. Contractors should initiate solicitation efforts early in the bidding period.
 - b. The Contractor must comply with the following provisions when submitting their bid:
 - 1) The contractor must complete and submit EPA Form 6100-4, 'DBE Program Subcontractor Utilization Form' (**copy attached**) as part of the prime contractor's bid or proposal package to the Owner. Note, only DBE subcontractors should be listed. If no DBE subcontractors are to be used, the contractor must still complete and submit the form.
 - 2) The contractor must have each of its proposed DBE subcontractors complete the EPA Form 6100-3, 'DBE Program Subcontractor Performance Form' (**copy attached**). The completed forms must be submitted as part of the prime contractor's bid or proposal package to the Owner.
 - c. Prior to contract award, as the Successful Bidder, the Contractor must comply with the following provisions:
 - 1) The contractor must submit to the Owner documentation of its good faith efforts (such as copies of solicitation letters and emails) and data relied upon in formulating its fair share objectives. Solicitation documentation must include proof of receipt. The records must be submitted to the Owner even if the goals were met.
 - 2) The contractor must submit to the Owner a bidders list of all firms that bid or quote on subcontracts, including both MBE/WBEs and non-MBE/WBEs. The purpose of a bidders list is to provide contractors who conduct competitive bidding with as accurate a database as possible about the universe of MBE/WBE and non-MBE/WBE subcontractors. The list must include the following information:
 - i) Entity's name with point of contact;
 - ii) Entity's mailing address, telephone number, and e-mail address;
 - iii) The procurement on which the entity bid or quoted, and when; and
 - iv) Entity's status as an MBE/WBE or non-MBE/WBE.
 - 3) Additional information and forms may be found in the CWSRF Supplementary Conditions.

E. Suspension and Debarment

1. The eligibility of successful bidder will be verified through the federal government's Excluded Parties List System prior to Vermont Department of Environmental Conservation approval of the contract award. Furthermore, by entering into the contract, the contractor shall certify that no part of the contract shall be subcontracted to a Debarred or Suspended person or firm. Detailed information may be found in the CWSRF Supplementary Conditions.

F. Restrictions on Lobbying

1. The successful bidder must submit certification regarding Lobbying (EPA form 6600-06) to the Owner prior to contract award. If applicable, the contractor shall also complete and submit the Disclosure of Lobbying Activities form (EPA Standard Form LLL) to the Owner prior to contract award." Detailed information and forms can be found in the CWSRF Supplementary Conditions.

G. Davis-Bacon and Related Acts

1. The contractor must comply with Davis-Bacon (DB) and Davis-Bacon Related Acts (DBRA). All laborers and mechanics employed by the contractor and subcontractors on this project shall not be paid less than the prevailing wage rates contained in the wage determination published in these bidding documents. All laborers and mechanics not listed in the wage determination but employed by the contractor and subcontractors on this project shall be paid at least as much as the lowest wage rate for other similar trade classifications already contained in the wage determination published in these bidding documents. A form 1444 submission will be required to obtain additional employee rate classifications, after contract award. No allowances or extra considerations on behalf of any contractor or subcontractor will be permitted subsequently by reason of error or oversight on account of Department of Labor wage determinations. The contractor and subcontractors shall pay all employees weekly. The contractor and subcontractors shall submit weekly certified payrolls to the owner or designated representative, including a payroll summary with signed certification form WH-347. Detailed information and forms can be found in the CWSRF Supplementary Conditions.

H. Federal Requirements

1. The contractor must comply with all Federal requirements found in the CWSRF Supplementary Conditions

I. Bid Protests

1. All protests arising from the Owner's procurement practices must be submitted to the Owner as soon as practical. The Owner will investigate the basis for the protest, seek the advice of legal counsel, document all meetings and actions, and attempt to resolve the protest promptly and equitably.

SECTION 000410

BID FORM

PROJECT IDENTIFICATION: Montgomery Center Community Decentralized Wastewater Treatment and Disposal System

CONTRACT IDENTIFICATION AND NUMBER:

**Town of Montgomery, Vermont
Center Community Decentralized Wastewater Treatment and Disposal System
Hoyle, Tanner Project No. 129800.02
CWSRF ID: RF1-340**

ARTICLE 1 – BID RECIPIENT

- 1.01 This Bid shall be submitted via the online electronic bid service through the Hoyle Tanner’s portal at <https://www.questcdn.com>.
- 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.

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 obtained and carefully studied (or accepts the consequences for not doing so) all additional or supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents to be employed by Bidder, and safety precautions and programs incident thereto.**
- F. 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.
- G. 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.
- H. 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.
- I. **Bidder has correlated the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.**
- J. 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.
- K. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work.
- L. 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.

- M. Bidder will submit written evidence of its authority to do business in the state where the Project is located not later than the date of its execution of the Agreement.

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 anything 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.
- E. Disclosure of Lobbying Activities – In conformance with 45 CFR Part 604, the Bidder certifies, to the best of his or her knowledge and belief, that:
 - 1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, member of Congress, an officer or employee of Congress or an employee of a member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant or Federal loan and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant or loan.
 - 2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a member of Congress, an officer or employee of Congress, or an employee of a member of Congress in connection with this Federal contract, grant or loan, the undersigned shall complete and submit Standard Form – LLL, “Disclosure of Lobbying Activities,” in accordance with its instructions.
 - 3. The Bidder shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including contracts, subcontracts and sub-grants under grand and loans) and that all sub-recipients shall certify and disclose accordingly.

4. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.
- F. **Certification Regarding Debarment, Suspension, Ineligibility – The Bidder certifies that neither it nor its principals is presently debarred, suspended, proposed to for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency. Where the Bidder is unable to certify to any of the statements in this certification, the undersigned shall attach an explanation to this proposal.**
- G. **Notice to Labor Unions or other Organizations of Workers (Non-Discrimination in Employment) – The Bidder hereby agrees to the following conditions:**
 1. It will incorporate or cause to be incorporated into any contract for construction work, or modification thereof, paid for in whole or in part with funds obtained from the Federal Government pursuant to a grant, contract, loan, insurance, or guarantee, or undertaken pursuant to any Federal program involving such grant, contract, loan, insurance, or guarantee, the provision prescribed for Government contracts and Federal assisted construction contracts by Sections 202 and 301 of Executive Order 11246, as amended.
 2. It will assist and cooperate actively with the Environmental Protection Agency and the Secretary of Labor in obtaining the compliance of Contractors and Subcontractors with said contract provisions and with the rules, regulations and relevant orders of the Secretary.
 3. It will obtain and furnish to the Environmental Protection Agency and to the Secretary of Labor such information as they may require for the supervision of such compliance.
 4. It will enforce the obligations of Contractors and Subcontractors under such provisions, rules, regulations and orders.
 5. It will carry out sanctions and penalties for violations such obligations imposed upon Contractors and Subcontractors by the Secretary of Labor or the Environmental Protection Agency.
 6. It will refrain from entering into any contract subject to this Order or extension or other modification of such a contract with a Contractor or Subcontractor debarred from Government contracts and Federally assisted construction contracts under Part II, Subpart D of this Order, and
 7. In the event that he fails and refuses to comply with his undertakings, the Bidder agrees that the Environmental Protection Agency may cancel, terminate, or suspend in whole or in part this grant (contract, loan, insurance or guarantee), may refrain from extending any further assistance under any of its programs subject to Executive Order 11246, as amended, until satisfactory assurance of future compliance has been received from such Bidder, or may refer the case to the Department of Justice for appropriate legal proceedings.
- H. **Certification of Non-Segregated Facilities – The Bidder certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not permit his employees to perform their services at any location, under his**

control, where segregated facilities are maintained. The Bidder certifies further that he will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he will not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The Bidder agrees that a breach of this certification is a violation of the Equal Opportunity clause in this contract. As used in this certification, the term segregated facilities means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise. The Bidder agrees that (except where he has obtained identical certifications from proposed Subcontractors prior to the award of subcontracts exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity clause, and that he will retain such certifications in his files.

ARTICLE 5 - BASIS OF BID

5.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

Bidder acknowledges that (1) each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and (2) estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all unit price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

BID SCHEDULE						
Section Title	Item Code	Item Description	Unit	Quantity	Unit Price	Extension
BASE BID A ITEMS - WRRF SITE and PUMP STATIONS						
	Base Bid					
	A.1	Water Resource Recovery Facility	LS	1		\$0.00
	A.2	Pump Station 1	LS	1		\$0.00
	A.3	Pump Station 2	LS	1		\$0.00
	A.4	Drip Dispersal System Equipment	ALLOW	1		\$0.00
BASE BID B ITEMS - LINEAR WORK						
	Base Bid					
	B.1	Single Pipe in Trench (0' - 10' depth)	LF	10,151		\$0.00
	B.2	Dual Pipe in Trench (0' - 10' depth)	LF	3,850		\$0.00
	B.3	Pipe Insulation	LF	1,144		\$0.00
	B.4	1,500 Gallon Septic Tank	EA	64		\$0.00
	B.5	2,000 Gallon Septic Tank	EA	8		\$0.00
	B.6	2,500 Gallon Septic Tank	EA	2		\$0.00
	B.7	3,000 Gallon Septic Tank	EA	1		\$0.00
	B.8	4,500 Gallon Septic Tank	EA	1		\$0.00
	B.9	5,500 Gallon Septic Tank	EA	1		\$0.00
	B.10	6,000 Gallon Septic Tank	EA	2		\$0.00
	B.11	6,500 Gallon Septic Tank	EA	1		\$0.00
	B.12	8,000 Gallon Septic Tank	EA	1		\$0.00
	B.13	Future Stub Connection	EA	3		\$0.00
	B.14	Flush Tank #2	EA	1		\$0.00
	B.15	Effluent Sewer Lateral Cleanout	EA	84		\$0.00
	B.16	Effluent Sewer Mainline Cleanout	EA	27		\$0.00
	B.17	Effluent Sewer Lateral Check Valve	EA	81		\$0.00
	B.18	Effluent Sewer Vent	EA	1		\$0.00
	B.19	Jack & Bore Crossing - Rec. Park	LS	1		\$0.00
	B.20	Jack & Bore Crossing - 237 Mountain Road	LS	1		\$0.00
	B.21	Jack & Bore Crossing - 22 Mountain Road	LS	1		\$0.00
BASE BID C ITEMS - COMMON ITEMS						
	C.1	Bituminous Pavement	LF	1913		\$0.00
	C.2	Aggregate Pavement	LF	845		\$0.00
	C.3	Unsuitable Material Excavation	CY	2571		\$0.00
	C.4	Rock Removal	CY	157		\$0.00
	C.5	Borrow Fill	CY	2,729		\$0.00
	C.6	Erosion Protection & Sediment Control Plan	LS	1		\$0.00
	C.7	Miscellaneous Erosion & Sediment Controls	LS	1		\$0.00
	C.8	Dust Control with Water	LS	1		\$0.00
BASE BID D ITEMS - GENERAL CONTRACT						
	D.1	Contractor Mobilization/Demobilization	LS	5%		\$0.00
	D.2	As-Builts and O&M Manuals	LS	1%		\$0.00

BID SCHEDULE

Section Title	Item Code	Item Description	Unit	Quantity	Unit Price	Extension
ADD ALTERNATE 1 BID						
ITEMS	ALT-1.1	Single Pipe in Trench (0' - 10' depth)	LF	4,338		\$0.00
	ALT-1.2	Pipe Insulation	LF	1,136		\$0.00
	ALT-1.3	Trout River Effluent Sewer Crossing	LS	1		\$0.00
	ALT-1.4	1,500 Gallon Septic Tank	EA	16		\$0.00
	ALT-1.5	3,500 Gallon Septic Tank	EA	1		\$0.00
	ALT-1.6	6,000 Gallon Septic Tank	EA	1		\$0.00
	ALT-1.7	Future Stub Connection	EA	6		\$0.00
	ALT-1.8	Flush Tank #1	EA	1		\$0.00
	ALT-1.9	Effluent Sewer Lateral Cleanout	EA	18		\$0.00
	ALT-1.10	Effluent Sewer Mainline Cleanout	EA	13		\$0.00
	ALT-1.11	Effluent Sewer Lateral Check Valve	EA	18		\$0.00
	ALT-1.12	Effluent Sewer Vent	EA	1		\$0.00
	ALT-1.13	Air/Vacuum Release Valve Manhole	EA	1		\$0.00
	ALT-1.14	Jack & Bore Crossing - South Main Street	LS	1		\$0.00
	ALT-1.15	Bituminous Pavement	LD	1,293		\$0.00
	ALT-1.16	Aggregate Pavement (Gravel Top Surface)	LD	413		\$0.00
	ALT-1.17	Unsuitable Material Excavation	CY	803		\$0.00
	ALT-1.18	Borrow Fill	CY	803		\$0.00
	ALT-1.19	Erosion Protection & Sediment Control Plan	LS	1		\$0.00
	ALT-1.20	Miscellaneous Erosion & Sediment Controls	LS	1		\$0.00
	ALT-1.21	Dust Control with Water	LS	1		\$0.00
ADD ALTERNATE 2 BID						
ITEMS	ALT-2.1	Single Pipe in Trench (0' - 10' depth)	LF	2,562		\$0.00
	ALT-2.2	Dual Pipe in Trench (0' - 10' depth)	LF	440		\$0.00
	ALT-2.3	Pipe Insulation	LF	710		\$0.00
	ALT-2.4	1,500 Gallon Septic Tank	EA	7		\$0.00
	ALT-2.5	Future Stub Connection	EA	2		\$0.00
	ALT-2.6	Effluent Sewer Lateral Cleanout	EA	7		\$0.00
	ALT-2.7	Effluent Sewer Mainline Cleanout	EA	6		\$0.00
	ALT-2.8	Effluent Sewer Lateral Check Valve	EA	7		\$0.00
	ALT-2.9	Air/Vacuum Release Valve Manhole	EA	1		\$0.00
	ALT-2.10	Jack & Bore Crossing - Pump Station 2	EA	1		\$0.00
	ALT-2.11	Bituminous Pavement	LF	108		\$0.00
	ALT-2.12	Aggregate Pavement (Gravel Top Surface)	LF	252		\$0.00
	ALT-2.13	Unsuitable Material Excavation	CY	577		\$0.00
	ALT-2.14	Borrow Fill	CY	577		\$0.00
	ALT-2.15	Erosion Protection & Sediment Control Plan	LS	1		\$0.00
	ALT-2.16	Miscellaneous Erosion & Sediment Controls	LS	1		\$0.00
	ALT-2.17	Dust Control with Water	LS	1		\$0.00

BID SCHEDULE

Section Title	Item Code	Item Description	Unit	Quantity	Unit Price	Extension
ADD ALTERNATE 3 BID						
ITEMS (Non ARPA)	ALT-3.1	Single Pipe in Trench (0' - 10' depth)	LF	2,860		\$0.00
	ALT-3.2	Pipe Insulation	LF	1,260		\$0.00
	ALT-3.3	1,500 Gallon Septic Tank	EA	9		\$0.00
	ALT-3.4	2,500 Gallon Septic Tank	EA	1		\$0.00
	ALT-3.5	Future Stub Connection	EA	2		\$0.00
	ALT-3.6	Effluent Sewer Lateral Cleanout	EA	10		\$0.00
	ALT-3.7	Effluent Sewer Mainline Cleanout	EA	7		\$0.00
	ALT-3.8	Effluent Sewer Lateral Check Valve	EA	10		\$0.00
	ALT-3.9	Jack & Bore Crossing - 427 Mountain Road	LS	1		\$0.00
	ALT-3.10	Jack & Bore Crossing - 519 Mountain Road	LS	1		\$0.00
	ALT-3.11	Bituminous Pavement	LF	22		\$0.00
	ALT-3.12	Aggregate Pavement (Gravel Top Surface)	LF	15		\$0.00
	ALT-3.13	Unsuitable Material Excavation	CY	530		\$0.00
	ALT-3.14	Borrow Fill	CY	530		\$0.00
	ATL-3.15	Erosion Protection & Sediment Control Plan	LS	1		\$0.00
	ALT-3.16	Miscellaneous Erosion & Sediment Controls	LS	1		\$0.00
	ALT-3.17	Dust Control with Water	LS	1		\$0.00

TOTAL CONTRACT PRICE BASE BID (Bid Items A-1 thru A-10): \$ _____

The total of all Unit Price and Lump Sum Bid Items for the Base Bid and bid alternate shall be the basis of bid comparison for Contract Award.

Unit Prices have been computed in accordance with paragraph 13.03.B of the General Conditions.

The Contract will be awarded to the lowest, responsive bidder of **Total Base Bid Items (Items A-1 thru A-10)**.

Bidder acknowledges that (1) each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and (2) estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all unit price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

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.: _____ [or] Evidence of Bidder's ability to obtain a State Contractor's License and a covenant by Bidder to obtain said license within the time for acceptance of Bids;~~
 - G. **Required Bidder Qualification Statement with supporting data;**
 - H. **Signed Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions (AD-1048);**
 - I. **EPA Form 6100-4, "DBE Program Subcontractor Utilization Form"**
 - J. **EPA Form 6100-3, "DBE Program Subcontractor Performance Form"**

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

- 9.01 **By signing this BID, the Bidder certifies that the Bidder complies with the following Federal requirements:**
- A. **45 CFR Part 604 – Disclosure of Lobbying Activities**
 - B. **Certification regarding Debarment, Suspension and Ineligibility Statement**
 - C. **Notice to Labor Unions or other Organization of Workers Certification of Non-Segregated Facilities.**
- 9.02 I have, have not (check one), participated in a previous contract or subcontract subject to Executive order No. 11246, as amended, (regarding equal employment opportunity) or a preceding similar Executive Order. See the following Executive Order No. 11246: <http://www.dol.gov/ofccp/regs/statutes/eo11246.htm>
- 9.03 I have, have not (check one), previously had contracts subject to the written affirmative action programs requirements of the Secretary of Labor.
- 9.04 Bidder understands that if Bidder has failed to file any compliance reports that have been required of them, Bidder is not eligible and will not be eligible to have their Bid considered or to enter into the proposed contract unless and until Bidder makes an arrangement regarding such reporting that is satisfactory to the Agency and the Office where the reports are required to be filed.
- 9.05 Bidder understands and acknowledges that the penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

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.: _____

END OF SECTION

SECTION 000430

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: **Town of Montgomery, 86 Mountain Rd, Montgomery Center, VT 05471**

BID

Bid Due Date:

Description: **Center Community Decentralized Wastewater Treatment and Disposal System**

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

Bidder'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

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.

COMPLIANCE STATEMENT

This statement relates to a proposed contract with _____

(Name of borrower or grantee)

who expects to finance the contract with assistance from either the Rural Housing Service (RHS), Rural Business-Cooperative Service (RBS), or the Rural Utilities Service (RUS) or their successor agencies, United States Department of Agriculture (whether by a loan, grant, loan insurance, guarantee, or other form of financial assistance). I am the undersigned bidder or prospective contractor, I represent that:

1. I have, have not, participated in a previous contract or subcontract subject to Executive Order 11246 (regarding equal employment opportunity) or a preceding similar Executive Order.
2. If I have participated in such a contract or subcontract, I have, have not, filed all compliance reports that have been required to file in connection with the contract or subcontract.
 If the proposed contract is for \$50,000 or more: or If the proposed nonconstruction contract is for \$50,000 or more and I have 50 or more employees, I also represent that:
3. I have, have not previously had contracts subject to the written affirmative action programs requirements of the Secretary of Labor.
4. If I have participated in such a contract or subcontract, I have, have not developed and placed on file at each establishment affirmative action programs as required by the rules and regulations of the Secretary of Labor.

I understand that if I have failed to file any compliance reports that have been required of me, I am not eligible and will not be eligible to have my bid considered or to enter into the proposed contract unless and until I make an arrangement regarding such reports that is satisfactory to either the RHS, RBS or RUS, or to the office where the reports are required to be filed.

I also certify that I do not maintain or provide for my employees any segregated facilities at any of my establishments, and that I do not permit my employees to perform their services at any location, under my control, where segregated facilities are maintained. I certify further that I will not maintain or provide for my employees any segregated facilities at any of my establishments, and that I will not permit my employees to perform their services at any location, under my control, where segregated facilities are maintained. I agree that a breach of this certification is a violation of the Equal Opportunity clause in my contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and wash rooms, restaurants and other eating areas time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise. I further agree that (except where I have obtained identical certifications for proposed subcontractors for specific time periods) I will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity clause; that I will retain such certifications in my files; and that I will forward the following notice to such proposed subcontractors (except where the proposed subcontractors have submitted identical certifications for specific time periods):

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays the valid OMB control number. The valid OMB control number for this information collection is 0575-0018. The time required to complete this information collection is estimated to average 10 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

**NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENTS FOR
CERTIFICATIONS OF NON-SEGREGATED FACILITIES**

A certification of Nonsegregated Facilities, as required by the May 9, 1967, order (32F.R. 7439, may 19, 1967) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted prior to the award of a subcontract exceeding \$ 10,000 which is not exempt from the provisions of the Equal Opportunity clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

DATE _____

(Signature of Bidder or Prospective Contractor)

Address (including Zip Code)

CERTIFICATION FOR CONTRACTS, GRANTS AND LOANS

The undersigned certifies, to the best of his or her knowledge and belief, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant or Federal loan, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant or loan.

2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant or loan, the undersigned shall complete and submit Standard Form - LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.

3. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including contracts, subcontracts, and subgrants under grants and loans) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

(name)

(date)

(title)

oOo



**Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion AD-1048
 Lower Tier Covered Transactions**

The following statement is made in accordance with the Privacy Act of 1974 (5 U.S.C. § 552a, as amended). This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, and 2 C.F.R. §§ 180.300, 180.335, Participants' responsibilities. The regulations were amended and published on August 31, 2005, in 70 Fed. Reg. 51865-51880. Copies of the regulations may be obtained by contacting the Department of Agriculture agency offering the proposed covered transaction.

According to the Paperwork Reduction Act of 1995 an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0505-0027. The time required to complete this information collection is estimated to average 15 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. The provisions of appropriate criminal and civil fraud privacy, and other statutes may be applicable to the information provided.

(Read instructions on page two before completing certification.)

- A. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency;
- B. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

ORGANIZATION NAME	PR/AWARD NUMBER OR PROJECT NAME
NAME(S) AND TITLE(S) OF AUTHORIZED REPRESENTATIVE(S)	
SIGNATURE(S)	DATE

In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotope, American Sign Language, etc.) should contact the responsible agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at [How to File a Program Discrimination Complaint \(https://www.ascr.usda.gov/filing-program-discrimination-complaint-usda-customer\)](https://www.ascr.usda.gov/filing-program-discrimination-complaint-usda-customer) and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442.

Instructions for Certification

- (1) By signing and submitting this form, the prospective lower tier participant is providing the certification set out on page 1 in accordance with these instructions.
- (2) The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension or debarment.
- (3) The prospective lower tier participant shall provide immediate written notice to the person(s) to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
- (4) The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549, at 2 C.F.R. Parts 180 and 417. You may contact the department or agency to which this proposal is being submitted for assistance in obtaining a copy of those regulations.
- (5) The prospective lower tier participant agrees by submitting this form that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
- (6) The prospective lower tier participant further agrees by submitting this form that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
- (7) A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the System for Award Management (SAM) database.
- (8) Nothing contained in the foregoing shall be construed to require establishment of a system of records to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
- (9) Except for transactions authorized under paragraph (5) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

SECTION 000451

QUALIFICATIONS STATEMENT

THE INFORMATION SUPPLIED IN THIS DOCUMENT IS CONFIDENTIAL TO THE EXTENT PERMITTED BY LAWS AND REGULATIONS

1. SUBMITTED BY:

Official Name of Firm:

Address:

2. SUBMITTED TO:

3. SUBMITTED FOR:

Owner:

Project Name:

TYPE OF WORK:

4. CONTRACTOR'S CONTACT INFORMATION

Contact Person:

Title:

Phone:

Email:

5. AFFILIATED COMPANIES:

Name: _____

Address: _____

6. TYPE OF ORGANIZATION:

SOLE PROPRIETORSHIP

Name of Owner: _____

Doing Business As: _____

Date of Organization: _____

PARTNERSHIP

Date of Organization: _____

Type of Partnership: _____

Name of General Partner(s): _____

CORPORATION

State of Organization: _____

Date of Organization: _____

Executive Officers:

- President: _____

- Vice President(s): _____

- Treasurer: _____

- Secretary: _____

LIMITED LIABILITY COMPANY

State of Organization: _____

Date of Organization: _____

Members: _____

JOINT VENTURE

Sate of Organization: _____

Date of Organization: _____

Form of Organization: _____

Joint Venture Managing Partner

- Name: _____

- Address: _____

Joint Venture Managing Partner

- Name: _____

- Address: _____

Joint Venture Managing Partner

- Name: _____

- Address: _____

7. LICENSING

Jurisdiction: _____

Type of License: _____

License Number: _____

Jurisdiction: _____

Type of License: _____

License Number: _____

8. CERTIFICATIONS

CERTIFIED BY:

Disadvantage Business Enterprise: _____

Minority Business Enterprise: _____

Woman Owned Enterprise: _____

Small Business Enterprise: _____

Other (_____): _____

9. BONDING INFORMATION

Bonding Company: _____

Address: _____

Bonding Agent: _____

Address: _____

Contact Name: _____

Phone: _____

Aggregate Bonding Capacity: _____

Available Bonding Capacity as of date of this submittal: _____

10. FINANCIAL INFORMATION

Financial Institution: _____

Address: _____

Account Manager: _____

Phone: _____

INCLUDE AS AN ATTACHMENT AN AUDITED BALANCE SHEET FOR EACH OF THE
LAST 3 YEARS

11. CONSTRUCTION EXPERIENCE:

Current Experience:

List on **Schedule A** all uncompleted projects currently under contract (If Joint Venture list each participant's projects separately).

Previous Experience:

List on **Schedule B** all projects completed within the last 5 Years (If Joint Venture list each participant's projects separately).

Has firm listed in Section 1 ever failed to complete a construction contract awarded to it?

YES NO

If YES, attach as an Attachment details including Project Owner's contact information.

Has any Corporate Officer, Partner, Joint Venture participant or Proprietor ever failed to complete a construction contract awarded to them in their name or when acting as a principal of another entity?

YES NO

If YES, attach as an Attachment details including Project Owner's contact information.

Are there any judgments, claims, disputes or litigation pending or outstanding involving the firm listed in Section 1 or any of its officers (or any of its partners if a partnership or any of the individual entities if a joint venture)?

YES NO

If YES, attach as an Attachment details including Project Owner's contact information.

12. SAFETY PROGRAM:

Name of Contractor's Safety Officer: _____

Include the following as attachments:

Provide as an Attachment Contractor's (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) OSHA No. 500- Log & Summary of Occupational Injuries & Illnesses for the past 5 years.

Provide as an Attachment Contractor's (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) list of all OSHA Citations & Notifications of Penalty (monetary or other) received within the last 5 years (indicate disposition as applicable) - IF NONE SO STATE.

Provide as an Attachment Contractor's (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) list of all safety citations or violations under any state all received within the last 5 years (indicate disposition as applicable) - IF NONE SO STATE.

Provide the following for the firm listed in Section V (and for each proposed Subcontractor furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) the following (attach additional sheets as necessary):

Workers' compensation Experience Modification Rate (EMR) for the last 5 years:

YEAR	_____	EMR	_____
YEAR	_____	EMR	_____
YEAR	_____	EMR	_____
YEAR	_____	EMR	_____
YEAR	_____	EMR	_____

Total Recordable Frequency Rate (TRFR) for the last 5 years:

YEAR	_____	TRFR	_____
YEAR	_____	TRFR	_____
YEAR	_____	TRFR	_____
YEAR	_____	TRFR	_____
YEAR	_____	TRFR	_____

Total number of man-hours worked for the last 5 Years:

YEAR	_____	TOTAL NUMBER OF MAN-HOURS	_____
YEAR	_____	TOTAL NUMBER OF MAN-HOURS	_____
YEAR	_____	TOTAL NUMBER OF MAN-HOURS	_____
YEAR	_____	TOTAL NUMBER OF MAN-HOURS	_____
YEAR	_____	TOTAL NUMBER OF MAN-HOURS	_____

Provide Contractor's (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) Days Away From Work, Days of Restricted Work Activity or Job Transfer (DART) incidence rate for the particular industry or type of Work to be performed by Contractor and each of Contractor's proposed Subcontractors and Suppliers) for the last 5 years:

YEAR	_____	DART	_____
YEAR	_____	DART	_____
YEAR	_____	DART	_____
YEAR	_____	DART	_____
YEAR	_____	DART	_____

13. EQUIPMENT:

MAJOR EQUIPMENT:

List on **Schedule C** all pieces of major equipment available for use on Owner's Project.

I HEREBY CERTIFY THAT THE INFORMATION SUBMITTED HEREWITH, INCLUDING ANY ATTACHMENTS, IS TRUE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

NAME OF ORGANIZATION: _____

BY: _____

TITLE: _____

DATED: _____

NOTARY ATTEST:

SUBSCRIBED AND SWORN TO BEFORE ME

THIS _____ DAY OF _____, 20__

NOTARY PUBLIC - STATE OF _____

MY COMMISSION EXPIRES: _____

REQUIRED ATTACHMENTS

1. Schedule A (Current Experience).
2. Schedule B (Previous Experience).
3. Schedule C (Major Equipment).
4. Audited balance sheet for each of the last 3 years for firm named in Section 1.
5. Evidence of authority for individuals listed in Section 7 to bind organization to an agreement.
6. Resumes of officers and key individuals (including Safety Officer) of firm named in Section 1.
7. Required safety program submittals listed in Section 13.
8. Additional items as pertinent.

SCHEDULE A

CURRENT EXPERIENCE

Project Name	Owner's Contact Person	Design Engineer	Contract Date	Type of Work	Status	Cost of Work
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				

SCHEDULE B

PREVIOUS EXPERIENCE (Include ALL Projects Completed within last 5 years)

Project Name	Owner's Contact Person	Design Engineer	Contract Date	Type of Work	Status	Cost of Work
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				

SCHEDULE B

PREVIOUS EXPERIENCE (Include ALL Projects Completed within last 5 years)

Project Name	Owner's Contact Person	Design Engineer	Contract Date	Type of Work	Status	Cost of Work
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				

SCHEDULE C - LIST OF MAJOR EQUIPMENT AVAILABLE

ITEM	PURCHASE DATE	CONDITION	ACQUIRED VALUE

SECTION 000510
NOTICE OF AWARD

Date of Issuance:

Owner: Town of Montgomery

Owner's Contract No.:

Engineer: Hoyle, Tanner, & Associates

Engineer's Project No.: 129800.02

Project: Center Community
Decentralized Wastewater Treatment
and Disposal System

Contract Name:

Bidder:

Bidder's Address:

TO BIDDER:

You are notified that Owner has accepted your Bid dated [_____] for the above Contract, and that you are the Successful Bidder and are awarded a Contract for:

[describe Work, alternates, or sections of Work awarded]

The Contract Price of the awarded Contract is: \$ _____ *[note if subject to unit prices, or cost-plus]*

[] unexecuted counterparts of the Agreement accompany this Notice of Award, and one copy of the Contract Documents accompanies this Notice of Award, or has been transmitted or made available to Bidder electronically. *[revise if multiple copies accompany the Notice of Award]*

a set of the Drawings will be delivered separately from the other Contract Documents.

You must comply with the following conditions precedent within 15 days of the date of receipt of this Notice of Award:

1. Deliver to Owner **(4) four** counterparts of the Agreement, fully executed by Bidder.
2. Deliver with the executed Agreement(s) the Contract security and insurance documentation as specified in the Instructions to Bidders and General Conditions, Articles 2 and 6.
3. Other conditions precedent (if any):

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default, annul this Notice of Award, and declare your Bid security forfeited.

Within ten days after you comply with the above conditions, Owner will return to you one fully executed counterpart of the Agreement, together with any additional copies of the Contract Documents as indicated in Paragraph 2.02 of the General Conditions.

Owner: Town of Montgomery

Authorized Signature

By:

Title:

Copy: Engineer

SECTION 000520

AGREEMENT
BETWEEN OWNER AND CONTRACTOR
FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

THIS AGREEMENT is by and between Town of Montgomery, Vermont (“Owner”) and
_____ (“Contractor”).

Owner and Contractor hereby agree as follows:

ARTICLE 1 – WORK

- 1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:
- A. Decommissioning of existing septic tanks, installation of new septic tanks, constructing a new Water Resource Recovery Facility (WRRF), new effluent pump stations, new small diameter HDPE gravity effluent sewer and effluent force mains, and other associated work as described in the bid documents.

ARTICLE 2 – THE PROJECT

- 2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows:
- A. Decommissioning of existing septic tanks, installation of new septic tanks, constructing a new Water Resource Recovery Facility (WRRF), new effluent pump stations, new small diameter HDPE gravity effluent sewer and effluent force mains, and other associated work as described in the bid documents.
 - B.

ARTICLE 3 – ENGINEER

- 3.01 The Project has been designed by **Hoyle, Tanner & Associates, 125 College Street, 4th Floor, Burlington, Vermont 05401.**
- 3.02 The Owner has retained **Hoyle, Tanner & Associates** (“Engineer”) to act as Owner’s representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 – CONTRACT TIMES

- 4.01 *Time of the Essence*
- All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.
- 4.02 *Contract Times: Days*

- A. The Work will be substantially completed within **475** days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within **505** days after the date when the Contract Times commence to run.

4.03 *Liquidated Damages*

- A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with the Contract. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):
1. Substantial Completion: Contractor shall pay Owner **\$5,000.00** for each day that expires after the time (as duly adjusted pursuant to the Contract) specified in Paragraph 4.02.A above for Substantial Completion until the Work is substantially complete.
 2. Completion of Remaining Work: After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner **\$5,000.00** for each day that expires after such time until the Work is completed and ready for final payment.
 3. Liquidated damages for failing to timely attain Substantial Completion and final completion are not additive and will not be imposed concurrently.
 4. Milestones: Contractor shall pay **Owner \$5,000.00** for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for achievement of Milestone 1, until Milestone 1 is achieved.

~~4.04 *Special Damages*~~

- ~~A. In addition to the amount provided for liquidated damages, Contractor shall reimburse Owner (1) for any fines or penalties imposed on Owner as a direct result of the Contractor's failure to attain Substantial Completion according to the Contract Times, and (2) for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Substantial Completion (as duly adjusted pursuant to the Contract), until the Work is substantially complete.~~
- ~~B. After Contractor achieves Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times, Contractor shall reimburse Owner for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Work to be completed and ready for final payment (as duly adjusted pursuant to the Contract), until the Work is completed and ready for final payment.~~

ARTICLE 5 – CONTRACT PRICE

- 5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents the amounts that follow, subject to adjustment under the Contract:
- A. **For all Work other than Unit Price Work, a lump sum of: \$ _____.**

All specific cash allowances are included in the above price in accordance with Paragraph 13.02 of the General Conditions.

- B. For all Unit Price Work, an amount equal to the sum of the extended prices (established for each separately identified item of Unit Price Work by multiplying the unit price times the actual quantity of that item):

Unit Price Work					
Item No.	Description	Unit	Estimated Quantity	Unit Price	Extended Price
Total of all Extended Prices for Unit Price Work (subject to final adjustment based on actual quantities)					\$

TOTAL OF ALL UNIT PRICES _____ \$ _____ (dollars)
 (use words)

The extended prices for Unit Price Work set forth as of the Effective Date of the Contract are based on estimated quantities. As provided in Paragraph 13.03 of the General Conditions, estimated quantities are not guaranteed, and determinations of actual quantities and classifications are to be made by Engineer.

- C. Total of Lump Sum Amount and Unit Price Work (subject to final Unit Price adjustment) \$ _____.
- D. For all Work, at the prices stated in Contractor’s Bid, attached hereto as an exhibit.

ARTICLE 6 – PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

- A. Contractor shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.02 *Progress Payments; Retainage*

- A. Owner shall make progress payments on account of the Contract Price on the basis of Contractor’s Applications for Payment **within 20 days of receipt of a complete and accurate Application for Payment and upon recommendation of the Engineer** ~~on or about the final day of each month~~ during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by

the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract
 - a. 95 percent of Work completed (with the balance being retainage). ~~If the Work has been 50 percent completed as determined by Engineer, and if the character and progress of the Work have been satisfactory to Owner and Engineer, then as long as the character and progress of the Work remain satisfactory to Owner and Engineer, there will be no additional retainage; and~~
 - b. 95 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).
- B. Upon Substantial Completion of the entire construction to be provided under the Contract Documents, Owner shall pay an amount sufficient to increase total payments to Contractor to 95 percent of the Work completed, less such amounts set off by Owner pursuant to Paragraph 15.01.E of the General Conditions, and less 150 percent of Engineer's estimate of the value of Work to be completed or corrected as shown on the punch list of items to be completed or corrected prior to final payment.

6.03 *Final Payment*

- A. Upon final completion and acceptance of the Work in accordance with Paragraph 15.06 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 15.06.

ARTICLE 7 – INTEREST

7.01 All amounts not paid when due shall bear interest at the rate of 0 percent per annum.

ARTICLE 8 – CONTRACTOR'S REPRESENTATIONS

- 8.01 In order to induce Owner to enter into this Contract, Contractor makes the following representations:
- A. Contractor has examined and carefully studied the Contract Documents, and any data and reference items identified in the Contract Documents.
 - B. Contractor has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
 - C. Contractor is familiar with and is satisfied as to all Laws and Regulations that may affect cost, progress, and performance of the Work.
 - D. Contractor 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. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Site-related reports and drawings identified in the Contract 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 Contractor; and (3) Contractor's safety precautions and programs.
- F. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
- G. Contractor 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 Contract Documents.
- H. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
- I. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
- J. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

ARTICLE 9 – CONTRACT DOCUMENTS

9.01 *Contents*

- A. The Contract Documents consist of the following:
 - 1. This Agreement (pages 1 to 8, inclusive).
 - 2. Performance bond (pages 1 to 3, inclusive).
 - 3. Payment bond (pages 1 to 3, inclusive).
 - 4. ~~Other bonds.~~
 - a. ~~___ (pages ___ to ___, inclusive).~~
 - 5. General Conditions (pages 1 to 69, inclusive).
 - 6. Supplementary Conditions (pages 1 to 23, inclusive).
 - 7. Specifications as listed in the table of contents of the Project Contract Documents.
 - 8. Drawings listed on the attached sheet index on **Contract Drawings Dated Month, Year.**
 - 9. Addenda (numbers ___ to ___, inclusive).
 - 10. Exhibits to this Agreement (enumerated as follows):
 - a. Contractor's Bid (pages ___ to ___, inclusive).

11. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
 - a. Notice to Proceed.
 - b. Work Change Directives.
 - c. Change Orders.
 - d. Field Orders.
- B. The documents listed in Paragraph 9.01.A are attached to this Agreement (except as expressly noted otherwise above).
- C. There are no Contract Documents other than those listed above in this Article 9.
- D. The Contract Documents may only be amended, modified, or supplemented as provided in the General Conditions.

ARTICLE 10 – MISCELLANEOUS

10.01 *Terms*

- A. Terms used in this Agreement will have the meanings stated in the General Conditions and the Supplementary Conditions.

10.02 *Assignment of Contract*

- A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

10.03 *Successors and Assigns*

- A. Owner and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

10.04 *Severability*

- A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

10.05 *Contractor's Certifications*

- A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 10.05:
 1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process or in the Contract execution;

2. “fraudulent practice” means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract 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.

10.06 *Other Provisions*

- A. Owner stipulates that if the General Conditions that are made a part of this Contract are based on EJCDC® C-700, Standard General Conditions for the Construction Contract, published by the Engineers Joint Contract Documents Committee®, and if Owner is the party that has furnished said General Conditions, then Owner has plainly shown all modifications to the standard wording of such published document to the Contractor, through a process such as highlighting or “track changes” (redline/strikeout), or in the Supplementary Conditions.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement.

This Agreement will be effective on _____ (which is the Effective Date of the Contract).

OWNER:

CONTRACTOR:

Town of Montgomery _____

By: _____

By: _____

Title: _____

Title: _____

(If Contractor is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest: _____

Attest: _____

Title: _____

Title: _____

Address for giving notices:

Address for giving notices:

Town of Montgomery _____

86 Mountain Road _____

Montgomery Center, VT 05471 _____

License No.: _____
(where applicable)

Owner shall attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.

SECTION 000550
NOTICE TO PROCEED

Owner: Town of Montgomery	Owner's Contract No.:
Contractor:	Contractor's Project No.:
Engineer: Hoyle, Tanner, & Associates, Inc.	Engineer's Project No.:
Project:	129800.02
	Contract Name: Center Community Decentralized Wastewater Treatment and Disposal System
	Effective Date of Contract:

TO CONTRACTOR:

Owner hereby notifies Contractor that the Contract Times under the above Contract will commence to run on [REDACTED], 20[REDACTED]. *[see Paragraph 4.01 of the General Conditions]*

On that date, Contractor shall start performing its obligations under the Contract Documents. No Work shall be done at the Site prior to such date. In accordance with the Agreement, the date of Substantial Completion is _____, and the date of readiness for final payment is _____.

Before starting any Work at the Site, Contractor must comply with the following:
[Note any access limitations, security procedures, or other restrictions]

Owner:

Authorized Signature

By:

Title:

Date Issued:

Copy: Engineer

PERFORMANCE BOND

CONTRACTOR *(name and address)*:

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

OWNER: Town of Montgomery

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 here from 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: Town of Montgomery

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 here from 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.
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:
 8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.



Contractor's Application for Payment No. _____

Application Period:		Application Date:
To (Owner):	From (Contractor):	Via (Engineer):
Project:	Contract:	
Owner's Contract No.:	Contractor's Project No.:	Engineer's Project No.:
Notice to Proceed:	Original Date of Final Completion:	Current Date of Final Completion:

**Application For Payment
Change Order Summary**

Approved Change Orders	1. ORIGINAL CONTRACT PRICE.....	\$ _____
Number	2. Net change by Change Orders.....	\$ _____
Additions	3. Current Contract Price (Line 1 ± 2).....	\$ _____
Deductions	4. TOTAL COMPLETED AND STORED TO DATE	
	(Column F total on Progress Estimates).....	\$ _____
	5. RETAINAGE:	
	a. X _____ Work Completed.....	\$ _____
	b. X _____ Stored Material.....	\$ _____
	c. Total Retainage (Line 5.a + Line 5.b).....	\$ _____
	6. AMOUNT ELIGIBLE TO DATE (Line 4 - Line 5.c).....	\$ _____
TOTALS	7. LESS PREVIOUS PAYMENTS (Line 6 from prior Application).....	\$ _____
NET CHANGE BY	8. AMOUNT DUE THIS APPLICATION.....	\$ _____
CHANGE ORDERS	9. BALANCE TO FINISH, PLUS RETAINAGE	
	(Column G total on Progress Estimates + Line 5.c above).....	\$ _____

Contractor's Certification

The undersigned Contractor certifies, to the best of its knowledge, the following:

(1) All previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with the Work covered by prior Applications for Payment;

(2) Title to all Work, materials and equipment incorporated in said Work, or otherwise listed in or covered by this Application for Payment, will pass to Owner at time of payment free and clear of all Liens, security interests, and encumbrances (except such as are covered by a bond acceptable to Owner indemnifying Owner against any such Liens, security interest, or encumbrances); and

(3) All the Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.

Contractor Signature

By: _____ Date: _____

Payment of: \$ _____
(Line 8 or other - attach explanation of the other amount)

is recommended by: _____ (Engineer) _____ (Date)

Payment of: \$ _____
(Line 8 or other - attach explanation of the other amount)

is approved by: _____ (Owner) _____ (Date)

Approved by: _____ (Date)
Funding or Financing Entity (if applicable)

Progress Estimate - Lump Sum Work

Contractor's Application

For (Contract):					Application Number:			
Application Period:					Application Date:			
			Work Completed		E	F		G
A	B	C	D	Materials Presently Stored (not in C or D)	Total Completed and Stored to Date (C + D + E)	% (F / B)	Balance to Finish (B - F)	
Specification Section No.	Description	Scheduled Value (\$)	From Previous Application (C+D) This Period					
Totals								

Progress Estimate - Unit Price Work

Contractor's Application

For (Contract):						Application Number:					
Application Period:						Application Date:					
A					B	C	D	E	F		
Item		Contract Information				Estimated Quantity Installed	Value of Work Installed to Date	Materials Presently Stored (not in C)	Total Completed and Stored to Date (D + E)	% (F / B)	Balance to Finish (B - F)
Bid Item No.	Description	Item Quantity	Units	Unit Price	Total Value of Item (\$)						
Totals											

Stored Material Summary

Contractor's Application

For (Contract):								Application Number:				
Application Period:								Application Date:				
Bid Item No.	A		B		C	D		E	Subtotal Amount Completed and Stored to Date (D + E)	F		G
	Supplier Invoice No.	Submittal No. (with Specification Section No.)	Storage Location	Description of Materials or Equipment Stored		Stored Previously				Incorporated in Work	Materials Remaining in Storage (\$) (D + E - F)	
					Date Placed into Storage (Month/Year)	Amount (\$)	Amount Stored this Month (\$)		Date (Month/Year)	Amount (\$)		
Totals												

**SECTION 000700
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. §§5501 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.H 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. Contractor shall include and list Owner as additional insureds on the policy. 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 consider 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 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 11.01.C.2.a and 11.01.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 special 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.

SECTION 000800

SUPPLEMENTARY CONDITIONS

These Supplementary Conditions amend or supplement the Section 000700 Standard General Conditions of the Construction Contract. 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.A.8 Add the following language at the end of last sentence of Paragraph 1.01.A.8:

The Change Order form to be used on this Project is EJCDC C-941. Agency approval is required before Change Orders are effective.

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

Abnormal Weather Conditions – Conditions of extreme or unusual weather for a given region, elevation, or season as determined by Engineer. Extreme or unusual weather that is typical for a given region, elevation, or season should not be considered Abnormal Weather Conditions.

SC-1.01.A.50 Add the following new Paragraph after Paragraph 1.01.A.49:

Agency – The Project is financed in part by the United States Environmental Protection Agency (EPA) through the State of Vermont Revolving Loan Program. The Revolving Loan Program is administered by the Vermont Department of Environmental Conservation (DEC), **Water Investment** Division; therefore the Agency for these documents is DEC – **Water Investment** Division.

Agency – The Project is financed in part by the USDA Rural Utilities Service pursuant to the Consolidated Farm and Rural Development Act (7 USC Section 1921 et seq.). The Rural Utilities Service programs are administered through the USDA Rural Development offices; therefore, the Agency for these documents is USDA Rural Development.

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.

ARTICLE 2 – PRELIMINARY MATTERS

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-2.05 **Add the following new paragraph immediately after paragraph 2.05 A.3.**

B. If the Contractor’s submitted Progress Schedule, Schedule of Submittals and Schedule of Values are acceptable to the Engineer a Conference may not be required.

SC-2.06.B. Delete Paragraph 2.06.B and replace it with the following term:

[DELETED]

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

SC-4.01.A Delete paragraph 4.01A in its entirety and replace with the following:

A. **The Contract Times will commence to run on the day indicated in the Notice to Proceed. ~~In no event will the Contract Times commence to run later than the sixtieth (60th) day after the day of Bid opening or the thirtieth (30th) day after the Effective Date of the Contract, whichever date is earlier.~~**

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;

SC-4.05.C.1 Amend Paragraph 4.05.C.1 by adding: “(COVID-19)” after the word “epidemics.”

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL 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. **Subsurface soil documentation**. The Technical Data contained in such report upon whose accuracy Contractor may rely are 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 **Month, Year**, prepared by Hoyle, Tanner & Associates Inc., Burlington, VT, entitled “TOWN OF MONTGOMERY, VT, CENTER COMMUNITY DECENTRALIZED WASTEWATER TREATMENT AND DISPOSAL SYSTEM” consisting of **XX** sheets.
- ~~E. 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 Hoyle, Tanner & Associates, Inc., 125 College St, 4th Floor, Burlington, VT 05401 during regular business hours, or may request copies from Engineer.~~

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. Not Used.

ARTICLE 6 – BONDS AND INSURANCE

SC-6.02 Add the following new paragraphs immediately after Paragraph 6.02 J.:

- K. Should any of the required insurance policies be cancelled before the expiration date thereof, notice will be delivered in accordance with the policy provisions.

SC-6.03 *Contractor’s Insurance*

SC-6.03 Change the time period stated on the second line in Paragraph 6.03.I.3 from “10 days” to “30 days”

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>500,000</u>
Bodily injury by disease, aggregate	\$ <u>500,000</u>
Employer's Liability:	
Bodily injury, each accident	\$ <u>500,000</u>
Bodily injury by disease, each employee	\$ <u>500,000</u>
Bodily injury/disease aggregate	\$ <u>500,000</u>

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

General Aggregate	\$ <u>2,000,000</u>
Products - Completed Operations Aggregate	\$ <u>2,000,000</u>
Personal and Advertising Injury	\$ <u>1,000,000</u>
Each Occurrence (Bodily Injury and Property Damage)	\$ <u>1,000,000</u>
Damage to Rented Premises	\$ <u>250,000</u>
Med. Expense (any one person)	\$ <u>5,000</u>

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

Bodily Injury:	
Each person	\$ <u>1,000,000</u>
Each accident	\$ <u>1,000,000</u>
Property Damage:	
Combined Single Limit of	\$ <u>1,000,000</u>

4. Excess or Umbrella Liability:

Per Occurrence	\$ <u>1,000,000</u>
General Aggregate	\$ <u>1,000,000</u>

5. Contractor's Pollution Liability:

Each Occurrence	\$	<u>N/A</u>
General Aggregate	\$	<u>N/A</u>

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:

- Town of Montgomery
- Hoyle, Tanner & Associates, Inc.
- All subcontractors employed by the Contractor, for this project.

SC-6.04 Change the time period stated on the fourth line in Paragraph 6.04.B from "10 days" to "30 days"

SC-6.05 Property Insurance

SC-6.05.A.1. Add the following new subparagraph after subparagraph 6.05.A.1:

- a. In addition to Owner, Contractor, and all Subcontractors, include as insured the following:
- Town of Montgomery
 - Hoyle, Tanner & Associates, Inc.
 - All subcontractors employed by the Contractor, for this project.

SC-6.05.A.2 Delete "flood" from the first sentence.

SC-6.05.A Add the following to the list of requirements in Paragraph 6.05.A, as a numbered item:

14. Include for the benefit of Owner loss of profits and soft cost coverage including, without limitation, fixed expenses and debt service for a minimum of 12 months with a maximum deductible of 30 days, plus attorney's fees and engineering or other consultants' fees, if not otherwise covered, **Advertising, Professional Fees, Financing, Lease Administration, Realty Taxes, General Administration, Lease Expenses, Permit Fees and Insurance premiums.**
15. **shall include "Extra Expenses" which may arise as a result of a "delay" resulting from direct physical loss or damage to the project that is caused by a covered peril.**
16. **shall include "Rental Income" payment for loss of rental income that arises out of a "delay" resulting from direct physical loss or damage to the project that is caused by a covered peril.**
17. provide coverage for not less than the following:

ARTICLE 7 – CONTRACTOR’S RESPONSIBILITIES

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 Monday through Friday from 7:00 AM to 7:00 PM. Contractor will not perform work on a Saturday, Sunday, or any legal holiday without permission of the Owner. Legal holidays include the following:**
 - a. **New Year’s Day**
 - b. **Martin Luther King Day**
 - c. **President’s Day**
 - d. **Town Meeting Day**
 - e. **Memorial Day**
 - f. **Independence Day**
 - g. **Bennington Battle Day**
 - h. **Labor Day**
 - i. **Columbus Day**
 - j. **Veteran’s Day (Observed)**
 - k. **Thanksgiving Day**
 - l. **Christmas Day**
2. **If there is a delay in Contractor’s progress as described in Paragraph 4.05, the Contractor shall not include non-regular working days (i.e. Saturdays, Sundays or holidays) in the contract time equitable adjustment proposal.**
3. **Work done outside of the normally identified hours will count against Contract calendar days at the rate of 8 hours per calendar day.**

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 ‘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 7.04.A.1.a.4 in its entirety and insert the following in its place:

[Deleted]

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:

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 and American Society of Civil Engineers. All rights reserved.

The Contractor shall not award work valued at more than fifty percent of the Contract Price to Subcontractor(s), without prior 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.D Amend the last sentence of Paragraph 7.06.D to read as follows "...objection within thirty days."

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

SC-7.08 *Permits*

SC-7.08.A Add the following new paragraphs immediately after paragraph 7.08.A

- B. The Owner has applied for the following permits for this project, which are listed below.
 - 1. Town of Montgomery Department of Planning and Zoning: Zoning Permit
 - 2. Vermont Department of Public Safety, Division of Fire Safety Construction Permit
- C. Copies of these permits will be provided by the Owner once obtained. The Contractor is responsible for complying with the project specific conditions outlined in the permit(s). If the Contractor intends to proceed with construction means and methods that are outside the General Conditions and Specific Conditions of the permit(s), it is the Contractor's responsibility to obtain new permit(s) for these means and methods and to bear all costs associated with applying for and obtaining new permit(s).

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 Vermont 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-7.12 *Safety and Protection*

SC-7.12 Add a new paragraph immediately after Paragraph 7.12.G:

- H. The Contractor shall comply with all pertinent provisions of the Occupational Safety and Health Administration (OSHA) and any VOSHA (Vermont OSHA) Safety and Health requirements.

SC-7.16.A Add the following new paragraph immediately after paragraph 7.16.A:

Contractor shall submit the number of copies which the Contractor requires, plus two copies (which will be retained by the Engineer) of shop drawings and other submittals to Engineer for review. If the submittal is made electronically, no paper copies will be provided to the Contractor.

SC-7.16.E Delete paragraph immediately after paragraph 7.16.E.2 in its entirety and insert the following in its place:

- 2. Engineer shall review a maximum of two submittals of shop drawings or samples for a particular submittal item at no cost to the Contractor. The Contractor shall reimburse the Owner for costs by the Engineer relative to the review of subsequent submittals of shop drawings or samples of the same item.**

ARTICLE 8 – OTHER WORK AT THE SITE

~~SC-8.02 Delete Paragraph 8.02.A in its entirety and replace with the following:~~

~~A. Owner intends to contract with others for the performance of other work at or adjacent to the Site.~~

- ~~1. [Here identify individual or entirety] shall have authority and responsibility for coordination of the various contractors and work forces at the Site;~~
- ~~2. The following specific matters are to be covered by such authority and responsibility: [here itemize such matters];~~
- ~~3. The extent of such authority and responsibilities is: [here provide the extent]~~

ARTICLE 9 – OWNER’S RESPONSIBILITIES

~~SC-9.13 Add the following new paragraph immediately after Paragraph 9.12 of the General Conditions:~~

~~SC-9.13 Owner will furnish an “Owner’s Site Representative” to represent Owner at the Site and assist Owner in observing the progress and quality of the Work. The Owner’s Site Representative is not Engineer’s consultant, agent, or employee. Owner’s Site Representative will be [Here identify individual or entirety]. The authority and responsibilities of Owner’s Site Representative follow: [Here describe the duties and activities of the Owner’s Site Representative]~~

ARTICLE 10 – ENGINEER’S STATUS DURING CONSTRUCTION

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

- B. The full-time 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. The duties and responsibilities of the RPR are limited to those of Engineer in the Agreement with the Owner and in the Contract Documents, and are further limited and described as follows:**
 - 1. General: RPR's dealings in matters pertaining to the Work in general shall be with Engineer and Contractor. RPR's dealings with Subcontractors shall only be through or with the full knowledge and approval of Contractor. RPR shall**

- generally communicate with Owner only with the knowledge of and under the direction of Engineer.
2. Schedules: Review the progress schedule, schedule of Shop Drawing and Sample submittals, and Schedule of Values prepared by Contractor and consult with Engineer concerning acceptability.
 3. Conferences and Meetings: Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings, and prepare and circulate copies of minutes thereof.
 4. Liaison:
 - a. Serve as Engineer's liaison with Contractor. Working principally through Contractor's authorized representative or designee, assist in providing information regarding the provisions and intent of the Contract Documents.
 - b. Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on-Site operations.
 - c. Assist in obtaining from Owner additional details or information, when required for proper execution of the Work.
 5. Interpretation of Contract Documents: Report to Engineer when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor clarifications and interpretations as issued by Engineer.
 6. Shop Drawings and Samples:
 - a. Record date of receipt of Samples and Contractor-approved Shop Drawings.
 - b. Receive Samples which are furnished at the Site by Contractor, and notify Engineer of availability of Samples for examination.
 - c. Advise Engineer and Contractor of the commencement of any portion of the Work requiring a Shop Drawing or Sample submittal for which RPR believes that the submittal has not been approved by Engineer.
 7. Modifications: Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and report such suggestions, together with RPR's recommendations, if any, to Engineer. Transmit to Contractor in writing decisions as issued by Engineer.
 8. Review of Work and Rejection of Defective Work:
 - a. Conduct on-site observations of Contractor's work in progress to assist Engineer in determining if the Work is in general proceeding in accordance with the Contract Documents.
 - b. Report to Engineer whenever RPR believes that any part of Contractor's work in progress is defective, will not produce a completed Project that conforms generally to the Contract Documents, or will imperil the integrity of the design concept of the completed Project as a functioning whole as indicated in the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test or approval

required to be made; and advise Engineer of that part of work in progress that RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection or approval.

9. Inspections, Tests, and System Start-ups:
 - a. Verify that tests, equipment, and systems start-ups and operating and maintenance training are conducted in the presence of appropriate Owner's personnel, and that Contractor maintains adequate records thereof.
 - b. Observe, record, and report to Engineer appropriate details relative to the test procedures and systems start-ups.
10. Records:
 - a. Prepare a daily report or keep a diary or log book, recording Contractor's hours on the Site, Subcontractors present at the Site, weather conditions, data relative to questions of Change Orders, Field Orders, Work Change Directives, or changed conditions, Site visitors, deliveries of equipment or materials, daily activities, decisions, observations in general, and specific observations in more detail as in the case of observing test procedures; and send copies to Engineer.
 - b. Record names, addresses, fax numbers, e-mail addresses, web site locations, and telephone numbers of all Contractors, Subcontractors, and major Suppliers of materials and equipment.
 - c. Maintain records for use in preparing Project documentation.
11. Reports:
 - a. Furnish to Engineer periodic reports as required of progress of the Work and of Contractor's compliance with the Progress Schedule and schedule of Shop Drawing and Sample submittals.
 - b. Draft and recommend to Engineer proposed Change Orders, Work Change Directives, and Field Orders. Obtain backup material from Contractor.
 - c. Immediately notify Engineer of the occurrence of any Site accidents, emergencies, acts of God endangering the Work, force majeure or delay events, damage to property by fire or other causes, or the discovery of any Constituent of Concern or Hazardous Environmental Condition.
12. Payment Requests: Review applications for payment with Contractor for compliance with the established procedure for their submission and forward with recommendations to Engineer, noting particularly the relationship of the payment requested to the Schedule of Values, Work completed, and materials and equipment delivered at the Site but not incorporated in the Work.
13. Certificates, Operation and Maintenance Manuals: During the course of the Work, verify that materials and equipment certificates, operation and maintenance manuals and other data required by the Contract Documents to be assembled and furnished by Contractor are applicable to the items actually installed and in accordance with the Contract Documents, and have these documents delivered to Engineer for review and forwarding to Owner prior to

payment for that part of the Work.

14. Completion:

- a. Participate in Engineer's visits to the Site to determine Substantial Completion, assist in the determination of Substantial Completion and the preparation of a punch list of items to be completed or corrected.
- b. Participate in Engineer's final visit to the Site to determine completion of the Work, in the company of Owner and Contractor, and prepare a final punch list of items to be completed and deficiencies to be remedied.
- c. Observe whether all items on the final list have been completed or corrected and make recommendations to Engineer concerning acceptance and issuance of the notice of acceptability of the work.

C. The RPR shall not:

1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items).
2. Exceed limitations of Engineer's authority as set forth in the Contract Documents.
3. Undertake any of the responsibilities of Contractor, Subcontractors, or Suppliers.
4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of Contractor's work.
5. Advise on, issue directions regarding, or assume control over security or safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.
6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Engineer.
7. Accept Shop Drawing or Sample submittals from anyone other than Contractor.
8. Authorize Owner to occupy the Project in whole or in part.

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

SC-11.07 Add the following new Paragraphs after Paragraph 11.07.B:

- C. **All Contract Change Orders must be concurred in by Agency before they are effective.**
- D. **Any requested and/or approved change to the Contract Price or Contract Time, both additions and deletions, must be accompanied by an updated schedule prior to consideration for Approval.**

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

~~SC 13.01.B.5.c Delete Paragraph 13.01.B.5.c in its entirety and insert the following in its place:~~

~~c. Construction Equipment and Machinery:~~

- ~~1) Rentals of all construction equipment and machinery, and the parts thereof, 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.~~

- ~~2) Costs for equipment and machinery owned by Contractor will be paid at a rate shown for such equipment in the [cite the rate book appropriate for the Project]. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs. Costs will include the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, shall cease to accrue when the use thereof is no longer necessary for the changed Work. Equipment or machinery with a value of less than \$1,000 will be considered small tools.~~

~~SC 13.03.E~~ Delete Paragraph 13.03.E in its entirety and insert the following in its place:

~~E. The unit price of an item of Unit Price Work shall be subject to reevaluation and adjustment under the following conditions:~~

- ~~1. if the extended price of a particular item of Unit Price Work amounts to _____ percent or more of the Contract Price (based on estimated quantities at the time of Contract formation) and the variation in the quantity of that particular item of Unit Price Work actually furnished or performed by Contractor differs by more than _____ percent from the estimated quantity of such item indicated in the Agreement; and~~
- ~~2. if there is no corresponding adjustment with respect to any other item of Work; and~~
- ~~3. if Contractor believes that Contractor has incurred additional expense as a result thereof, Contractor may submit a Change Proposal, or if Owner believes that the quantity variation entitles Owner to an adjustment in the unit price, Owner may make a Claim, seeking an adjustment in the Contract Price.~~

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

SC-14.02 Add the following paragraph immediately after paragraph 14.02.F:

- G. Contractor shall pay all costs associated with any re-inspection and/or retesting of materials and equipment required by the Engineer as a result of failure of previous test or rejected work as determined by the Engineer. Contractor shall also pay all costs associated with any additional testing requested by the Contractor.**

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

SC-15.01 Progress Payments

SC 15.01.B Amend the second sentence of Paragraph 15.01.B.1 by striking out the following text: “a bill of sale, invoice, or other.”

SC 15.01.B.3 Add the following language at the end of paragraph 15.01.B.3:

No payments will 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 new Paragraph after Paragraph 15.01.B.3:

The Application for Payment form to be used on this Project is EJCDC C-620. The Agency must approve all Applications for Payment before payment is made.

SC 15.01.B.5 Add the following new Paragraph after Paragraph 15.01.B.4:

No payments will be made without accurate and complete weekly certified payroll reports using form WH-347 or its equivalent for both the General Contractor and any subcontractors that worked during the period identified in the payment request.

SC 15.01.B.6 Add the following new Paragraph after Paragraph 15.01.B.5:

No payments will be made without appropriate AIS certification for any materials installed during the period identified in the payment request. Failure to supply the required certification will cause that portion of the request, both labor and material, to be removed from consideration for payment.

SC 15.01.D.1 Delete Paragraph 15.01.D.1 in its entirety and insert the following in its place:

The Application for Payment with Engineer's recommendations will be presented to the Owner and Agency for consideration. If both the Owner and Agency find the Application for Payment acceptable, the recommended amount less any reduction under the provisions of Paragraph 15.01.E will become due twenty (20) days after the Application for Payment is presented to the Owner, and the Owner will make payment to the Contractor.

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 Owner" and insert "no later than the time of payment by Owner."

SC 15.03.B Add the following new subparagraph to Paragraph 15.03.B:

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 15.04.B Add the following new paragraph to Paragraph 15.04.A:

The ENGINEER shall issue a Certificate of Partial Substantial Completion upon request of the Contractor, and when the construction of a specified part of the work sufficiently completed, in accordance with the Contract Documents, so that the specified part can be utilized for all purposes for which it is intended and in the manner in which it is intended. Sufficiently complete is defined as: the WRRF work/equipment is installed, start-up tested, commissioned, and is operational; all septic tanks are installed and connected to the effluent sewer collection system; all effluent pump stations and effluent force mains completed and operational, all power generator work is complete, all training is complete.

SC 15.06.A.1. Add the following new Paragraphs after Paragraph 15.06.A.2.e:

- f. All weekly certified payrolls for both the General Contractor and all subcontractors, for the entire project must be submitted to the Owner;
- g. All AIS certifications are complete and submitted for all materials that are regulated by the AIS Public Law.
- h. All DBE utilization, including -\$0-, has been reported to the Owner.

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

SC-17.02 Add the following new paragraph immediately after Paragraph 17.01.

SC-17.02 Arbitration

~~A. All matters subject to final resolution under this Article will be decided by arbitration by a single arbitrator selected by agreement of the parties. In the event the parties are unable to agree on the selection of an arbitrator within thirty (30) days from the date on which a demand for arbitration was filed on a party, either party may file a demand for arbitration with the American Arbitration Association and the arbitration will be conducted in accordance with the Construction Industry Rules of the American Arbitration Association, subject to the conditions and limitations of this paragraph. This agreement to arbitrate and any other agreement or consent to arbitrate entered into will be specifically enforceable under the prevailing law of any court having jurisdiction.~~

~~B. The demand for arbitration will be filed in writing with the other party to the Contract and with the selected arbitrator or arbitration provider (if one has been selected), and a copy will be sent to Engineer for information. The demand for arbitration will be made within the specific time required in this Article, or if no specified time is applicable within a reasonable time after the matter in question has arisen, and in no event shall any such demand be made after the date when institution of legal or equitable proceedings based on such matter in question would be barred by the applicable statute of limitations. The demand for arbitration should include specific reference to Paragraph SC-17.02.D below.~~

~~C. No arbitration arising out of or relating to the Contract shall include by consolidation, joinder, or in any other manner any other individual or entity (including Engineer, and Engineer’s consultants and the officers, directors, partners, agents, employees or consultants of any of them) who is not a party to this Contract unless:~~

- ~~1. the inclusion of such other individual or entity is necessary if complete relief is to be afforded among those who are already parties to the arbitration; and~~
- ~~2. such other individual or entity is substantially involved in a question of law or fact which is common to those who are already parties to the arbitration and which will arise in such proceedings.~~

~~D. The award rendered by the arbitrator(s) shall be consistent with the agreement of the parties, in writing, and include a concise breakdown of the award, and a written explanation of the award specifically citing the Contract provisions deemed applicable and relied on in making the award.~~

~~E. The award will be final. Judgment may be entered upon it in any court having~~

~~jurisdiction thereof, and it will not be subject to modification or appeal, subject to provisions of the Laws and Regulations relating to vacating or modifying an arbitral award.~~

~~F. The fees and expenses of the arbitrators and any arbitration service shall be shared equally by Owner and Contractor.~~

SC-17.03 Attorneys' Fees

- A. In most jurisdictions in the United States, as a general matter each party to a dispute is responsible for its own attorneys' fees, unless an express agreement provides to the contrary. Some legal authorities believe that this general rule encourages claims and disputes, because claimants have little concern that they will be forced to pay for the opposing party's fees if the claim fails. Other authorities take the opposite view – that the enticing prospect of not only prevailing but also of having one's own fees paid by the opponent would encourage overly aggressive pursuit of claims (or overzealous defense against valid claims).

If an exception to the general American rule is preferred for disputes subject to final resolution under Article 17, then add the following express statement:

SC-17.02 Add the following new paragraph immediately after Paragraph 17.01.

SC-17.03 Attorneys' Fees: For any matter subject to final resolution under this Article, the prevailing party shall be entitled to an award of its attorneys' fees incurred in the final resolution proceedings, in an equitable amount to be determined in the discretion of the court, arbitrator, arbitration panel, or other arbiter of the matter subject to final resolution, taking into account the parties' initial demand or defense positions in comparison with the final results.

SC-18.09 Add the following new paragraph after Paragraph 18.08:

Tribal Sovereignty. No provision of this Agreement will be construed by any of the signatories as abridging or debilitating any sovereign powers of the {insert name of Tribe} Tribe; affecting the trust-beneficiary relationship between the Secretary of the Interior, Tribe, and Indian landowner(s); or interfering with the government-to-government relationship between the United States and the Tribe.

Add the following new section of Supplemental Conditions:

ARTICLE 19 – FEDERAL REQUIREMENTS

SC-19.01 Agency Not a Party

SC 19.01 Add the following language:

- A. **This Contract is expected to be funded in whole or part with funds provided by Agency. Neither Agency, nor any of its departments, entities, or employees is a party to this Contract.**

SC-19.02 ***Contract Approval***

SC 19.02 **Add the following language:**

- A. **Owner and Contractor will furnish Owner’s attorney such evidence as required so that Owner’s attorney can complete and execute the following “Certificate of Owner’s Attorney” (Attachment GC-A) before Owner submits the executed Contract Documents to Agency for approval.**
- B. **Concurrence by Agency in the award of the Contract is required before the Contract is effective.**

SC-19.03 ***Conflict of Interest***

SC 19.03 **Add the following language:**

- 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 a financial interest in Contractor. Owner’s officers, employees, or agents shall neither solicit nor accept gratuities, favors or anything of monetary value from Contractor or subcontractors.**

SC-19.04 ***Gratuities***

SC 19.04 **Add the following language:**

- A. **If Owner finds after a notice and hearing that Contractor, or any of Contractor’s agents or representatives, offered or gave gratuities (in the form of entertainment, gifts, or otherwise) to any official, employee, or agent of Owner or Agency 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 Owner bases such findings shall be an issue and may be reviewed in proceedings under the 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 Owner) which shall not be less than three nor more than ten times the costs Contractor incurs in providing any such gratuities to any such officer or employee.**

SC-19.05 ***Audit and Access to Records***

SC 19.05 Add the following language:

- A. Owner, Agency, the Comptroller General of the United States, or any of their duly authorized representatives, shall have access to any books, documents, papers, and records of the Contractor which are pertinent to the Agreement, for the purpose of making audits, examinations, excerpts, and transcriptions. Engineer shall maintain all required records for three years after final payment is made and all other pending matters are closed.

SC-19.06 *Small, Minority and Women's Businesses*

SC 19.06 Add the following language:

- ~~A. If Contractor intends to let any subcontracts for a portion of the work, Contractor shall take affirmative steps to assure that small, minority and women's businesses are used when possible as sources of supplies, equipment, construction, and services. Affirmative steps shall consist of: (1) including qualified small, minority and women's businesses on solicitation lists; (2) assuring that small, minority and women's businesses are solicited whenever they are potential sources; (3) dividing total requirements when economically feasible, into small tasks or quantities to permit maximum participation of small, minority, and women's businesses; (4) establishing delivery schedules, where the requirements of the work permit, which will encourage participation by small, minority and women's businesses; (5) using the services and assistance of the Small Business Administration and the Minority Business Development Agency of the U.S. Department of Commerce; (6) requiring each party to a subcontract to take the affirmative steps of this section; and (7) Contractor is encouraged to procure goods and services from labor surplus area firms.~~

- A. Contracting with small and minority businesses, women's business enterprises, and labor surplus area firms. If Contractor intends to let any subcontracts for a portion of the work, Contractor must take all necessary affirmative steps to assure that minority businesses, women's business enterprises, and labor surplus area firms are used when possible. Affirmative steps must include:

- (1) Placing qualified small and minority businesses and women's business enterprises on solicitation lists;
- (2) Assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources;
- (3) Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses, and women's business enterprises;
- (4) Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority businesses, and women's business enterprises;
- (5) Using the services and assistance, as appropriate, of such organizations

as the Small Business Administration and the Minority Business Development Agency of the Department of Commerce.

SC-19.07 **Anti-Kickback**

SC 19.07 Add the following language:

- ~~A. Contractor shall comply with the Copeland Anti-Kickback Act (18 USC 874 and 40 USC 276c) as supplemented by Department of Labor regulations (29 CFR Part 3, "Contractors and Subcontractors on Public Buildings or Public Works Financed in Whole or in Part by Loans or Grants of the United States"). The Act provides that Contractor or subcontractor shall be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public facilities, to give up any part of the compensation to which they are otherwise entitled. Owner shall report all suspected or reported violations to Agency.~~
- A. Contractor shall comply with the Copeland Anti-Kickback Act (40 U.S.C 3145) as supplemented by Department of Labor regulations (29 CFR Part 3, "Contractors and Subcontractors on Public Buildings or Public Work Financed in Whole or in Part by Loans or Grants from the United States"). The Act provides that Contractor or subcontractor must be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he or she is otherwise entitled. Owner shall report all suspected or reported violations to Agency.**

SC 19.08 **Clean Air Act (42 U.S.C. 7401-7671q.) and the Federal Water Pollution Control Act (33 U.S.C. 1251-1387), as amended:**

- ~~A. Contractor to agree to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251-1387). Violations must be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA). If this Contract exceeds \$100,000, compliance with all applicable standards, orders, or requirements issued under section 306 of the Clean Air Act (42 U.S.C. 1857(h) and 42 USC 7401 et. seq.), section 508 of the Clean Water Act (33 U.S.C. 1368) and Federal Water Pollution Control Act (33 USC 1251 et seq.), Executive Order 11738, and Environmental Protection Agency regulations is required. Contractor will report violations to the Agency and the Regional Office of the EPA.~~

SC 19.09 **Equal Employment Opportunity:**

- A. The Contract is considered a federally assisted construction contract. Except as otherwise provided under 41 CFR Part 60, all contracts that meet the definition of**

“federally assisted construction contract” in 41 CFR Part 60-1.3 must include the equal opportunity clause provided under 41 CFR 60-1.4(b), in accordance with Executive Order 11246, “Equal Employment Opportunity” (30 FR 12319, 12935, 3 CFR Part, 1964-1965 Comp., p. 339), as amended by Executive Order 11375, “Amending Executive Order 11246 Relating to Equal Employment Opportunity,” and implementing regulations at 41 CFR part 60, “Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor.”

SC 19.10 Byrd Anti-Lobbying Amendment (31 U.S.C. 1352):

- A. Contractors that apply or bid for an award exceeding \$100,000 must file the required certification (RD Instruction 1940-Q, Exhibit A-1). The Contractor certifies to the Owner and every subcontractor certifies to the Contractor that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining the Contract if it is covered by 31 U.S.C. 1352. The Contractor and every subcontractor must also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the Owner. Necessary certification and disclosure forms shall be provided by Owner.

SC-19.11 *State Energy Policy*

SC 19.11 Add the following:

- A. Contractor shall comply with the Energy Policy and Conservation Act (P.L. 94-163). Mandatory standards and policies relating to energy efficiency, contained in any applicable State Energy Conservation Plan, shall be utilized.

SC 19.12 Environmental Requirements

When constructing a Project involving trenching and/or other related earth excavations, Contractor shall comply with the following environmental conditions:

- A. Wetlands – When disposing of excess, spoil, or other construction materials on public or private property, Contractor shall not fill in or otherwise convert wetlands.
- B. Floodplains – When disposing of excess, spoil, or other construction materials on public or private property, Contractor shall not fill in or otherwise convert 500-year floodplain areas (Standard Flood Hazard Area) delineated on the latest Federal Emergency Management Agency Floodplain Maps, or other appropriate maps, e.g., alluvial soils on NRCS Soil Survey Maps.
- C. Historic Preservation – Any excavation by Contractor that uncovers an historical or archaeological artifact or human remains shall be immediately reported to Owner and a representative of Agency. Construction shall be temporarily halted pending the notification process and further directions issued by Agency after consultation with the State Historic Preservation Officer (SHPO).

- D. **Endangered Species** – Contractor shall comply with the Endangered Species Act, which provides for the protection of endangered and/or threatened species and critical habitat. Should any evidence of the presence of endangered and/or threatened species or their critical habitat be brought to the attention of Contractor, Contractor will immediately report this evidence to Owner and a representative of Agency. Construction shall be temporarily halted pending the notification process and further directions issued by Agency after consultation with the U.S. Fish and Wildlife Service.
- E. **Mitigation Measures** – The following environmental mitigation measures are required on this Project: ~~{Insert mitigation measures here}~~.

SC-19.13 *Equal Opportunity Requirements*

SC 19.13 Add the following:

- A. If this Contract exceeds \$10,000, Contractor shall comply with Executive Order 11246, “Equal Employment Opportunity,” as amended by Executive Order 11375, “Amending Executive Order 11246 Relating to Equal Employment Opportunity,” and as supplemented by regulations at 41 CFR part 60, “Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor.”
- B. Contractor’s compliance with Executive Order 11246 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative active obligations required by the Standard Federal Equal Employment Opportunity Construction Contract Specifications, as set forth in 41 CFR Part 60-4 and its efforts to meet the goals established for the geographical area where the Contract is to be performed. The hours of minority and female employment and training must be substantially uniform throughout the length of the Contract, and in each trade, and Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting Contractor’s goals shall be a violation of the Contract, the Executive Order, and the regulations in 41 CFR part 60-4. Compliance with the goals will be measured against the total work hours performed.
- C. Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the Contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number; estimated dollar amount of subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the Contract is to be performed.

SC-19.14 *Contract Work Hours and Safety Standards Act (40 U.S.C. 3701-3708)*

SC 19.14 Add the following:

- A. Where applicable, for contracts awarded by the Owner in excess of \$100,000 that involve the employment of mechanics or laborers, the Contractor must comply with 40 U.S.C. 3702 and 3704, as supplemented by Department of Labor regulations (29

CFR Part 5). Under 40 U.S.C. 3702 of the Act, the Contractor must compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.C. 3704 are applicable to construction work and provide that no laborer or mechanic must be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

SC-19.15 ***Restrictions on Lobbying***

SC 19.15 **Add the following:**

- A.** Contractor and each subcontractor shall comply with Restrictions on Lobbying (Public Law 101-121, Section 319) as supplemented by applicable Agency regulations. This Law applies to the recipients of contracts and subcontracts that exceed \$100,000 at any tier under a Federal loan that exceeds \$150,000 or a Federal grant that exceeds \$100,000. If applicable, Contractor must complete a certification form on lobbying activities related to a specific Federal loan or grant that is a funding source for this Contract. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 U.S.C. 1352. Each tier shall disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Certifications and disclosures are forwarded from tier to tier up to the Owner. Necessary certification and disclosure forms shall be provided by Owner.

SC-19.16 ***Environmental Requirements***

SC 19.16 **Add the following:**

When constructing a Project involving trenching and/or other related earth excavations, Contractor shall comply with the following environmental conditions:

- A.** Wetlands – When disposing of excess, spoil, or other construction materials on public or private property, Contractor shall not fill in or otherwise convert wetlands.
- B.** Floodplains – When disposing of excess, spoil, or other construction materials on public or private property, Contractor shall not fill in or otherwise convert 500-year floodplain areas (Standard Flood Hazard Area) delineated on the latest Federal Emergency Management Agency Floodplain Maps, or other appropriate maps, e.g., alluvial soils on NRCS Soil Survey Maps.
- C.** Historic Preservation – Any excavation by Contractor that uncovers an historical or archaeological artifact or human remains shall be immediately reported to Owner and a representative of Agency. Construction shall be temporarily halted pending the notification process and further directions issued by Agency after consultation

with the State Historic Preservation Officer (SHPO).

- D. **Endangered Species** – Contractor shall comply with the Endangered Species Act, which provides for the protection of endangered and/or threatened species and critical habitat. Should any evidence of the presence of endangered and/or threatened species or their critical habitat be brought to the attention of Contractor, Contractor will immediately report this evidence to Owner and a representative of Agency. Construction shall be temporarily halted pending the notification process and further directions issued by Agency after consultation with the U.S. Fish and Wildlife Service.

SC 19.17

Debarment and Suspension (Executive Orders 12549 and 12689)

- A. A contract award (see 2 CFR 180.220) must not be made to parties listed on the governmentwide exclusions in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 CFR 180 that implement Executive Orders 12549 (3 CFR part 1986 Comp., p. 189) and 12689 (3 CFR part 1989 Comp., p. 235), “Debarment and Suspension.” SAM Exclusions contains the names of parties debarred, suspended, or otherwise excluded by agencies, as well as parties declared ineligible under statutory or regulatory authority other than Executive Order 12549.

SC 19.18

Procurement of recovered materials

- A. The Contractor must comply with 2 CFR Part 200.322, “Procurement of recovered materials.”

SC-19.19 Federal Wage & Fringe Rate Requirements

- A. Contractor and all Subcontractors shall comply with the Davis Bacon Act Federal Wage & Fringe Rate Requirements including:
 - 1. U.S. Department of Labor Memorandum No. 143 (Dec. 23, 1985)
 - 2. US EPA Memorandum dated November 16, 2012 Class Deviation – Prevailing Wage Interview Interval Requirement
 - 3. Weekly Certified Payroll reporting form (WH 347) with its compliance certification for Contractors and their Subcontractors.
 - 4. Davis Bacon Act Federal Wage & Fringe Rate Requirements
 - 5. EEOC-P/E-1 (Revised 11/09) – Equal Employment Opportunity Poster
 - 6. WH-1321 Employee Rights Under the Davis-Bacon Act Posted.
 - 7. Department of Labor All Agency Memorandums #130 & 131 on the application of the Standard of Comparison “Projects of a Character Similar” under the Davis-Bacon and Related Acts.
 - 8. General Wage Determination(s) Applicable to this Contract
- B. During the course of the Work, for each and every week Work while the contract is in progress, the Contractor and their Subcontractors shall submit weekly Payroll reports to the Owner and for a period not less than 3 years from the Final Completion of Work, the Contractor and Subcontractors shall maintain and allow for inspection of all payroll and basic records related to this Contract.
- C. Refer to Appendix A for additional guidance on compliance with Federal Wage &

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Fringe Rate Requirements.

SC-19.20 Disadvantaged Business Enterprise (DBE) Requirements & Reporting

Contractor shall comply with DBE Requirements and 40 CFR Part 33 Subpart C – Good Faith Efforts §33.301, DBE Annual and Final Report EPA Form 5700-52A. Refer to Appendix B for additional guidance on compliance with DBE Requirements and Reporting.

SC-19.21 Federal Acquisition Regulations System

Contractor shall comply with all elements of Title 48, Part 15 Federal Acquisition Regulations System, US Environmental Protection Agency.

SC-19.22 Energy Policy and Conservation Act

Contractor shall comply with the Energy Policy and Conservation Act (P.L. 94-163) as implemented in relevant CFR sections.

SC-19.23 American Iron & Steel

Contractor shall comply with requirements for use of “American Iron and Steel” as governed by:

- A. Consolidated Appropriations Act of 2014 (P.L. 113-76)
- B. Water Resources Reform and Development Act
- C. Consolidated and Further Continuing Appropriations Act 2015 (P.L. 113-235)
- D. Consolidated Appropriations Act 2016 (P.L. 114-113)

SC-19.24 Audit Requirements for Federal Awards

Contractor shall comply with 2 CFR Subpart B, Chapter XV, Part 1500, Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards.

SC-19.25 Hazardous Materials

If at any time during construction the presence of unanticipated hazardous materials at or proximate to a construction site is detected, the Contractor shall cease work in the affected area and perform the following immediately:

- A. Notify the Owner verbally and in writing. The Owner is responsible for notification of the Waste Management Division of the Vermont Agency of Natural Resources.
- B. Take all action necessary and appropriate for the protection and safety of the public and persons at or about the site, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying Owners and users of adjacent sites and utilities.
- C. Actions at the construction site following completion of these steps shall be at the

direction of the Waste Management Division. Nothing in these requirements shall be construed to require the Engineer and/or the Contractor to perform work for which adequate compensation has not been contracted for other than to ensure that basic measures necessary to protect the health and welfare of workers, residents and abutters are immediately adopted.

- D. At construction sites where the presence of contaminated or hazardous materials are suspected to exist and provisions have been made in the Contract Documents for their management, the requirements in the Contract Documents will determine the appropriate actions of the Contractor. In any event, discovery of contaminated soils requires the immediate notification of the Owner. If sites other than the suspected areas previously delineated in the Contract Documents are discovered, items A, B and C above shall apply.

SC-19.26 *Historic Preservation*

- A. If at any time during construction, the presence of possible human remains are discovered at or proximate to a construction site, the Contractor shall cease work in the affected area and immediately contact the local medical examiner or law enforcement official in addition to notifying the Owner or Owner's representative, verbally and in writing. The Contractor shall take all action necessary and appropriate for the protection and safety of the public and the site. The Owner is responsible for promptly notifying the Agency representative.
- B. If at any time during construction, the presence of unanticipated historic and archeological resources are detected at or proximate to a construction site, the Contractor shall cease work in the affected area, take all action necessary and appropriate for the protection and safety of the public and the site, and immediately perform the following:
 - 1. Notify the Owner verbally and in writing. The Owner is responsible for promptly notifying the Agency representative.
 - 2. Notify the Vermont Division of Historic Preservation at: (802) 828-3222.
- C. Actions at the construction site following completion of these steps shall be at the direction of the local medical examiner, law enforcement agent or Historic Preservation Division as appropriate. Nothing in this Article shall be construed to require the Engineer and/or the Contractor to perform work for which adequate compensation has not been contracted for other than to ensure that basic measures necessary to protect the safety and welfare of the workers and the site.

SC-19.27 *Unauthorized Bypassing of Sewerage Facilities*

- A. The Contractor is not authorized to initiate any bypassing of sewerage facilities whether or not under construction or rehabilitation. Any Owner authorized bypass within the system is specified in detail in these Contract Documents. If a bypass not specified in these Contract Documents occurs under an unavoidable emergency situation, the Contractor is required to immediately notify the Owner, verbally and in writing, giving the details of the occurrence. The Owner is required by State Law to immediately notify the Watershed Management Division of the Vermont Department of Environmental Conservation.

- B. If the Owner, upon receipt of a written request from the Contractor, is asked to consider bypassing of the system or components of treatment and such bypass will result in discharges with treatment levels less than those allowed in the NPDES Permit, the Contractor acknowledges that the Owner is required to file a request for State of Vermont review and approval prior to any such bypass. If approved, DEC will issue an Emergency Pollution Permit, which must be in-place prior to any bypass.

SC-19.28 *Governing Federal Regulations*

- 19.21 The Bidder and Contractor are responsible for knowledge of, and compliance with all requirements, provisions, policies and permits contained in the Contract Documents. Any conflicts between these Contract Documents and the most current version of the Code of Federal Regulations housed online at eCFR shall be governed by the most current version of the ruling.

SC-19.29 *Permits*

- 19.22 Contractor shall comply with all Federal, State and Local permits that apply to the performance of Work under this Contract.

SC-19.29 *Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment*

This term and condition implements 2 CFR 200.216 and is effective for obligations and expenditures of EPA financial assistance funding on or after 8/13/2020. As required by 2 CFR 200.216, EPA recipients and subrecipients, including borrowers under EPA funded revolving loan fund programs, are prohibited from obligating or expending loan or grant funds to procure or obtain; extend or renew a contract to procure or obtain; or enter into a contract (or extend or renew a contract) to procure or obtain equipment, services, or systems that use covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. As described in Public Law 115-232, section 889, covered telecommunications equipment is telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).

Recipients, subrecipients, and borrowers also may not use EPA funds to purchase:

- a. For the purpose of public safety, security of government facilities, physical security surveillance of critical Page 4 of 29 infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).
- b. Telecommunications or video surveillance services provided by such entities or using such equipment.
- c. Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

Consistent with 2 CFR 200.471, costs incurred for telecommunications and video surveillance services or equipment such as phones, internet, video surveillance, and cloud servers are allowable except for the following circumstances:

a. Obligating or expending EPA funds for covered telecommunications and video surveillance services or equipment or services as described in 2 CFR 200.216 to:

- (1) Procure or obtain, extend or renew a contract to procure or obtain;
- (2) Enter into a contract (or extend or renew a contract) to procure; or
- (3) Obtain the equipment, services, or systems. Certain prohibited equipment, systems, or services, including equipment, systems, or services produced or provided by entities identified in section 889, are recorded in the System for Award Management exclusion list.

SC-19.30 Job Site Postings

A project sign shall be provided conforming to the attached checklist title SRF Project Signage Checklist. The following attachments shall be posted at the job site:

- a. State of Vermont Minimum Wage Notice
- b. Equal Employment Opportunity Poster
- c. US DOL Davis-Bacon Wage Rate Poster

ENGINEER'S DEVELOPMENT OF SUPPLEMENTARY CONDITIONS

The Engineer will develop Supplementary Conditions using the guidance from the Guide to the Preparation of Supplementary Conditions (EJCDC C-800 (Rev 1), 2013), instructions provided in this Bulletin, and by adding other project-specific supplementary conditions as required for the project.

The Supplementary Conditions document that is developed for a specific Project is the contractual means by which the Standard General Conditions (EJCDC C-700 (Rev 1), 2013) are modified and supplemented for the Project. The references in the Supplementary Conditions items below (and in EJCDC C-800 (Rev 1) (2013) as published) to adding, amending, or supplementing are referring to the paragraphs of C-700 (Rev 1) (2013). Thus the first item below, SC-1.01.A.8, is a contractual provision that adds the stated language ("The Change Order form to be used etc.") to Paragraph 1.01.A.8 of C-700 (Rev 1) (2013).

As in C-800 (Rev 1) (2013) itself, the actual Supplementary Conditions (contract terms) are shown in bold as modified below. Also included below are a few Guidance Notes to assist in development of the Project-specific Supplementary Conditions document. The Guidance Notes are not in bold.

The Supplementary Conditions items that follow are mandatory for each specific Project, unless noted otherwise. In most cases they are new (supplemental) SC items; in a few cases, they replace or expand on a Supplementary Condition item that is in EJCDC C-800 (Rev 1) (2013), as published.

In addition to including the items that follow in the Supplementary Conditions document for the specific Project, the Engineer (in cooperation with the Owner) also should follow the guidance of EJCDC C-800 (Rev 1) (2013), as published, to develop other SC items for inclusion in the Project-specific Supplementary Conditions document; as the published guidance indicates, some of the published SC items are mandatory, or require additional Project-specific input, such as insurance coverage limits. Other SC items in C-800 (Rev 1) (2013) as published are optional but in many cases will be useful for the specific Project.

Include the following RUS-mandated Supplementary Conditions (or follow the Guidance Notes provided) in the Supplementary Conditions document for the specific Project:

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

The Change Order form to be used on this Project is EJCDC C-941. Agency approval is required before Change Orders are effective.

- 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.48:

Abnormal Weather Conditions – Conditions of extreme or unusual weather for a given region, elevation, or season as determined by Engineer. Extreme or unusual weather that is typical for a given region, elevation, or season should not be considered Abnormal Weather Conditions.

- SC 1.01.A.50 Add the following new Paragraph after Paragraph 1.01.A.49:

Agency - The Project is financed in whole or in part by USDA Rural Utilities Service pursuant to the Consolidated Farm and Rural Development Act (7 USC Section 1921 et seq.). The Rural Utilities Service programs are administered through the USDA Rural Development offices; therefore, the Agency for these documents is USDA Rural Development.

- 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 2.06.B (Non-mandatory). Guidance Note: If the parties do not intend to develop electronic or digital transmittal protocols, then Paragraph 2.06B of the General Conditions may be deleted. Use the following Supplementary Condition in such case:
- SC- 2.06.B Delete Paragraph 2.06.B and replace it with the term **[Deleted]**.

Guidance Note, continued: If the use of electronic data, electronic media, or electronic project monitoring is planned for this Project, then the parties may develop a protocol with the assistance of the Engineer or Consensus DOCS form 200.2 may be added to the Construction Contract as an Exhibit. If Consensus DOCS form 200.2 will be used, then include the following Supplementary Condition:

SC-2.06.B Add the following language to the end of 2.06.B:

Special requirements for electronic data apply to this Project. See attached Exhibit entitled “Electronic Communications Protocol Addendum,” Consensus DOCS form 200.2.

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

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.

- 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;

- SC 5.03 Guidance Note: Amend Paragraph 5.03 using one of the suggested Paragraphs SC 5.03 in EJCDC C-800 (Rev 1) (2013), concerning reports and drawings of conditions at the Site, and any Technical Data in the reports and drawings on whose accuracy the Contractor may rely.
- SC 5.06 Guidance Note: Amend Paragraph 5.06 using one of the suggested Paragraphs SC 5.06 from EJCDC C-800 (Rev 1) (2013), concerning reports and drawings regarding Hazardous Environmental

Conditions at the Site, and any Technical Data in those reports and drawings on whose accuracy the Contractor may rely.

- SC 6.03 Guidance Note: Amend Paragraph 6.03 identifying specific insurance coverage requirements using guidance from EJCDC C-800 (Rev 1) (2013).
- 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 '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 7.04.A.1.a.4 in its entirety and insert the following in its place:

[Deleted]
- 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 fifty percent of the Contract Price to Subcontractor(s), without prior 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 Contractor to retain specific replacements; provided, however, that**”.
- SC 10.03 Guidance Note: Amend Paragraph 10.03 using one of the two alternatives presented in C-800's (Rev 1) (2013) section on SC 10.03 (either the Engineer will provide Resident Project Representative services on the Project, with specific authority and responsibilities, or Engineer will not provide Resident Project Representative services).
- SC 11.07.C Add the following new Paragraph after Paragraph 11.07.B:

All Contract Change Orders must be concurred in by Agency before they are effective.
- SC 13.02.C Delete Paragraph 13.02.C in its entirety and insert the following in its place:

[Deleted]
- SC 15.01.B Amend the second sentence of Paragraph 15.01.B.1 by striking out the following text: “**a bill of sale, invoice, or other.**”
- SC 15.01.B.3 Add the following language at the end of paragraph 15.01.B.3:

No payments will 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 new Paragraph after Paragraph 15.01.B.3:

The Application for Payment form to be used on this Project is EJCDC C-620. The Agency must approve all Applications for Payment before payment is made.

- SC 15.01.D.1 Delete Paragraph 15.01.D.1 in its entirety and insert the following in its place:

The Application for Payment with Engineer's recommendations will be presented to the Owner and Agency for consideration. If both the Owner and Agency find the Application for Payment acceptable, the recommended amount less any reduction under the provisions of Paragraph 15.01.E will become due twenty (20) days after the Application for Payment is presented to the Owner, and the Owner will make payment to the Contractor.

- 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 Owner" and insert "no later than the time of payment by Owner."
- SC 18.09 Add the following new paragraph after Paragraph 18.08:

Tribal Sovereignty. No provision of this Agreement will be construed by any of the signatories as abridging or debilitating any sovereign powers of the {insert name of Tribe} Tribe; affecting the trust-beneficiary relationship between the Secretary of the Interior, Tribe, and Indian landowner(s); or interfering with the government-to-government relationship between the United States and the Tribe.

- SC 19 Add Article 19 titled "**FEDERAL REQUIREMENTS**"
- SC 19.01 Add the following language as Paragraph 19.01 with the title "Agency Not a Party":
 - A. This Contract is expected to be funded in part with funds provided by Agency. Neither Agency, nor any of its departments, entities, or employees is a party to this Contract.**
- SC 19.02 Add the following sections after Article 19.01 with the title "**Contract Approval**":
 - A. Owner and Contractor will furnish Owner's attorney such evidence as required so that Owner's attorney can complete and execute the following "Certificate of Owner's Attorney" (Exhibit I of RUS Bulletin 1780-26) before Owner submits the executed Contract Documents to Agency for approval.**
 - B. Concurrence by Agency in the award of the Contract is required before the Contract is effective.**
- 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 a financial interest or other interest in or a tangible personal benefit from the Contractor. Owner's officers, employees, or agents shall neither solicit nor 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 Owner finds after a notice and hearing that Contractor, or any of Contractor's agents or representatives, offered or gave gratuities (in the form of entertainment, gifts, or otherwise) to any official, employee, or agent of Owner or Agency 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 Owner bases such findings shall be an issue and may be reviewed in proceedings under the 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 Owner) which shall not be less than three nor more than ten times the costs Contractor incurs in providing any such gratuities to any such officer or employee.**

- SC 19.05 Add the following language after Article 19.04.B with the title **“Small, Minority and Women's Businesses”**:
 - A. **Contracting with small and minority businesses, women's business enterprises, and labor surplus area firms. If Contractor intends to let any subcontracts for a portion of the work, Contractor must take all necessary affirmative steps to assure that minority businesses, women's business enterprises, and labor surplus area firms are used when possible. Affirmative steps must include:**
 - (1) **Placing qualified small and minority businesses and women's business enterprises on solicitation lists;**
 - (2) **Assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources;**
 - (3) **Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses, and women's business enterprises;**

- (4) Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority businesses, and women's business enterprises;**
- (5) Using the services and assistance, as appropriate, of such organizations as the Small Business Administration and the Minority Business Development Agency of the Department of Commerce; and**

- SC 19.06 Add the following after Article 19.05.A.(5) with the title **“Anti-Kickback”**:
 - A. Contractor shall comply with the Copeland Anti-Kickback Act (40 U.S.C 3145) as supplemented by Department of Labor regulations (29 CFR Part 3, “Contractors and Subcontractors on Public Buildings or Public Work Financed in Whole or in Part by Loans or Grants from the United States”). The Act provides that Contractor or subcontractor must be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he or she is otherwise entitled. Owner shall report all suspected or reported violations to Agency.**

- SC 19.07 Add the following after Article 19.06.A with the title **“Clean Air Act (42 U.S.C. 7401-7671q.) and the Federal Water Pollution Control Act (33 U.S.C. 1251-1387), as amended”**:
 - A. Contractor to agree to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251-1387). Violations must be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).**

- SC 19.08 Add the following after Article 19.07.A with the title **“Equal Employment Opportunity”**:
 - A. The Contract is considered a federally assisted construction contract. Except as otherwise provided under 41 CFR Part 60, all contracts that meet the definition of “federally assisted construction contract” in 41 CFR Part 60-1.3 must include the equal opportunity clause provided under 41 CFR 60-1.4(b), in accordance with Executive Order 11246, “Equal Employment Opportunity” (30 FR 12319, 12935, 3 CFR Part, 1964-1965 Comp., p. 339), as amended by Executive Order 11375, “Amending Executive Order 11246 Relating to Equal Employment Opportunity,” and implementing regulations at 41 CFR part 60, “Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor.”**

- SC 19.09 Add the following after Article 19.08.A with the title **“Byrd Anti-Lobbying Amendment (31 U.S.C. 1352)”**:
 - A. Contractors that apply or bid for an award exceeding \$100,000 must file the required certification (RD Instruction 1940-Q, Exhibit A-1). The Contractor certifies to the Owner and every subcontractor certifies to the Contractor that it will not and has not used Federal appropriated funds to pay any person or organization**

for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining the Contract if it is covered by 31 U.S.C. 1352. The Contractor and every subcontractor must also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the Owner. Necessary certification and disclosure forms shall be provided by Owner.

- SC 19.10 Add the following after Article 19.09.A with the title “**Environmental Requirements**”:

When constructing a Project involving trenching and/or other related earth excavations, Contractor shall comply with the following environmental conditions:

- A. **Wetlands – When disposing of excess, spoil, or other construction materials on public or private property, Contractor shall not fill in or otherwise convert wetlands.**
 - B. **Floodplains – When disposing of excess, spoil, or other construction materials on public or private property, Contractor shall not fill in or otherwise convert 100-year floodplain areas (Standard Flood Hazard Area) delineated on the latest Federal Emergency Management Agency Floodplain Maps, or other appropriate maps, e.g., alluvial soils on NRCS Soil Survey Maps.**
 - C. **Historic Preservation – Any excavation by Contractor that uncovers an historical or archaeological artifact or human remains shall be immediately reported to Owner and a representative of Agency. Construction shall be temporarily halted pending the notification process and further directions issued by Agency after consultation with the State Historic Preservation Officer (SHPO).**
 - D. **Endangered Species – Contractor shall comply with the Endangered Species Act, which provides for the protection of endangered and/or threatened species and critical habitat. Should any evidence of the presence of endangered and/or threatened species or their critical habitat be brought to the attention of Contractor, Contractor will immediately report this evidence to Owner and a representative of Agency. Construction shall be temporarily halted pending the notification process and further directions issued by Agency after consultation with the U.S. Fish and Wildlife Service.**
 - E. **Mitigation Measures – The following environmental mitigation measures are required on this Project: {Insert mitigation measures here}.**
- SC 19.11 Add the following after Article 19.10.E. with the title “**Contract Work Hours and Safety Standards Act (40 U.S.C. 3701-3708)**”:
- A. **Where applicable, for contracts awarded by the Owner in excess of \$100,000 that involve the employment of mechanics or laborers, the Contractor must comply with 40 U.S.C. 3702 and 3704, as supplemented by Department of Labor regulations (29 CFR Part 5). Under 40 U.S.C. 3702 of the Act, the Contractor must compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the**

worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.C. 3704 are applicable to construction work and provide that no laborer or mechanic must be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

- SC 19.12 Add the following after Article 19.11.A. with the title **“Debarment and Suspension (Executive Orders 12549 and 12689)”**:
 - A. A contract award (see 2 CFR 180.220) must not be made to parties listed on the governmentwide exclusions in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 CFR 180 that implement Executive Orders 12549 (3 CFR part 1986 Comp., p. 189) and 12689 (3 CFR part 1989 Comp., p. 235), **“Debarment and Suspension.”** SAM Exclusions contains the names of parties debarred, suspended, or otherwise excluded by agencies, as well as parties declared ineligible under statutory or regulatory authority other than Executive Order 12549.

 - SC 19.13 Add the following after Article 19.12.A. with the title **“Procurement of recovered materials”**:
 - A. The Contractor must comply with 2 CFR Part 200.322, **“Procurement of recovered materials.”**
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ENGINEER'S DEVELOPMENT OF SUPPLEMENTARY CONDITIONS

Notes to User: This exhibit contains a list of changes to be made by Engineer to the Supplementary Conditions of the Construction Contract (EJCDC C-800, 2018). The Engineer may also add other project-specific supplementary conditions as required for the Project.

The Supplementary Conditions (SC) document that is developed for a Project is the contractual means by which the Standard General Conditions of the Construction Contract (EJCDC C-700, 2018) are modified and supplemented for the Project. The references in the Supplementary Conditions items below (and in EJCDC C-800 as published) to adding, deleting, amending, or supplementing are referring to the paragraphs of C-700. Thus, the first item below, SC-1.01.A.8, is a contractual provision that adds the stated language ("The Change Order form to be used etc.") to Article 1.01.A.8 of C-700.

The Supplementary Conditions items that follow are mandatory for each specific Project, unless noted otherwise. In most cases they are new (supplemental) SC items; in a few cases, they replace or expand on a Supplementary Condition item that is in EJCDC C-800, as published. Guidance notes should not be included in the Bidding Documents.

The Engineer (in cooperation with the Owner) should follow the guidance of EJCDC C-800, as published, to develop Project-specific supplementary conditions; as the published guidance indicates, some of the published SC items are mandatory or require additional Project-specific input, such as insurance coverage limits. Other SC items in C-800 as published are optional but in many cases will be useful for the specific Project.

┆ ARTICLE 1 – Delete the sentence “No suggested Supplementary Conditions in this Article.”

┆ SC-1.01.A.8 – Add the following at the end of the Paragraph:

The Change Order form to be used on this Project is EJCDC C-941 (2018). Agency approval is required before Change Orders are effective.

┆ SC-1.01.A.30 – Add the following at the end of the Paragraph:

For the purposes of Rural Development, this term is synonymous with the term “applicant” as defined in 7 CFR 1780.7 (a) (1), (2) and (3) and is an entity receiving financial assistance from the federal programs.

┆ SC-1.01.A.50 – Add the following at the end of the Paragraph:

The Work Change Directive form to be used on this Project is EJCDC C-940 (2018). Agency approval is required before a Work Change Directive is issued.

┆ SC-1.01.A.51 – Add the following new paragraph immediately after Paragraph 1.01.A.50:

51. Agency - The Project is financed in whole or in part by USDA Rural Utilities Service pursuant to the Consolidated Farm and Rural Development Act (7 USC Section 1921 et seq.). The Rural Utilities Service programs are administered through the USDA Rural Development offices; therefore, the

Agency for these documents is USDA Rural Development.

- SC-1.01.A.52 – Add the following new paragraph with the title “American Iron and Steel Definitions” immediately after Paragraph 1.01.A.51:

52.a *American Iron and Steel (AIS)* - Requirements mandated by Section 746 of Title VII of the Consolidated Appropriations Act of 2017 (Division A - Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statutes mandating domestic preference for “iron and steel products,” meaning the following products, if made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and Construction Materials. AIS requirements apply in each of the several states, the District of Columbia, and each federally recognized Tribe, but not the U.S. Territories.

52.b *Coating* - A covering that is applied to the surface of an object. If a Coating is applied to the external surface of a domestic iron or Steel component, and the application takes place outside of the United States, said product would be considered a compliant product under the AIS requirements. Any Coating processes that are applied to the external surface of Iron and Steel components that would otherwise be AIS compliant would not disqualify the product from meeting the AIS requirements regardless of where the Coating processes occur, provided that final assembly of the product occurs in the United States. This exemption only applies to Coatings on the *external surface* of Iron and Steel components. It does not apply to Coatings or linings on internal surfaces of Iron and Steel products, such as the lining of lined pipes. All Manufacturing Processes for lined pipes, including the application of pipe lining, must occur in the United States for the product to be compliant with AIS requirements.

52.c *Construction Materials* - Those articles, materials, or supplies made primarily of iron and/or steel, that are permanently incorporated into the project, not including mechanical and/or electrical components, equipment and systems. Some of these products may overlap with what is also considered “structural steel”. Note: Mechanical and electrical components, equipment and systems are not considered Construction Materials. See definitions of Mechanical Equipment and Electrical Equipment.

52.d *Contractor’s Certification* - Documentation submitted by the Contractor upon Substantial Completion of the Contract that all Iron and Steel products installed were Produced in the United States.

52.e *De Minimis* - Various miscellaneous, incidental low-cost components that are essential for, but incidental to, the construction and are incorporated into the physical structure of the project. Examples of *De Minimis* components could include small washers, screws, fasteners (such as “off the shelf” nuts and bolts), miscellaneous wire, corner bead, ancillary tube, signage, trash bins, door hardware etc. Costs for such *De Minimis* components cumulatively may comprise no more than a total of five percent of the total cost of the materials used in and incorporated into a project; the cost of an individual item may not exceed one percent of the total cost of the materials used in and incorporated into a project.

52.f *Electrical Equipment* - Typically any machine powered by electricity and includes components that are part of the electrical distribution system. AIS does not apply to Electrical Equipment.

52.g *Engineer's Certification* - Documentation submitted by the Engineer that Drawings, Specifications, and Bidding Documents comply with AIS.

52.h *Iron and Steel products* - The following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and Construction Materials. Only items on the above list made primarily of iron or steel, permanently incorporated into the project must be Produced in the United States. For example, trench boxes, scaffolding or equipment, which are removed from the project site upon completion of the project, are not required to be made of U.S. iron or steel.

52.i *Manufacturer* - A Supplier, fabricator, distributor, materialman, or vendor is an entity with which the Owner, Contractor or any subcontractor has contracted to furnish materials or equipment to be incorporated in the project by the Owner, Contractor or a subcontractor.

52.j *Manufacturer's Certification* - Documentation provided by the Manufacturer stating that the Iron and Steel products to be used in the project are produced in the United States in accordance with American Iron and Steel (AIS) Requirements. If items are purchased via a Supplier, distributor, vendor, etc. from the Manufacturer directly, then the Supplier, distributor, vendor, etc. will be responsible for obtaining and providing these certifications to the parties purchasing the products.

52.k *Manufacturing Processes* - Processes such as melting, refining, pouring, forming, rolling, drawing, finishing, and fabricating. Further, if a domestic Iron and Steel product is taken out of the United States for any part of the manufacturing process, it becomes foreign source material. However, raw materials such as iron ore, limestone and iron and steel scrap are not covered by the AIS requirement, and the material(s), if any, being applied as a Coating are similarly not covered. Non-iron or Steel components of an Iron and Steel product may come from non-US sources. For example, for products such as valves and hydrants, the individual non-Iron and Steel components do not have to be of domestic origin. Raw materials, such as iron ore, limestone, scrap iron, and scrap steel, can come from non-U.S. sources.

52.l *Mechanical Equipment* - Typically equipment which has motorized parts and/or is powered by a motor. AIS does not apply to Mechanical Equipment.

52.m *Minor Components* - Components *within* an iron and/or Steel product otherwise compliant with the American Iron and Steel requirements; this waiver is typically used by Manufacturers. It differs from the *De Minimis* definition in that *De Minimis* pertains to the entire project and the minor component definition pertains to a single product. This waiver allows use of non-domestically produced miscellaneous Minor Components comprising up to five percent of the total material cost of an otherwise domestically produced Iron and Steel product. However, unless a separate waiver for a product has been approved, all other Iron and Steel components in said product must still meet the AIS requirements. This waiver does not exempt the whole product from the AIS requirements only Minor Components within said product and the iron or Steel components of the product must be produced domestically. Valves and hydrants are also subject to the cost ceiling requirements described here. Examples of Minor Components could include items such as pins and springs in valves/hydrants, bands/straps in couplings, and other low-cost items such as small fasteners etc.

52.n *Municipal Castings* - Cast iron or Steel infrastructure products that are melted and cast. They typically provide access, protection, or housing for components incorporated into utility owned drinking water, storm water, wastewater, and solid waste infrastructure.

52.o *Primarily Iron or Steel* - A product is made of greater than 50 percent iron or Steel on a materials cost basis. An exception to this definition is reinforced precast concrete (see Definitions). All technical specifications and applicable industry standards (e.g. NIST, NSF, AWWA) must be met. If a product is determined to be less than 50 percent iron and/or steel, the AIS requirements do not apply. For example, the cost of a fire hydrant includes:

- ┆ The cost of materials used for the iron portion of a fire hydrant (e.g. bonnet, body and shoe); and
- ┆ The cost to pour and cast to create those components (e.g. labor and energy).

Not included in the cost are:

- ┆ The additional material costs for the non-iron or Steel internal workings of the hydrant (e.g. stem, coupling, valve, seals, etc.); and
- ┆ The cost to assemble the internal workings into the hydrant body.

52.p *Produced in the United States* - The production in the United States of the iron or Steel products used in the project requires that all Manufacturing Processes must take place in the United States, with the exception of metallurgical processes involving refinement of steel additives.

52.q *Reinforced Precast Concrete* – Reinforced Precast Concrete structures must comply with AIS, regardless of whether it consists of at least 50 percent iron or steel. The reinforcing bar and wire must be Produced in the United States and meet the same standards as for any other iron or Steel product. Additionally, the casting of the concrete product must take place in the United States. The cement and other raw materials used in concrete production are not required to be of domestic origin. If the reinforced concrete is cast at the construction site, the reinforcing bar and wire are considered Construction Materials and must be Produced in the United States.

52.r *Steel* - An alloy that includes at least 50 percent iron, between 0.02 and 2 percent carbon, and may include other elements. Metallic elements such as chromium, nickel, molybdenum, manganese, and silicon may be added during the melting of Steel for the purpose of enhancing properties such as corrosion resistance, hardness, or strength. The definition of Steel covers carbon steel, alloy steel, stainless steel, tool steel, and other specialty steels.

52.s *Structural Steel* - Rolled flanged shapes, having at least one dimension of their cross-section three inches or greater, which are used in the construction of bridges, buildings, ships, railroad rolling stock, and for numerous other constructional purposes. Such shapes are designated as wide-flange shapes, standard I-beams, channels, angles, tees, and zees. Other shapes include but are not limited to, H-piles, sheet piling, tie plates, cross ties, and those for other special purposes.

- ☐ SC-2.02.A – Delete [number] and insert in its place “five.”
- ☐ SC-4.01.A – Delete the last sentence of paragraph.
- ☐ SC-4.05.C.5 – Paragraph is mandatory for WWD projects.

- SC-4.05.C.5.a – Add the following at the end of this paragraph:

Extreme or unusual weather that is typical for a given region, elevation, or season should not be considered abnormal weather conditions. Requests for time extensions due to abnormal weather conditions will be submitted to the Engineer within five days of the end of the abnormal weather condition event. It is the responsibility of the Contractor to provide the information listed in SC 4.05.C.5.b.
- └ SC-6.01 – Disregard EJCDC Guidance Notes – Performance and Payment Bonds, Note 1. Performance and Payment Bonds are required for WWD projects.
- └ SC-6.01 – EJCDC Guidance Notes – “Other Bonds,” Warranty Bond, Note 1. RD does not require a Warranty Bond, and RD will not accept a Warranty Bond in place of a Performance and Payment Bond. The decision to include a Warranty Bond is made by the Owner and their counsel. Please refer to EJCDC.
- SC-7.04.D – Add the following new paragraph immediately after Paragraph 7.04.C:

D. All Iron and Steel products must meet American Iron and Steel requirements.
- SC-7.04.E – Add the following new paragraph immediately after Paragraph 7.04.D:

E. For projects utilizing a *De Minimis* waiver, Contractor shall maintain an itemized list of non-domestically produced iron or steel incidental components and ensure that the cost is less than 5% of total materials cost for project.
- SC-7.05.A – Amend the third sentence of paragraph by striking out the following words:

Unless the specification or description contains or is followed by words reading that no like, equivalent, or “or-equal” item is permitted,
- └ SC-7.05.A.1.a.3 – Amend the last sentence of Paragraph a.3 by striking out “and;” and adding a period at the end of Paragraph a.3.
- └ SC-7.05.A.1.a.4 – Delete paragraph in its entirety and insert “Deleted.”
- SC-7.05.B – Add the following at the end of paragraph:

Contractor shall include a Manufacturer’s Certification letter for compliance with American Iron and Steel requirements in support data, if applicable. Refer to Manufacturer’s Certification Letter provided in these Contract Documents.
- SC-7.06.A.3.a.2 – Remove “and” from the end of paragraph.
- SC-7.06.A.3.a.3 – Add “; and” to the end of paragraph.
- └ SC-7.06.A.3.a.4 – Add the following new paragraph immediately after Paragraph 7.06.A.3.a.3:

4. Comply with American Iron and Steel by providing Manufacturer's Certification letter of American Iron and Steel compliance, if applicable. Refer to Manufacturer's Certification Letter provided in these Contract Documents.

- SC-7.07.A – Amend by adding the following to the end of the paragraph:

The total amount of work subcontracted by the Contractor shall not exceed fifty percent of the Contract price without prior approval from the Owner, Engineer and Agency.

- ┘ SC-7.07.B – Delete paragraph in its entirety and insert "Deleted".

- ┘ SC-7.07.E – Delete the second sentence of paragraph and insert the following in its place:

Owner may not require that Contractor use a specific replacement.

- SC-7.12.A Amend paragraph by adding the following after "written interpretations and clarifications,":

Manufacturers' Certifications,

- SC-7.16.A.1.c – Amend paragraph by deleting the last period and adding:

, including Manufacturer's Certification letter for any item in the submittal subject to American Iron and Steel requirements and include the Certificate in the submittal. Refer to Manufacturer's Certification Letter provided in these Contract Documents.

- SC-7.16.C.9 – Add new paragraph immediately after Paragraph 7.16.C.8:

9. Engineer's review and approval of a Shop Drawing or Sample shall include review of Manufacturers' Certifications in order to document compliance with American Iron and Steel requirements, as applicable.

- ┘ SC-7.17.F – Add new paragraph immediately after Paragraph 7.17.E:

F. Contractor shall certify upon Substantial Completion that all Work and Materials have complied with American Iron and Steel requirements as mandated by Section 746 of Title VII of the Consolidated Appropriations Act of 2017 (Division A - Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statutes mandating domestic preference. Contractor shall provide said Certification to Owner. Refer to General Contractor's Certification Letter provided in these Contract Documents.

- ┘ ARTICLE 11 – Delete the sentence "No suggested Supplementary Conditions in this Article."

- SC-11.02.C – Add new paragraph immediately after Paragraph 11.02.B:

C. The Engineer or Owner shall contact the Agency for concurrence on each Change Order prior to issuance. All Contract Change Orders must be concurred on (signed) by Agency before they are effective.

- ⌋ SC-11.03.A.2 - Add new Paragraph 11.03.A.2 immediately after Paragraph 11.03.A, which shall be renamed Paragraph 11.03.A.1:

2. The Engineer or Owner shall contact the Agency for concurrence on each Work Change Directive prior to issuance. Once authorized by Owner, a copy of each Work Change Directive shall be provided by Engineer to the Agency.

- ⌋ SC-11.05.B – Add the following at the end of this paragraph:

For Owner-authorized changes in the Work, the Contractor will provide the Manufacturer’s Certification(s) for materials subject to American Iron and Steel requirements except when sole-source is specified, in which case the Engineer will provide the Manufacturer’s Certification(s).

- ⌋ SC-11.09.B.2.c – Add new paragraph immediately after Paragraph 11.09.B.2.b:

c. Change orders involving materials subject to American Iron and Steel requirements shall include supporting data (name of Manufacturer, city and state where the product was manufactured, description of product, signature of authorized Manufacturer’s representative) in the Manufacturer’s Certification Letter, as applicable.

- ⌋ SC-13.02.C – Delete paragraph in its entirety and insert ”Deleted”.

- ⌋ SC 13.03.E – Delete paragraph in its entirety and replace with SC 13.03.E as shown in the EJCDC C-800 Supplementary Conditions.

- ⌋ ARTICLE 14 – Delete the sentence “No suggested Supplementary Conditions in this Article.”

- ⌋ SC-14.03.G – Add new paragraph immediately after Paragraph 14.03.F:

G. Installation of materials that are non-compliant with American Iron and Steel requirements shall be considered defective work.

- ⌋ SC-15.01.B.4 – Add the following language at the end of paragraph:

No payments will 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.5 – Add new paragraph immediately after Paragraph 15.01.B.4:

5. The Application for Payment form to be used on this Project is EJCDC® C-620. The Agency must approve all Applications for Payment before payment is made.

- ⌋ SC-15.01.B.6 – Add new paragraph immediately after Paragraph 15.01.B.5:

6. By submitting an Application for Payment based in whole or in part on furnishing equipment or materials, Contractor certifies that such equipment and materials are compliant with American Iron and Steel requirements. Manufacturer’s Certification letter for materials satisfy this requirement. Refer to

Manufacturer's Certification Letter provided in these Contract Documents.

- SC-15.01.C.2.d – Add the following new paragraph immediately after Paragraph 15.01.C.2.c:
 - d. The materials presented for payment in an Application for Payment comply with American Iron and Steel requirements.

- SC-15.01.D.1 – Delete paragraph in its entirety and insert the following in its place:

The Application for Payment with Engineer's recommendations will be presented to the Owner and Agency for consideration. If both the Owner and Agency find the Application for Payment acceptable, the recommended amount less any reduction under the provisions of Paragraph 15.01.E will become due twenty (20) days after the Application for Payment is presented to the Owner, and the Owner will make payment to the Contractor.

- ⌊ SC-15.02.A – Amend paragraph by striking out the following text: "7 days after".

- ⌊ SC-15.03.A – Modify by adding the following after the last sentence:

Contractor shall also submit the General (Prime) Contractor's Certification of Compliance certifying that to the best of the Contractor's knowledge and belief all substitutes, equals, and all Iron and Steel products proposed in the Shop Drawings, Change Orders, and Partial Payment Estimates, and those installed for the Project, are either Produced in the United States or are the subject of an approved waiver under Section 746 of Title VII of the Consolidated Appropriations Act of 2017 (Division A - Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statutes mandating domestic preference.

- SC-18.11 – Add new paragraph immediately after Paragraph 18.10:

18.11 *Tribal Sovereignty*

- A. No provision of this Agreement will be construed by any of the signatories as abridging or debilitating any sovereign powers of the *[insert name of Tribe]* Tribe; affecting the trust-beneficiary relationship between the Secretary of the Interior, Tribe, and Indian landowner(s); or interfering with the government-to-government relationship between the United States and the Tribe.

- SC-19 – Add the following new Article 19 immediately after Article 18:

Article 19 - FEDERAL REQUIREMENTS

19.01 *Agency Not a Party*

- A. This Contract is expected to be funded in part with funds provided by Agency. Neither Agency, nor any of its departments, entities, or employees, is a party to this Contract.

19.02 *Contract Approval*

- A. Owner and Contractor will furnish Owner's attorney such evidence as required so that Owner's attorney can complete and execute the "Certificate of Owner's Attorney" (Exhibit G of this Bulletin) before Owner submits the executed Contract Documents to Agency for approval.
- B. Agency concurrence is required on both the Bid and the Contract before the Contract is effective.

19.03 *Conflict of Interest*

- A. Contractor may not knowingly contract with a Supplier or Manufacturer if the individual or entity who prepared the Drawings 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 a financial interest or other interest in or a tangible personal benefit from the Contractor. Owner's officers, employees, or agents shall neither solicit nor accept gratuities, favors or anything of monetary value from Contractor or subcontractors.

19.04 *Gratuities*

- A. If Owner finds after a notice and hearing that Contractor, or any of Contractor's agents or representatives, offered or gave gratuities (in the form of entertainment, gifts, or otherwise) to any official, employee, or agent of Owner or Agency 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 Owner bases such findings shall be an issue and may be reviewed in proceedings under the 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 Owner) which shall not be less than three nor more than ten times the

costs Contractor incurs in providing any such gratuities to any such officer or employee.

19.05 *Small, Minority and Women's Businesses*

- A. If Contractor intends to let any subcontracts for a portion of the work, Contractor will take all necessary affirmative steps to assure that minority businesses, women's business enterprises, and labor surplus area firms are used when possible. Affirmative steps will include:
1. Placing qualified small and minority businesses and women's business enterprises on solicitation lists;
 2. Assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources;
 3. Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses, and women's business enterprises;
 4. Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority businesses, and women's business enterprises;
 5. Using the services and assistance, as appropriate, of such organizations as the Small Business Administration and the Minority Business Development Agency of the Department of Commerce.

19.06 *Anti-Kickback*

- A. Contractor shall comply with the Copeland Anti-Kickback Act (40 USC 3145) as supplemented by Department of Labor regulations (29 CFR Part 3, "Contractors and Subcontractors on Public Buildings or Public Works Financed in Whole or in Part by Loans or Grants of the United States"). The Act provides that Contractor or subcontractor shall be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public facilities, to give up any part of the compensation to which they are otherwise entitled. Owner shall report all suspected or reported violations to Agency.

19.07 *Clean Air Act (42 U.S.C. 7401-7671q.) and the Federal Water Pollution Control Act (33 U.S.C. 1251-1387), as amended*

- A. Contractor to agree to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251-1387). Violations must be reported to the federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).

19.08 *Equal Employment Opportunity*

- A. The Contract is considered a federally assisted construction contract. Except as otherwise provided under 41 CFR Part 60, all contracts that meet the definition of "federally assisted construction contract" in 41 CFR Part 60-1.3 must include the equal opportunity clause provided under 41 CFR 60-1.4(b), in accordance with Executive Order 11246, "Equal Employment Opportunity" (30 FR 12319, 12935, 3 CFR Part, 1964-1965 Comp., p. 339), as amended by Executive Order 11375, "Amending Executive Order 11246 Relating to

Equal Employment Opportunity,” and implementing regulations at 41 CFR part 60, “Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor.”

19.09 *Byrd Anti-Lobbying Amendment (31 U.S.C. 1352)*

- A. Contractors that apply or bid for an award exceeding \$100,000 must file the required certification (RD Instruction 1940-Q Exhibit A-1). The Contractor certifies to the Owner and every subcontractor certifies to the Contractor that it will not and has not used federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining the Contract if it is covered by 31 U.S.C. 1352. The Contractor and every subcontractor must also disclose any lobbying with non-federal funds that takes place in connection with obtaining any federal award. Such disclosures are forwarded from tier to tier up to the Owner. Necessary certification and disclosure forms shall be provided by Owner.

19.10 Environmental Requirements

- A. When constructing a Project involving trenching and/or other related earth excavations, Contractor shall comply with the following environmental conditions:
 - 1. Wetlands – When disposing of excess, spoil, or other Construction Materials on public or private property, Contractor shall not fill in or otherwise convert wetlands.
 - 2. Floodplains – When disposing of excess, spoil, or other Construction Materials on public or private property, Contractor shall not fill in or otherwise convert 100-year floodplain areas (Standard Flood Hazard Area) delineated on the latest Federal Emergency Management Agency Floodplain Maps, or other appropriate maps, e.g., alluvial soils on NRCS Soil Survey Maps.
 - 3. Historic Preservation - Applicants shall ensure that Contractors maintain a copy of the following inadvertent discovery plan onsite for review:
 - a. If during the course of any ground disturbance related to any Project, any post review discovery, including but not limited to, any artifacts, foundations, or other indications of past human occupation of the area are uncovered, shall be protected by complying with 36 CFR § 800.13(b)(3) and (c) and shall include the following:
 - i. All Work, including vehicular traffic, shall immediately stop within a 50 ft. radius around the area of discovery. The Contractor shall ensure barriers are established to protect the area of discovery and notify the Engineer to contact the appropriate RD personnel. The Engineer shall engage a Secretary of the Interior (SOI) qualified professional archeologist to quickly assess the nature and scope of the discovery; implement interim measures to protect the discovery from looting and vandalism; and establish broader barriers if further historic and/or precontact properties, can reasonably be expected to occur.
 - ii. The RD personnel shall notify the appropriate RD environmental staff member, the Federal Preservation Officer (FPO), and State Historic Preservation Office

(SHPO) immediately. Indian tribe(s) or Native Hawaiian Organization (NHOs) that have an interest in the area of discovery shall be contacted immediately. The SHPO may require additional tribes or NHOs who may have an interest in the area of discovery also be contacted. The notification shall include an assessment of the discovery provided by the SOI qualified professional archeologist.

- iii. When the discovery contains burial sites or human remains, the Contractor shall immediately notify the appropriate RD personnel who will contact the RD environmental staff member, FPO, and the SHPO. The relevant law enforcement authorities shall be immediately contacted by onsite personnel to reduce delay times, in accordance with tribal, state, or local laws including 36 CFR Part 800.13; 43 CFR Part 10, Subpart B; and the Advisory Council on Historic Preservation's Policy Statement Regarding treatment of Burial Sites, Human Remains, or Funerary Objects (February 23, 2007).
 - iv. When the discovery contains burial sites or human remains, all construction activities, including vehicular traffic shall stop within a 100 ft. radius of the discovery and barriers shall be established. The evaluation of human remains shall be conducted at the site of discovery by a SOI qualified professional. Remains that have been removed from their primary context and where that context may be in question may be retained in a secure location, pending further decisions on treatment and disposition. RD may expand this radius based on the SOI professional's assessment of the discovery and establish broader barriers if further subsurface burial sites, or human remains can reasonably be expected to occur. RD, in consultation with the SHPO and interested tribes or NHOs, shall develop a plan for the treatment of native human remains.
 - v. Work may continue in other areas of the undertaking where no historic properties, burial sites, or human remains are present. If the inadvertent discovery appears to be a consequence of illegal activity such as looting, the onsite personnel shall contact the appropriate legal authorities immediately if the landowner has not already done so.
 - vi. Work may not resume in the area of the discovery until a notice to proceed has been issued by RD. RD shall not issue the notice to proceed until it has determined that the appropriate local protocols and consulting parties have been consulted.
 - vii. Inadvertent discoveries on federal and tribal land shall follow the processes required by the federal or tribal entity.
4. Endangered Species – Contractor shall comply with the Endangered Species Act, which provides for the protection of endangered and/or threatened species and critical habitat. Should any evidence of the presence of endangered and/or threatened species or their critical habitat be brought to the attention of Contractor, Contractor will immediately report this evidence to Owner and a representative of Agency. Construction shall be temporarily halted pending the notification process and further directions issued by Agency after consultation with the U.S. Fish and Wildlife Service.

5. Mitigation Measures – The following environmental mitigation measures are required on this Project: *[Insert mitigation measures from the Letter of Conditions here]*.

19.11 *Contract Work Hours and Safety Standards Act (40 U.S.C. 3701-3708)*

- A. Where applicable, for contracts awarded by the Owner in excess of \$100,000 that involve the employment of mechanics or laborers, the Contractor will comply with 40 U.S.C. 3702 and 3704, as supplemented by Department of Labor regulations (29 CFR Part 5). Under 40 U.S.C. 3702 of the Act, the Contractor will compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.C. 3704 are applicable to construction work and provide that no laborer or mechanic will be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

19.12 *Debarment and Suspension (Executive Orders 12549 and 12689)*

- A. A contract award (see 2 CFR 180.220) must not be made to parties listed on the governmentwide exclusions in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 CFR 180 that implement Executive Orders 12549 (3 CFR part 1986 Comp., p. 189) and 12689 (3 CFR part 1989 Comp., p. 235), “Debarment and Suspension.” SAM Exclusions contains the names of parties debarred, suspended, or otherwise excluded by agencies, as well as parties declared ineligible under statutory or regulatory authority other than Executive Order 12549.

19.13 *Procurement of recovered materials*

- A. The Contractor will comply with 2 CFR Part 200.322, “Procurement of recovered materials.”

19.14 *American Iron and Steel*

- A. Section 746 of Title VII of the Consolidated Appropriations Act of 2017 (Division A - Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statutes mandating domestic preference applies an American Iron and Steel requirement to this project. All iron and steel products used in this project must be produced in the United States. The term “iron and steel products” means the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and Construction Materials.
- B. The following waivers apply to this Contract:
1. *De Minimis*,
 2. Minor Components,
 3. Pig iron and direct reduced iron, and

4. *[add project specific waivers as applicable].*

**SECTION 000850
SPECIAL CONDITIONS**

The following Special Conditions apply and are hereby made part of the Agreement and Contract Documents.

1.01 PERMITS

- A. Permits applied for or obtained by the Owner, if any, are indicated in paragraph SC-7.08 of the Supplementary Conditions.

1.02 CONSTRUCTION SCHEDULE

- A. The Owner anticipates issuing a Notice to Proceed on this project by **October 1, 2023** subject to the successful bidder satisfying the requirements indicated in the Notice of Award.

1.03 RESIDENT PROJECT REPRESENTATIVE

- A. The Owner will provide a **full-time** Resident Project Representative at no cost to the Contractor. The Resident Project Representative is being provided for the benefit of the Owner, not the Contractor. Duties and responsibilities of the Resident Project Representative are indicated in paragraph SC-10.03 of the Supplementary Conditions.
- B. The Contractor shall notify the Engineer a minimum of 24 hours in advance of key construction activities in order to have the Resident Project Representative present and observe the work. The Contractor shall provide this advance notice for the following construction activities:
 - 1. Installation of Best Management Practices.
 - 2. Cofferdam installation and foundation excavation.
 - 3. Any ledge excavation encountered during construction.
 - 4. All backfilling and compaction activities underneath footings and in, around, behind or over structures.
 - 5. Completion of constructing concrete formwork and placing reinforcing steel.
 - 6. All cast-in-place concrete placement operations.
 - 7. Delivery and placement of precast concrete units.
 - 8. Placement and compaction of roadway subbase.
 - 9. Installation of guardrail.
 - 10. All asphalt paving operations.

11. Failure of the Contractor to provide the proper advanced notice of construction activities as indicated in paragraph 1.03-B may be cause for rejection of the work. Any work rejected shall be removed and replaced by the Contractor at no additional cost to the Owner.

1.04 OTHER CONDITIONS

END OF SECTION

**SECTION 000940
WORK CHANGE DIRECTIVE**

Work Change Directive No.

Date of Issuance:	Effective Date:
Owner: Town of Montgomery, Vermont	Owner's Contract No.:
Contractor:	Contractor's Project No.:
Engineer: Hoyle, Tanner & Associates, Inc.	Engineer's Project No.: 129800.02
Project:	Contract Name: Center Community Decentralized Wastewater Treatment and Disposal System

Description:

Attachments: *[List documents supporting change]*

Purpose for Work Change Directive:

Directive to proceed promptly with the Work described herein, prior to agreeing to changes on Contract Price and Contract Time, is issued due to: *[check one or both of the following]*

- Non-agreement on pricing of proposed change.
- Necessity to proceed for schedule or other Project reasons.

Estimated Change in Contract Price and Contract Times (non-binding, preliminary):

Contract Price \$	[increase] [decrease].
Contract Time days	[increase] [decrease].

Basis of estimated change in Contract Price:

- | | |
|---|-------------------------------------|
| <input type="checkbox"/> Lump Sum | <input type="checkbox"/> Unit Price |
| <input type="checkbox"/> Cost of the Work | <input type="checkbox"/> Other |

RECOMMENDED:	AUTHORIZED BY:	RECEIVED:
By: Engineer (Authorized Signature)	By: Owner (Authorized Signature)	By: Contractor (Authorized Signature)
Title:	Title:	Title:
Date:	Date:	Date:

Approved by Funding Agency (if applicable)

By:	Date:
Title:	

END OF SECTION

**SECTION 000942
FIELD ORDER**

Field Order No. _____

Date of Issuance: _____ Effective Date: _____
Owner: Town of Montgomery, Vermont Owner's Contract No.: _____
Contractor: _____ Contractor's Project No.: _____
Engineer: Hoyle, Tanner & Associates, Inc. Engineer's Project No.: 129800.02
Project: _____ Contract Name: Center Community
Decentralized Wastewater
Treatment and Disposal System

Contractor is hereby directed to promptly execute this Field Order, issued in accordance with General Conditions Paragraph 11.01, for minor changes in the Work without changes in Contract Price or Contract Times. If Contractor considers that a change in Contract Price or Contract Times is required, submit a Change Proposal before proceeding with this Work.

Reference: _____
Specification(s) Drawing(s) / Detail(s)

Description:

Attachments:

ISSUED:	RECEIVED:
By: _____ Engineer (Authorized Signature)	By: _____ Contractor (Authorized Signature)
Title: _____	Title: _____
Date: _____	Date: _____

Copy to: Owner

END OF SECTION

SECTION 000943
CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner:	Town of Montgomery, Vermont	Owner's Contract No.:	
Contractor:		Contractor's Project No.:	
Engineer:	Hoyle, Tanner & Associates, Inc.	Engineer's Project No.:	129800.02
Project:		Contract Name:	Center Community Decentralized Wastewater Treatment and Disposal System

This [preliminary] [final] Certificate of Substantial Completion applies to:

All Work The following specified portions of the Work:

Date of Substantial Completion

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Work or portion thereof designated above is hereby established, subject to the provisions of the Contract pertaining to Substantial Completion. The date of Substantial Completion in the final Certificate of Substantial Completion marks the commencement of the contractual correction period and applicable warranties required by the Contract.

A punch list of items to be completed or corrected is attached to this Certificate. This list may not be all-inclusive, and the failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance, and warranties upon Owner's use or occupancy of the Work shall be as provided in the Contract, except as amended as follows: *[Note: Amendments of contractual responsibilities recorded in this Certificate should be the product of mutual agreement of Owner and Contractor; see Paragraph 15.03.D of the General Conditions.]*

Amendments to Owner's responsibilities: None
 As follows:

Amendments to Contractor's responsibilities: None
 As follows:

The following documents are attached to and made a part of this Certificate:

This Certificate does not constitute an acceptance of Work not in accordance with the Contract Documents, nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract.

EXECUTED BY ENGINEER:	RECEIVED:	RECEIVED:
By: _____ (Authorized signature)	By: _____ Owner (Authorized Signature)	By: _____ Contractor (Authorized Signature)
Title: _____	Title: _____	Title: _____
Date: _____	Date: _____	Date: _____

**SECTION 000943
CERTIFICATE OF SUBSTANTIAL COMPLETION**

END OF SECTION

**SECTION 000950
CONSENT OF SURETY COMPANY TO FINAL PAYMENT**

OWNER'S CONTRACT NO.: _____

ENGINEER' PROJECT NO.: 129800.02

AGREEMENT DATE: _____

BOND NUMBER: _____

CONTRACT TITLE: Center Community Decentralized Wastewater Treatment and Disposal System

To: Town of Montgomery (Owner)
86 Mountain Road
Montgomery Center, VT 05471

From: _____ (Contractor)

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the _____(Surety) on the bond of _____(Contractor) hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall not relieve the Surety Company of any of it's obligations to the Town of Montgoery (Owner) as set forth in the said Surety Company's Bond.

IN WITNESS WHEREOF, the Surety Company has hereunto set its hand this _____ day of _____, 20__.

Surety Company

Signature of Authorized Representative

Attest: (Seal)

Name & Title

Note: Power of Attorney should be attached in instances where same applies.

END OF SECTION

SECTION 000960
CONTRACTOR'S FINAL LIEN WAIVER
(Page 1 of 2)

OWNER'S CONTRACT NO.: _____

ENGINEER' PROJECT NO.: 129800.02

AGREEMENT DATE: _____

CONTRACT TITLE: Center Community Decentralized Wastewater Treatment and Disposal System

To: Town of Montgomery (Owner)
86 Mountain Road
Montgomery Center, VT 05471

APPLICATION FOR FINAL PAYMENT

The undersigned hereby certifies that the amount owed set forth below constitutes the entire value of all work performed and services rendered by, through or under the undersigned with respect to the project not heretofore paid for up to and including the period covered by the above Application for Final Payment; that all work covered by such Application has been incorporated into the project and title thereto has passed to the Owner free and clear of all liens, claims, security, interests or encumbrances; and that no work covered by such Application has been acquired subject to an agreement under which any interest therein or an encumbrance thereon is retained by the seller or any other person. In consideration of payment of the requisition, the undersigned hereby releases the Owner from all claims of lien which the undersigned has regarding the Project.

The undersigned, in order to induce the Owner to pay the requisition, hereby represents that it has paid or will pay from the proceeds of the requisition all sums due to those parties who have performed work or provided materials to the undersigned in connection with the Project, and that it will on request of the Owner provide written evidence of the discharge by the undersigned of its obligations to such parties.

Executed under seal as of this _____ day of _____, 20__.

Amount Owed to Contractor by Owner as Final Payment:
\$ _____ (total value of project including change orders)

Amount Unpaid From Previous Application for Payment:
\$ _____

CONTRACTOR'S FINAL LIEN WAIVER
(Page 2 of 2)

From: _____ (Contractor)

Authorized Representative Signature

Name and Title (printed)

NOTARY:

Then personally appeared the above named _____ and
acknowledged the foregoing to be the free act and deed of the above-named Contractor, before
me.

Subscribed and sworn to on the _____ day of _____, 20____.

Notary Public: _____

My Commission Expires: _____

END OF SECTION

SECTION 000970
CERTIFICATE OF FINAL COMPLETION OF WORK
(Page 1 of 2)

OWNER'S CONTRACT NO.: _____

ENGINEER' PROJECT NO.: 129800.02

AGREEMENT DATE: _____

CONTRACT TITLE: Center Community Decentralized Wastewater Treatment and Disposal System

FINAL COMPLETION DATE PER AGREEMENT AND CHANGE ORDERS: _____

ACTUAL DATE OF FINAL COMPLETION: _____

FINAL CERTIFICATION OF CONTRACTOR

I hereby certify that the Work as identified in the Final Payment Request dated _____ for the above-noted construction Contract represents full compensation for the actual value of work completed. Additionally, all work completed conforms to the terms of the Agreement and authorized changes.

CONTRACTOR

Date

Authorized Representative's Signature

Name & Title

FINAL CERTIFICATION OF ENGINEER

I have reviewed the Contractor's Final Payment Request dated _____ and hereby certify that to the best of my knowledge, the cost of the work identified on the Final Payment Request represents full compensation for the actual value of work completed and that the work has been completed in accordance with the terms of the Agreement and authorized changes.

Hoyle, Tanner and Associate, Inc.
ENGINEER

Date

Authorized Representative's Signature

Name & Title

CERTIFICATE OF FINAL COMPLETION OF WORK

(Page 2 of 2)

FINAL ACCEPTANCE OF OWNER

I, as representative of the Owner, accept the above Final Certifications and authorize Final Payment in the amount of \$_____ and direct the Contractor's attention to the General Conditions. The guaranty for all Work completed subsequent to the date of Substantial Completion, expires _____year from the date of this Final Acceptance.

At a meeting of the _____(Town Council/Selectmen/Alderman), the Owner, _____(Name of the community) has accepted the constructed project.

Town of Montgomery _____
OWNER

Date

Authorized Representative's Signature

Name & Title

END OF SECTION

Date of Issuance:	Effective Date:
Owner:	Owner's Contract No.:
Contractor:	Contractor's Project No.:
Engineer:	Engineer's Project No.:
Project:	Contract Name:
	Notice to Proceed (date):
	Original Contract Length (days):

The Contract is modified as follows upon execution of this Change Order:

Description:

Attachments:

(Updated Schedule *required for any change in Contract Time*)

CHANGE IN CONTRACT PRICE	CHANGE IN CONTRACT TIMES <i>[note changes in Milestones if applicable]</i>
Original Contract Price: \$ _____	Original Contract Times: Substantial Completion: _____ Ready for Final Payment: _____ days or dates
[Increase] [Decrease] from previously approved Change Orders No. ___ to No. ___: \$ _____	[Increase] [Decrease] from previously approved Change Orders No. ___ to No. ___: Substantial Completion: _____ Ready for Final Payment: _____ days
Contract Price prior to this Change Order: \$ _____	Contract Times prior to this Change Order: Substantial Completion: _____ Ready for Final Payment: _____ days or dates
[Increase] [Decrease] of this Change Order: \$ _____	[Increase] [Decrease] of this Change Order: Substantial Completion: _____ Ready for Final Payment: _____ days or dates
Contract Price incorporating this Change Order: \$ _____	Contract Times with all approved Change Orders: Substantial Completion: _____ Ready for Final Payment: _____ days or dates

RECOMMENDED:	ACCEPTED:	ACCEPTED:
By: _____ Engineer (if required)	By: _____ Owner (Authorized Signature)	By: _____ Contractor (Authorized Signature)
Title: _____	Title: _____	Title: _____
Date: _____	Date: _____	Date: _____

Approved by Funding Agency (if applicable)

By: _____ Date: _____
Title: _____

CONTRACTOR'S PAYROLL CERTIFICATION AND AMERICAN IRON AND STEEL CERTIFICATION

(To be submitted with each application for payment)

Name of Contractor: _____

Address of Contractor: _____

Project Name: _____

Project Number: _____

Project Location: _____

Payment Application No.: _____

Payment App. End Date: _____

I hereby certify that all of the contract requirements as specified under the Labor Standards Provision for Federal and Federally Assisted Contracts have been complied with by the above-named Contractor, and by each Subcontractor employing Laborers or Mechanics at the site of the work, or there is an honest dispute with respect to the required provisions.

I hereby certify that the "American Iron and Steel" provisions of the Water Resources Reform and Development Act of 2014, the Consolidated Appropriations Act of 2014 ([Public Law 113-76](#)), and subsequent laws that continue the requirement for the use of American Iron and Steel products in State Revolving Fund construction projects as applicable, have been met, and that all iron and steel used in the project named above have been produced in the United States in a manner that complies with American Iron and Steel Requirements, and/or that applicable EPA-approved waivers have been obtained to comply with American Iron and Steel requirements.

CONTRACTOR: _____
Name of Responsible Official

Title

Signature

Date

AMERICAN IRON AND STEEL *DE MINIMIS* LIST FORMAT

Notes to User: This exhibit is an example format for Contractors to use in maintaining a list of items to document the use of the De Minimis waiver of the American Iron and Steel requirements. This list or similar is required to be filled out throughout the construction Contract as needed. The State Engineer may periodically ask to review this information. At the Contract completion, this list, along with all Manufacturers' certifications, are to be given to the Engineer for delivery to the Owner.

DE MINIMIS COSTING WORKSHEET

Project Name: _____

Contract Name/# (if more than one) _____

Contractor (Company Name): _____

Representative: _____

Date: _____

Total Cost of All Materials (or Estimated Value at 50% of the Installed Bid Price): _____ \$

Allowable Total *De Minimis* Costs (5% of all materials) _____ \$

Total Cost of all *De Minimis* Items _____ \$

Remaining Amount Allowed for Future *De Minimis* Items _____ \$

Note: No single De Minimis item can be more than 1% of the total material cost.

No.	Detailed Description and Manufacturer or Local Source of <i>De Minimis</i> Material	Quantity	Cost Per Item	Total Item Cost
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				

MANUFACTURER'S CERTIFICATION OF COMPLIANCE

Notes to User: This exhibit is the sample Manufacturer's Certification of Compliance with the American Iron and Steel requirements to be provided by all Manufacturers of American Iron and Steel covered items, to be submitted by Contractor to the Engineer with the corresponding Shop Drawing submittal for delivery to the Owner at Substantial Completion.

EXAMPLE OF A MANUFACTURER'S CERTIFICATION OF COMPLIANCE WITH PROVISIONS OF THE AMERICAN IRON AND STEEL (AIS) REQUIREMENTS OF SECTION 746 OF TITLE VII OF THE CONSOLIDATED APPROPRIATIONS ACT OF 2017 (DIVISION A - AGRICULTURE, RURAL DEVELOPMENT, FOOD AND DRUG ADMINISTRATION, AND RELATED AGENCIES APPROPRIATIONS ACT, 2017) AND SUBSEQUENT STATUTES MANDATING DOMESTIC PREFERENCE

Date:

Company Name:

Company Address:

Subject: American Iron and Steel (AIS) Certification for Project (X), Owner's Name, and Contract Number

I, (company representative), certify that the (melting, bending, galvanizing, cutting, etc.) processes for (manufacturing or fabricating) the following products and/or material shipped or provided for the subject project is in full compliance with the AIS requirement as mandated by Section 746 of Title VII of the Consolidated Appropriations Act of 2017 (Division A - Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statutes mandating domestic preference.

Item, Products and/or Materials, and location of delivery (City, State):

1.

2.

Such processes for AIS took place at the following location:

(City, State)

Authorized Company Representative Signature

Notes: Authorized signature will be Manufacturer's representative, not the material distributor or Supplier. If any of the above compliance statements change while providing materials to this project, please immediately notify the person(s) who is requesting to use your product(s).

CERTIFICATE OF OWNER’S ATTORNEY AND AGENCY CONCURRENCE

Notes to User: This exhibit consists of two certificates, on a single page, to be attached to the Contract and signed upon execution. The first is a certificate to be signed by the Owner’s attorney and the second is the concurrence to be signed by the State Engineer. This page is to be inserted after the Agreement between Owner and Contractor for Construction Contract (Stipulated Price) (EJCDC C-520, 2018) in the Construction Contract Documents.

CERTIFICATE OF OWNER’S ATTORNEY

PROJECT NAME:

CONTRACTOR NAME AND CONTRACT NUMBER:

I, the undersigned, _____, the duly authorized and acting legal representative of _____, do hereby certify as follows: I have examined the attached Contract(s) and performance and payment bond(s) and the manner of execution thereof, and I am of the opinion that each of the aforesaid agreements is adequate and has been duly executed by the proper parties thereto acting through their duly authorized representatives; that said representatives have full power and authority to execute said agreements on behalf of the respective parties named thereon; and that the foregoing agreements constitute valid and legally binding obligations upon the parties executing the same in accordance with the terms, conditions, and provisions thereof.

Name

Date

AGENCY CONCURRENCE

As lender or insurer of funds to defray the costs of this Contract, and without liability for any payments thereunder, the Agency hereby concurs in the form, content, and execution of this Agreement.

Agency Representative

Date

Name

GENERAL (PRIME) CONTRACTOR'S CERTIFICATION OF COMPLIANCE

Notes to User: This exhibit is the sample General (Prime) Contractor's Certification of Compliance with the American Iron and Steel requirements to be provided by all General (Prime) Contractors to Engineer for delivery to the Owner at Substantial Completion.

GENERAL (PRIME) CONTRACTOR'S CERTIFICATION OF COMPLIANCE WITH PROVISIONS OF THE AMERICAN IRON AND STEEL REQUIREMENTS OF SECTION 746 OF TITLE VII OF THE CONSOLIDATED APPROPRIATIONS ACT OF 2017 (DIVISION A - AGRICULTURE, RURAL DEVELOPMENT, FOOD AND DRUG ADMINISTRATION, AND RELATED AGENCIES APPROPRIATIONS ACT, 2017) AND SUBSEQUENT STATUTES MANDATING DOMESTIC PREFERENCE

DATE:

RE: PROJECT NAME
APPLICANT
CONTRACT NUMBER

I hereby certify that to the best of my knowledge and belief all Iron and Steel products installed for this project by my company and by any and all subcontractors and Manufacturers my company has contracted with for this project comply with Section 746 of Title VII of the Consolidated Appropriations Act of 2017 (Division A - Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statutes mandating domestic preference or are the subject of a waiver approved by the Secretary of Agriculture or designee.

Name of Construction Company (PRINT)

By Authorized Representative (SIGNATURE)

Title

ENGINEER'S CERTIFICATION OF FINAL PLANS AND SPECIFICATIONS

PROJECT NAME: _____

The final Drawings and Specifications, other assembled Construction Contract Documents, bidding-related documents (or requests for proposals or other construction procurement documents), and any other Final Design Phase deliverables, comply with all requirements of the U.S. Department of Agriculture, Rural Utilities Service, to the best of my knowledge and professional judgment.

If the Engineers Joint Contract Documents Committee (EJCDC) documents have been used, all modifications required by RUS Bulletin 1780-26 have been made in accordance with the terms of the license agreement, which states in part that the Engineer "must plainly show all changes to the Standard EJCDC Text, using 'Track Changes' (redline/strikeout), highlighting, or other means of clearly indicating additions and deletions." Such other means may include attachments indicating changes (e.g. Supplementary Conditions modifying the General Conditions).

Engineer

Date

Name and Title

**SECTION 000850
SPECIAL CONDITIONS**

The following Special Conditions apply and are hereby made part of the Agreement and Contract Documents.

1.01 PERMITS

- A. Permits applied for or obtained by the Owner, if any, are indicated in paragraph SC-7.08 of the Supplementary Conditions.

1.02 CONSTRUCTION SCHEDULE

- A. The Owner anticipates issuing a Notice to Proceed on this project by **October 1, 2023** subject to the successful bidder satisfying the requirements indicated in the Notice of Award.

1.03 RESIDENT PROJECT REPRESENTATIVE

- A. The Owner will provide a **full-time** Resident Project Representative at no cost to the Contractor. The Resident Project Representative is being provided for the benefit of the Owner, not the Contractor. Duties and responsibilities of the Resident Project Representative are indicated in paragraph SC-10.03 of the Supplementary Conditions.
- B. The Contractor shall notify the Engineer a minimum of 24 hours in advance of key construction activities in order to have the Resident Project Representative present and observe the work. The Contractor shall provide this advance notice for the following construction activities:
 - 1. Installation of Best Management Practices.
 - 2. Cofferdam installation and foundation excavation.
 - 3. Any ledge excavation encountered during construction.
 - 4. All backfilling and compaction activities underneath footings and in, around, behind or over structures.
 - 5. Completion of constructing concrete formwork and placing reinforcing steel.
 - 6. All cast-in-place concrete placement operations.
 - 7. Delivery and placement of precast concrete units.
 - 8. Placement and compaction of roadway subbase.
 - 9. Installation of guardrail.
 - 10. All asphalt paving operations.

11. Failure of the Contractor to provide the proper advanced notice of construction activities as indicated in paragraph 1.03-B may be cause for rejection of the work. Any work rejected shall be removed and replaced by the Contractor at no additional cost to the Owner.

1.04 OTHER CONDITIONS

END OF SECTION

**SECTION 000940
WORK CHANGE DIRECTIVE**

Work Change Directive No.

Date of Issuance:	Effective Date:
Owner: Town of Montgomery, Vermont	Owner's Contract No.:
Contractor:	Contractor's Project No.:
Engineer: Hoyle, Tanner & Associates, Inc.	Engineer's Project No.: 129800.02
Project:	Contract Name: Center Community Decentralized Wastewater Treatment and Disposal System

Description:

Attachments: *[List documents supporting change]*

Purpose for Work Change Directive:

Directive to proceed promptly with the Work described herein, prior to agreeing to changes on Contract Price and Contract Time, is issued due to: *[check one or both of the following]*

- Non-agreement on pricing of proposed change.
- Necessity to proceed for schedule or other Project reasons.

Estimated Change in Contract Price and Contract Times (non-binding, preliminary):

Contract Price \$	[increase] [decrease].
Contract Time days	[increase] [decrease].

Basis of estimated change in Contract Price:

- | | |
|---|-------------------------------------|
| <input type="checkbox"/> Lump Sum | <input type="checkbox"/> Unit Price |
| <input type="checkbox"/> Cost of the Work | <input type="checkbox"/> Other |

RECOMMENDED:	AUTHORIZED BY:	RECEIVED:
By: Engineer (Authorized Signature)	By: Owner (Authorized Signature)	By: Contractor (Authorized Signature)
Title:	Title:	Title:
Date:	Date:	Date:

Approved by Funding Agency (if applicable)

By:	Date:
Title:	

END OF SECTION

**SECTION 000943
CERTIFICATE OF SUBSTANTIAL COMPLETION**

Owner:	Town of Montgomery, Vermont	Owner's Contract No.:	
Contractor:		Contractor's Project No.:	
Engineer:	Hoyle, Tanner & Associates, Inc.	Engineer's Project No.:	129800.02
Project:		Contract Name:	Center Community Decentralized Wastewater Treatment and Disposal System

This [preliminary] [final] Certificate of Substantial Completion applies to:

All Work The following specified portions of the Work:

Date of Substantial Completion

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Work or portion thereof designated above is hereby established, subject to the provisions of the Contract pertaining to Substantial Completion. The date of Substantial Completion in the final Certificate of Substantial Completion marks the commencement of the contractual correction period and applicable warranties required by the Contract.

A punch list of items to be completed or corrected is attached to this Certificate. This list may not be all-inclusive, and the failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance, and warranties upon Owner's use or occupancy of the Work shall be as provided in the Contract, except as amended as follows: *[Note: Amendments of contractual responsibilities recorded in this Certificate should be the product of mutual agreement of Owner and Contractor; see Paragraph 15.03.D of the General Conditions.]*

Amendments to Owner's responsibilities: None
 As follows:

Amendments to Contractor's responsibilities: None
 As follows:

The following documents are attached to and made a part of this Certificate:

This Certificate does not constitute an acceptance of Work not in accordance with the Contract Documents, nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract.

EXECUTED BY ENGINEER:	RECEIVED:	RECEIVED:
By: _____ (Authorized signature)	By: _____ Owner (Authorized Signature)	By: _____ Contractor (Authorized Signature)
Title: _____	Title: _____	Title: _____
Date: _____	Date: _____	Date: _____

**SECTION 000943
CERTIFICATE OF SUBSTANTIAL COMPLETION**

END OF SECTION

**SECTION 000950
CONSENT OF SURETY COMPANY TO FINAL PAYMENT**

OWNER'S CONTRACT NO.: _____

ENGINEER' PROJECT NO.: 129800.02

AGREEMENT DATE: _____

BOND NUMBER: _____

CONTRACT TITLE: Center Community Decentralized Wastewater Treatment and Disposal System

To: Town of Montgomery (Owner)
86 Mountain Road
Montgomery Center, VT 05471

From: _____ (Contractor)

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the _____(Surety) on the bond of _____(Contractor) hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall not relieve the Surety Company of any of it's obligations to the Town of Montgoery (Owner) as set forth in the said Surety Company's Bond.

IN WITNESS WHEREOF, the Surety Company has hereunto set its hand this _____ day of _____, 20__.

Surety Company

Signature of Authorized Representative

Attest: (Seal)

Name & Title

Note: Power of Attorney should be attached in instances where same applies.

END OF SECTION

SECTION 000960
CONTRACTOR'S FINAL LIEN WAIVER
(Page 1 of 2)

OWNER'S CONTRACT NO.: _____

ENGINEER' PROJECT NO.: 129800.02

AGREEMENT DATE: _____

CONTRACT TITLE: Center Community Decentralized Wastewater Treatment and Disposal System

To: Town of Montgomery (Owner)
86 Mountain Road
Montgomery Center, VT 05471

APPLICATION FOR FINAL PAYMENT

The undersigned hereby certifies that the amount owed set forth below constitutes the entire value of all work performed and services rendered by, through or under the undersigned with respect to the project not heretofore paid for up to and including the period covered by the above Application for Final Payment; that all work covered by such Application has been incorporated into the project and title thereto has passed to the Owner free and clear of all liens, claims, security, interests or encumbrances; and that no work covered by such Application has been acquired subject to an agreement under which any interest therein or an encumbrance thereon is retained by the seller or any other person. In consideration of payment of the requisition, the undersigned hereby releases the Owner from all claims of lien which the undersigned has regarding the Project.

The undersigned, in order to induce the Owner to pay the requisition, hereby represents that it has paid or will pay from the proceeds of the requisition all sums due to those parties who have performed work or provided materials to the undersigned in connection with the Project, and that it will on request of the Owner provide written evidence of the discharge by the undersigned of its obligations to such parties.

Executed under seal as of this _____ day of _____, 20__.

Amount Owed to Contractor by Owner as Final Payment:
\$ _____ (total value of project including change orders)

Amount Unpaid From Previous Application for Payment:
\$ _____

CONTRACTOR'S FINAL LIEN WAIVER
(Page 2 of 2)

From: _____ (Contractor)

Authorized Representative Signature

Name and Title (printed)

NOTARY:

Then personally appeared the above named _____ and
acknowledged the foregoing to be the free act and deed of the above-named Contractor, before
me.

Subscribed and sworn to on the _____ day of _____, 20____.

Notary Public: _____

My Commission Expires: _____

END OF SECTION

SECTION 000970
CERTIFICATE OF FINAL COMPLETION OF WORK
(Page 1 of 2)

OWNER'S CONTRACT NO.: _____

ENGINEER' PROJECT NO.: 129800.02

AGREEMENT DATE: _____

CONTRACT TITLE: Center Community Decentralized Wastewater Treatment and Disposal System

FINAL COMPLETION DATE PER AGREEMENT AND CHANGE ORDERS: _____

ACTUAL DATE OF FINAL COMPLETION: _____

FINAL CERTIFICATION OF CONTRACTOR

I hereby certify that the Work as identified in the Final Payment Request dated _____ for the above-noted construction Contract represents full compensation for the actual value of work completed. Additionally, all work completed conforms to the terms of the Agreement and authorized changes.

CONTRACTOR

Date

Authorized Representative's Signature

Name & Title

FINAL CERTIFICATION OF ENGINEER

I have reviewed the Contractor's Final Payment Request dated _____ and hereby certify that to the best of my knowledge, the cost of the work identified on the Final Payment Request represents full compensation for the actual value of work completed and that the work has been completed in accordance with the terms of the Agreement and authorized changes.

Hoyle, Tanner and Associate, Inc.
ENGINEER

Date

Authorized Representative's Signature

Name & Title

CERTIFICATE OF FINAL COMPLETION OF WORK

(Page 2 of 2)

FINAL ACCEPTANCE OF OWNER

I, as representative of the Owner, accept the above Final Certifications and authorize Final Payment in the amount of \$_____ and direct the Contractor's attention to the General Conditions. The guaranty for all Work completed subsequent to the date of Substantial Completion, expires _____year from the date of this Final Acceptance.

At a meeting of the _____(Town Council/Selectmen/Alderman), the Owner, _____(Name of the community) has accepted the constructed project.

Town of Montgomery _____
OWNER

Date

Authorized Representative's Signature

Name & Title

END OF SECTION

Date of Issuance:	Effective Date:
Owner:	Owner's Contract No.:
Contractor:	Contractor's Project No.:
Engineer:	Engineer's Project No.:
Project:	Contract Name:
	Notice to Proceed (date):
	Original Contract Length (days):

The Contract is modified as follows upon execution of this Change Order:

Description:

Attachments:

(Updated Schedule *required for any change in Contract Time*)

CHANGE IN CONTRACT PRICE	CHANGE IN CONTRACT TIMES <i>[note changes in Milestones if applicable]</i>
Original Contract Price: \$ _____	Original Contract Times: Substantial Completion: _____ Ready for Final Payment: _____ days or dates
[Increase] [Decrease] from previously approved Change Orders No. ___ to No. ___: \$ _____	[Increase] [Decrease] from previously approved Change Orders No. ___ to No. ___: Substantial Completion: _____ Ready for Final Payment: _____ days
Contract Price prior to this Change Order: \$ _____	Contract Times prior to this Change Order: Substantial Completion: _____ Ready for Final Payment: _____ days or dates
[Increase] [Decrease] of this Change Order: \$ _____	[Increase] [Decrease] of this Change Order: Substantial Completion: _____ Ready for Final Payment: _____ days or dates
Contract Price incorporating this Change Order: \$ _____	Contract Times with all approved Change Orders: Substantial Completion: _____ Ready for Final Payment: _____ days or dates

RECOMMENDED:	ACCEPTED:	ACCEPTED:
By: _____ Engineer (if required)	By: _____ Owner (Authorized Signature)	By: _____ Contractor (Authorized Signature)
Title: _____	Title: _____	Title: _____
Date: _____	Date: _____	Date: _____

Approved by Funding Agency (if applicable)

By: _____ Date: _____
Title: _____

CONTRACTOR'S PAYROLL CERTIFICATION AND AMERICAN IRON AND STEEL CERTIFICATION

(To be submitted with each application for payment)

Name of Contractor: _____

Address of Contractor: _____

Project Name: _____

Project Number: _____

Project Location: _____

Payment Application No.: _____

Payment App. End Date: _____

I hereby certify that all of the contract requirements as specified under the Labor Standards Provision for Federal and Federally Assisted Contracts have been complied with by the above-named Contractor, and by each Subcontractor employing Laborers or Mechanics at the site of the work, or there is an honest dispute with respect to the required provisions.

I hereby certify that the "American Iron and Steel" provisions of the Water Resources Reform and Development Act of 2014, the Consolidated Appropriations Act of 2014 ([Public Law 113-76](#)), and subsequent laws that continue the requirement for the use of American Iron and Steel products in State Revolving Fund construction projects as applicable, have been met, and that all iron and steel used in the project named above have been produced in the United States in a manner that complies with American Iron and Steel Requirements, and/or that applicable EPA-approved waivers have been obtained to comply with American Iron and Steel requirements.

CONTRACTOR: _____
Name of Responsible Official

Title

Signature

Date

AMERICAN IRON AND STEEL *DE MINIMIS* LIST FORMAT

Notes to User: This exhibit is an example format for Contractors to use in maintaining a list of items to document the use of the De Minimis waiver of the American Iron and Steel requirements. This list or similar is required to be filled out throughout the construction Contract as needed. The State Engineer may periodically ask to review this information. At the Contract completion, this list, along with all Manufacturers' certifications, are to be given to the Engineer for delivery to the Owner.

DE MINIMIS COSTING WORKSHEET

Project Name: _____

Contract Name/# (if more than one) _____

Contractor (Company Name): _____

Representative: _____

Date: _____

Total Cost of All Materials (or Estimated Value at 50% of the Installed Bid Price): _____ \$

Allowable Total *De Minimis* Costs (5% of all materials) _____ \$

Total Cost of all *De Minimis* Items _____ \$

Remaining Amount Allowed for Future *De Minimis* Items _____ \$

Note: No single De Minimis item can be more than 1% of the total material cost.

No.	Detailed Description and Manufacturer or Local Source of <i>De Minimis</i> Material	Quantity	Cost Per Item	Total Item Cost
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				

MANUFACTURER'S CERTIFICATION OF COMPLIANCE

Notes to User: This exhibit is the sample Manufacturer's Certification of Compliance with the American Iron and Steel requirements to be provided by all Manufacturers of American Iron and Steel covered items, to be submitted by Contractor to the Engineer with the corresponding Shop Drawing submittal for delivery to the Owner at Substantial Completion.

EXAMPLE OF A MANUFACTURER'S CERTIFICATION OF COMPLIANCE WITH PROVISIONS OF THE AMERICAN IRON AND STEEL (AIS) REQUIREMENTS OF SECTION 746 OF TITLE VII OF THE CONSOLIDATED APPROPRIATIONS ACT OF 2017 (DIVISION A - AGRICULTURE, RURAL DEVELOPMENT, FOOD AND DRUG ADMINISTRATION, AND RELATED AGENCIES APPROPRIATIONS ACT, 2017) AND SUBSEQUENT STATUTES MANDATING DOMESTIC PREFERENCE

Date:

Company Name:

Company Address:

Subject: American Iron and Steel (AIS) Certification for Project (X), Owner's Name, and Contract Number

I, (company representative), certify that the (melting, bending, galvanizing, cutting, etc.) processes for (manufacturing or fabricating) the following products and/or material shipped or provided for the subject project is in full compliance with the AIS requirement as mandated by Section 746 of Title VII of the Consolidated Appropriations Act of 2017 (Division A - Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statutes mandating domestic preference.

Item, Products and/or Materials, and location of delivery (City, State):

1.

2.

Such processes for AIS took place at the following location:

(City, State)

Authorized Company Representative Signature

Notes: Authorized signature will be Manufacturer's representative, not the material distributor or Supplier. If any of the above compliance statements change while providing materials to this project, please immediately notify the person(s) who is requesting to use your product(s).

CERTIFICATE OF OWNER’S ATTORNEY AND AGENCY CONCURRENCE

Notes to User: This exhibit consists of two certificates, on a single page, to be attached to the Contract and signed upon execution. The first is a certificate to be signed by the Owner’s attorney and the second is the concurrence to be signed by the State Engineer. This page is to be inserted after the Agreement between Owner and Contractor for Construction Contract (Stipulated Price) (EJCDC C-520, 2018) in the Construction Contract Documents.

CERTIFICATE OF OWNER’S ATTORNEY

PROJECT NAME:

CONTRACTOR NAME AND CONTRACT NUMBER:

I, the undersigned, _____, the duly authorized and acting legal representative of _____, do hereby certify as follows: I have examined the attached Contract(s) and performance and payment bond(s) and the manner of execution thereof, and I am of the opinion that each of the aforesaid agreements is adequate and has been duly executed by the proper parties thereto acting through their duly authorized representatives; that said representatives have full power and authority to execute said agreements on behalf of the respective parties named thereon; and that the foregoing agreements constitute valid and legally binding obligations upon the parties executing the same in accordance with the terms, conditions, and provisions thereof.

Name

Date

AGENCY CONCURRENCE

As lender or insurer of funds to defray the costs of this Contract, and without liability for any payments thereunder, the Agency hereby concurs in the form, content, and execution of this Agreement.

Agency Representative

Date

Name

GENERAL (PRIME) CONTRACTOR'S CERTIFICATION OF COMPLIANCE

Notes to User: This exhibit is the sample General (Prime) Contractor's Certification of Compliance with the American Iron and Steel requirements to be provided by all General (Prime) Contractors to Engineer for delivery to the Owner at Substantial Completion.

GENERAL (PRIME) CONTRACTOR'S CERTIFICATION OF COMPLIANCE WITH PROVISIONS OF THE AMERICAN IRON AND STEEL REQUIREMENTS OF SECTION 746 OF TITLE VII OF THE CONSOLIDATED APPROPRIATIONS ACT OF 2017 (DIVISION A - AGRICULTURE, RURAL DEVELOPMENT, FOOD AND DRUG ADMINISTRATION, AND RELATED AGENCIES APPROPRIATIONS ACT, 2017) AND SUBSEQUENT STATUTES MANDATING DOMESTIC PREFERENCE

DATE:

RE: PROJECT NAME
APPLICANT
CONTRACT NUMBER

I hereby certify that to the best of my knowledge and belief all Iron and Steel products installed for this project by my company and by any and all subcontractors and Manufacturers my company has contracted with for this project comply with Section 746 of Title VII of the Consolidated Appropriations Act of 2017 (Division A - Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statutes mandating domestic preference or are the subject of a waiver approved by the Secretary of Agriculture or designee.

Name of Construction Company (PRINT)

By Authorized Representative (SIGNATURE)

Title

ENGINEER'S CERTIFICATION OF FINAL PLANS AND SPECIFICATIONS

PROJECT NAME: _____

The final Drawings and Specifications, other assembled Construction Contract Documents, bidding-related documents (or requests for proposals or other construction procurement documents), and any other Final Design Phase deliverables, comply with all requirements of the U.S. Department of Agriculture, Rural Utilities Service, to the best of my knowledge and professional judgment.

If the Engineers Joint Contract Documents Committee (EJCDC) documents have been used, all modifications required by RUS Bulletin 1780-26 have been made in accordance with the terms of the license agreement, which states in part that the Engineer "must plainly show all changes to the Standard EJCDC Text, using 'Track Changes' (redline/strikeout), highlighting, or other means of clearly indicating additions and deletions." Such other means may include attachments indicating changes (e.g. Supplementary Conditions modifying the General Conditions).

Engineer

Date

Name and Title

SECTION 011000

SUMMARY OF WORK

1. GENERAL

1.1 CONTRACT DOCUMENTS

- A. Attention shall be directed to the General Conditions for the definition of the Contract Documents. This division of these specifications is a part of the Contract Documents as defined in the General Conditions. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other parts of these specifications.
- B. Titles to and arrangements of sections and paragraphs in these specifications are used merely for convenience and shall not be taken as a correct or complete segregation of the several categories of materials, equipment, and labor, nor as an attempt to outline or define jurisdictional procedures.
- C. The entire work provided for in these technical specifications and on the drawings shall be constructed and finished in every respect in a good, workmanlike, and substantial manner. All parts necessary for the proper and complete execution of the work, whether the same may have been specifically mentioned or not; or indicated on the drawings, shall be done, and furnished and installed in a manner corresponding with the rest of the work as if the same were particularly described and specifically provided for herein. It is not intended that the drawings shall show every detailed piece of material or equipment. Such parts and pieces as may be necessary to satisfactorily complete any system in accordance with the best practices and regulatory requirements, even though not shown, shall be furnished, and installed. All materials and equipment shall be new unless specifically stated otherwise in these Contract Documents.

1.2 GENERAL DESCRIPTION OF WORK

- A. The work under this Contract consists of the following:
 - 1. General Description of Work: The work consists of the construction of a new decentralized wastewater collection, treatment and disposal system. The work includes, but is not limited to:
 - a. A Water Resource Recovery Facility (WRRF) including: buried precast concrete flow equalization storage tanks; a Secondary+ Treatment System utilizing partially buried treatment tanks and including a precast concrete wet well and skid-mounted pumping and valve systems; a control building; and all associated site, piping, civil, electrical, mechanical, I&C (instrumentation and controls) work.
 - b. A Collection and Conveyance System including: demolition or removal and replacement of approximately 120 precast septic tanks on individual

properties; two wastewater effluent pumping stations; small diameter gravity sewer lines; small diameter pressure force mains; jack and bore subsurface roadway crossings; and all associated site, piping, civil, electrical, mechanical and I&C work.

- B. Each septic tank demolition or removal and replacement on each property must be performed and the replacement tank connected to the new collection system within an 8-hour construction period. Septic tanks shall be pumped no later than 3 days prior to the day of removal or demolition and replacement.
- C. The Work required by these specifications shall include furnishing all labor, skill, supervision, tools, construction plant, equipment, and materials; and performing all operations necessary for the properly completed contract work as shown on the drawings, as mentioned in these specifications, and as evidently required with all incidental work necessary and customarily done to the complete satisfaction of the Owner and its authorized representative.
- D. All appurtenant demolition, clearing, cleaning, finishing, landscaping, and restoration are part of this work.

1.3 CONTRACTOR USE OF PREMISES

- A. The Contractor expressly undertakes at their own expense:
 - 1. To take every precaution against injuries to persons or damage to property.
 - 2. To store their apparatus, materials, supplies, and equipment in such orderly fashion at the site of the work as will not unduly interfere with the progress of his work, the work of any other contractors or the movement of residents in the project area.
 - 3. To place upon the work or any part thereof only such loads as are consistent with the safety of that portion of the work.
 - 4. To clean up frequently and promptly at the end of each workday all refuse, rubbish, scrap materials, and debris caused by this operation, to the end that at all times the site and the work shall present a neat, orderly, and workmanlike appearance.
 - 5. To dispose of all waste or excess materials in a legally approved manner.
 - 6. Before final payment, to remove all surplus material, false-work, temporary structures, including foundations thereof, plant of any description, and debris of every nature resulting from the operations, and to put the site in a neat, orderly condition.
- B. The Contractor shall not, except after written consent from the proper parties, enter or occupy with workers, tools, materials, or equipment, any land outside the rights-of-way or property of the Owner. A copy of the written consent shall be given to the Engineer.
- C. The Contractor shall properly safeguard all existing utilities, structures, and appurtenances not scheduled for removal and shall restore and repair any such items or facilities damaged by his/her operations. Restoration and repair of damaged items shall be done solely at the Contractor's own expense.

- D. Contractor shall coordinate with the Owner for possible storage locations.

1.4 LIMITS OF WORK

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

1.5 CONSTRUCTION PERMITS AND EASEMENTS

- A. The owner shall be responsible for identifying all federal, state, and local permits required by the nature and location of construction, and all such permits shall be listed in Specification Section 011110 – Permits. To the extent possible, such permits shall be obtained prior to the solicitation of bids for construction, and copies of all permits so obtained shall be included in the permits section. The status of the application on each permit, including the conditions thereof, not obtained prior to the solicitation of bids shall also be indicated in the permits section.
- B. The Contractor shall be responsible for obtaining all building and other permits required of their equipment, work force, or particular operations in the performance of the contract.
 - 1. When construction permits are accompanied by regulations or requirements issued by a particular authority or agency, it shall be the Contractor's responsibility to familiarize themselves and comply with such regulations or requirements as they apply to his operations on this project.

1.6 LAYOUT OF WORK

- A. The Contractor shall do all layout from established points to properly complete the contract work.
- B. The Engineer will furnish the Contractor a CADD plan with basic survey data necessary for the layout of the work. The survey data shall establish certain reference points and benchmarks in the immediate vicinity of the work areas. The Contractor shall layout all additional lines and grades and otherwise do all layout and measurement necessary for the proper completion of the work.
- C. The Contractor shall be responsible for preserving the control points provided by the Engineer throughout the life of the project. All control points lost or destroyed through the Contractor's negligence or carelessness will be replaced by the Engineer who shall be reimbursed for such work by the Contractor.

- D. The Contractor shall aid the Engineer as requested to check the layout or otherwise control the work. Such assistance shall be understood to include the provision of suitable workforce to assist the Engineer in taping measurements, holding a survey rod for checking grades, and the like.
- E. The Engineer reserves the right to observe, inspect or check any of this work, and the Contractor shall not claim added compensation for any delay occasioned by the Engineer exercising this right, nor for any corrective work which is required as a result of the Engineer's inspections.
- F. The Contractor shall furnish a legally safe environment with all legally required safety equipment for the Engineer's and/or Owner's use during inspection and checking.
- G. The Contractor shall be responsible for laying out and constructing the work to the lines and grades indicated and specified. The Contractor shall be responsible for complete, timely, and accurate field measurements as necessary for proper coordination, fabrication, and installation of his materials and equipment. All layout and survey work shall be done by a competent agent or employee of the Contractor and shall be subject to the approval of the Engineer.

1.7 COMPUTATION OF QUANTITY

- A. Wherever the estimated quantities of work to be done and materials to be furnished under this contract are shown in any of the documents including the proposal, they are given for use in comparing bids and the right is especially reserved except as herein otherwise specifically limited, to increase or diminish them as may be deemed reasonably necessary or desirable by the Owner to complete the work contemplated by this contract. Any such increase or diminution shall in no way vitiate this contract, nor shall any such increase or diminution give cause for claims or liability for damage. (See individual items in Specification Section 012000 – Measurement and Payment, for additional information on quantity computation and measurement.)
- B. For estimating quantities in which the computation of areas by geometric methods would be comparatively laborious, the planimeter shall be considered an instrument of precision adapted to the measurement of such areas and shall be used for estimating quantities.
- C. The computation of the volume of prisms shall be by the method of average end areas.

1.8 OSHA REQUIREMENTS

- A. The Contractor is obligated to meet all OSHA requirements for safe trenching and excavation procedures. The Contractor is hereby referred to the latest revised OSHA standards as published in Title 29 of the Code of Federal Regulations (29 CFR), Part 1926 and as published in the Federal Register on Tuesday, October 31, 1989. The Contractor shall be solely responsible for compliance with these latest OSHA standards for work on this project.

1.9 RECORD DOCUMENTS

- A. A complete set of Contract Documents shall be maintained at the work site by the Contractor. Refer to Specification Section 017839 – Project Record Document requirements.
- B. The Contractor shall record all changes and/or deviations from the original Contract Documents on Record ("As-Built") Documents. All such changes shall be clearly and accurately marked by the Contractor and shall include, but not be limited to:
 - 1. Locations of piping, structures, and foundations including material types, revised stationing, distances, slopes, elevations, inverts, sizes, etc.
 - 2. Any unknown conditions discovered during construction such as buried pipelines, structures, etc.
 - 3. The location and extent of all ledge/rock removed during construction.
 - 4. Location, size, and type of ducts and major raceway systems, both exterior and interior; locations of control devices, distribution and branch electrical circuitry, fuse, and circuit breaker size arrangements.
 - 5. Location of all interior and yard piping.
 - 6. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
 - 7. Miscellaneous items such as equipment pads, valves, valve operators, etc.
 - 8. Approved substitutions, Contract Modifications, and actual equipment and materials installed.
- C. A complete set of Record Documents shall be delivered, in good condition, to the Engineer by the Contractor at the completion of the work before final payment is due and payable. The document format shall be clear, concise, and acceptable to the Engineer. Defective, incomplete, torn, faded, stained, illegible, or otherwise deficient drawings will not be accepted. The Contractor shall be responsible for furnishing Record Documents of similar format and quality to the Engineer from all Subcontractors.
- D. The Contractor shall furnish copies of all warranties to the Owner.

1.10 SAFETY

- A. The Contractor (and the subcontractors) shall be required to comply with all applicable federal, State, and local regulations, codes, rules, laws, and ordinances and shall, at all times, exercise reasonable precautions for the safety of all persons. All rules, regulations and laws concerning safety that are in effect at the work site and in particular, all applicable regulations of the Occupational Safety and Health Administration of the U.S. Government, in addition to all the requirements of these Specifications, shall be complied with in all respects.
- B. The Contractor shall provide adequate equipment and facilities as are necessary and required for first aid service to any person who may be injured in the prosecution of the work under this Contract whether they are their own personnel, their subcontractor's personnel, the Owner's representative, or other persons who may for any reason enter

within the limits of the contract work. The Contractor shall have standing arrangements for removal and hospital treatment of any person who may be injured.

- C. The Contractor agrees to indemnify and hold the Owner and Engineer harmless for, of, and from any loss including but not limited to fines, legal fees, penalties, and corrective measures that the Contractor, Owner, or Engineer may sustain by reason of the Contractor's failure to provide a safe workplace or to comply with all laws, rules, and regulations in connection with the performance of this Contract.

1.11 COMPACTION OF TRENCHES WITHIN ROADWAYS

- A. The Contractor shall backfill and compact trenches within roadway rights-of-way (ROW) in strict conformance with the State of Vermont Agency of Transportation (VAOT) Standard Specifications for Road Construction, latest edition.

2. PRODUCTS

- 2.1 None used.

3. EXECUTION

- 3.1 None used.

END OF SECTION

SECTION 011010

PERMITS

1. GENERAL

1.1 CONTRACT DOCUMENTS

- A. Attention shall be directed to the General Conditions for the definition of the Contract Documents. The Contract Documents shall govern the work covered in all parts of these specifications.
- B. The Owner shall be responsible for identifying all federal, state, and local permits required by the nature and location of construction except as noted below. To the extent possible, such permits shall be obtained prior to the solicitation of bids for construction, and copies of all permits so obtained shall be included in these Contract Documents. The status of the application on each permit, including the conditions thereof, not obtained prior to the solicitation of bids shall also be indicated below. The Contractor shall obtain insurance as necessary to enable the Owner to obtain the necessary permits.
- C. The Contractor shall be responsible for obtaining all building and other permits required of their equipment, work force, or particular operations in the performance of the contract.

1.2 DEPARTMENT OF PUBLIC SAFETY, DIVISION OF FIRE SAFETY PERMIT

- A. A copy of this Permit is included in the Appendix. The Contractor must actively comply with all requirements of this permit.

1.3 GENERAL PERMIT 3-9020 FOR STORMWATER RUNOFF FROM CONSTRUCTION SITES

- A. A Vermont Agency of Natural Resources (VT ANR) Stormwater Construction Discharge General Permit (CGP) 3-9020 Notice of Intent (NOI) is required for this project. The Contractor shall be responsible for implementing and maintaining measures for erosion prevention and sedimentation control in accordance with Vermont DEC guidelines.

1.4 LOCAL PERMITS

- A. Planning and Zoning
 - 1. The Town of Montgomery Department of Planning and Zoning will require the following permits:
 - a. Zoning Permit: The Owner shall be responsible for obtaining approval from the Town Department of Planning and Zoning, Development Review Board for the construction of this project. The permit is required prior to performing any work within the project site.

SECTION 011216

WORK SEQUENCE

1. GENERAL

1.1 SECTION INCLUDES

- A. The Contractor shall coordinate their operations with those of the property owners. Cooperation will be required in the arrangement for the storage of materials and in the execution of the Work.
- B. The Contractor shall immediately upon award of the contract prepare a complete listing of equipment and materials and shall determine lead time between placing orders and delivery, including normal allowances of time for processing and correcting shop drawings. The construction schedule shall reflect these delivery dates. All orders for long-lead items shall be placed promptly; with those submittals prioritized such that orders can be placed within 30 days of award if delivery is critical to scheduling. Failure to place orders promptly will result in full liability for liquidated damages if schedules are not met.
- C. The Contractor shall plan their operations so that the operation and maintenance of existing utilities, including any electric, gas, water, sewer or drain utilities, are sustained. Any proposed interruption by the Contractor during construction must receive the prior approval of the Owner or other agencies, public or private, having jurisdiction over such facilities. See Specification Section 015000 – Temporary Facilities and Controls.
- D. If conditions are such that the work must be suspended at any time, it will be suspended only on written authorization from the Owner and only for such period of time as the Owner approves, consistent with the applicable requirements of the General Conditions. Depending on the reason, the period of such suspension of work may be excluded from the time limits established in the Agreement. During such suspensions, or during any period of general inactivity on the project, all material and equipment delivered to the site of the work shall be properly stored and protected.

1.2 CONSTRUCTION SEQUENCE

- A. The following is the intended sequence of construction.
 - 1. Construction of the Water Resource Recovery Facility (WRRF)
 - 2. Construction of the Collection and Conveyance System
 - 3. Removal or Demolition and Replacement of Septic Tanks on Individual Properties
- B. The WRRF and Conveyance Systems must be completed, tested and operational before septic tanks can be replaced and connected to the new system. The Collection (sewer) System can be constructed concurrently with the WRRF construction.
- C. Each Septic Tank removal or demolition and replacement on each property must be performed and the replacement tank connected to the new collection system within an

8-hour construction period. Septic tanks scheduled for removal or demolition and replacement shall be pumped prior to the day of removal and replacement.

- D. The Contractor shall prepare a detailed construction schedule to meet the required functions stated in this Section.
 - 1. Any process equipment, utility, etc. necessary to maintain the required functions must be maintained.
 - 2. The Contractor may submit an alternative method or order of work which shall be subject to the review and approval by the Engineer and Owner, prior to the commencement of work.
 - 3. Additionally, the Contractor shall make whatever provisions are necessary to protect and maintain the continued operation of the existing septic tanks.
 - 4. All existing underground services shall be located and identified prior to starting any new construction.
 - 5. All other work including new construction and demolition not mentioned in the above schedule may be performed concurrently with any stage of the work so long as the performance of such work will in no way inhibit the continuity of the existing septic tank operations, nor the quality of effluent disposal. Nothing contained herein shall preclude the Contractor from suggesting improved sequences of work. The Contractor shall coordinate their work closely with the ongoing work of all subcontractors.

- E. Any such equipment that must be relocated, either temporarily or permanently, or any process equipment, utilities, etc., that must be installed, either temporarily or permanently, to maintain wastewater conveyance and disposal for a septic tank system shall be the responsibility of the General Contractor. The Contractor shall include the cost of all temporary facilities required during the construction period in the base bid price, which may include, but is not limited to by-pass pumping and/or contracted pumping and hauling of septage to an approved site for treatment. The cost shall include the cost of all labor, tools, equipment, and materials necessary to perform the work.

- F. The Contractor shall submit to the Engineer for approval, a plan of operation for the complete project and each of the three major components which include: the Water Resource Recovery Facility (WRRF), conveyance system, and the existing

2. PRODUCTS

- 2.1 None used.

3. EXECUTION

- 3.1 None used.

END OF SECTION

1.5 VERMONT AGENCY OF TRANSPORTATION (VAOT) STATE HIGHWAY ACCESS AND WORK PERMIT

- A. A copy of this Permit is included in the Appendix. The Contractor must actively comply with all requirements of this permit.

1.6 CONTRACTOR RESPONSIBILITY

- A. The Contractor shall be responsible for obtaining all building and other permits required of their equipment, workforce, or particular operations (such as blasting or local street opening permits) in the performance of the contract.
 - 1. When construction permits are accompanied by regulations or requirements issued by a particular authority or agency, it shall be the Contractor's responsibility to familiarize themselves and comply with such regulations or requirements as they apply to their operations on this project.

1.7 WASTE DISPOSAL

- A. The Contractor shall be responsible for complying with all applicable Federal, State and local regulations regarding waste disposal from this project.

2. PRODUCTS

- 2.1 None used.

3. EXECUTION

- 3.1 None used.

END OF SECTION

SECTION 012000

MEASUREMENT AND PAYMENT

1. GENERAL

1.1 SECTION INCLUDES

- A. Payments to the Contractor will be made in accordance with the General Conditions of this specification.
- B. Payment for "extra work", authorized in writing by the Engineer shall be made upon completion of the "extra work" to the satisfaction of the Engineer and in the amount agreed upon at the time of authorization.
 - 1. Terms of such payment shall be as stated in the General Conditions.
 - a. All work shall be constructed under the lump sum bid except as noted below. Payment for any lump sum bid item shall be based on an approved schedule of values detailing work to be accomplished under the specific item. Contractor shall submit schedule of values for review and approval.

1.2 WATER RESOURCE RECOVERY FACILITY (WRRF)

- A. Measurement
 - 1. Measurement of the WRRF shall be by percentage of completion
- B. Payment
 - 1. Payment of the lump sum price shall be full compensation for installing all treatment and disposal systems, structures, piping, site work, electrical, instrumentation and controls and all other work required for a complete operational facility and shown on the plans and described in the specifications.

1.3 SEWER MAIN (Bid Item A-1)

- A. Measurement
 - 1. Measurement of PVC sewer main pipe shall be per linear foot as installed, from inside face of sewer manhole to inside face of sewer manhole, measured to the nearest foot.
- B. Payment
 - 1. Payment of the per unit price bid shall be full compensation for installing all sewer main pipe, including interconnection with the proposed fittings, connection to sewer services, connections to structures; establishing and maintaining a temporary sewer service, including sewer bypass pumping as required during the prosecution of the work; and all required bends for proper pipe installation, complete, including all saw-cutting pavement prior to excavation; trenching, excavation support, drainage, dewatering, excavation, removal and disposal of existing piping, bedding, backfill, compaction, gravel and crushed gravel subbase, waste material disposal, permits, acceptance testing, surface restoration including replacement of sidewalk

(restoration of concrete sidewalk to include replacement of sidewalk panel to the nearest joint) replacement of signage, restoration of stone walls not included in other pay items, and all appurtenances and related work as shown on the Contract Drawings and specified herein to make a complete sewer pipe installation.

1.4 STORM MAIN (Bid Item A-2)

A. Measurement

1. Measurement of drainage pipe shall be per linear foot as installed, from inside face of structure to inside face of structure, measured to the nearest tenth (0.10) of a foot.

B. Payment

1. Payment of the per unit price bid shall be full compensation for installing all drain pipe, including interconnection with the proposed fittings, connections to structures, complete, including all saw-cutting pavement prior to excavation, pavement removal, trenching, excavation support, drainage, dewatering, excavation, bedding, backfill, compaction, gravel and crushed gravel subbase, waste material disposal, testing, loam and seed, replacement of signage, restoration of stone walls, and surface restoration including replacement of sidewalk (restoration of concrete sidewalk to include replacement of sidewalk panel to the nearest joint) not included in other pay items and all appurtenances and related work as shown on the Contract Drawings and specified herein

1.5 4' PRECAST CONCRETE MANHOLE, FRAME, AND COVER (Bid Item B-1)

A. Measurement

1. 48" diameter manholes shall be measured by the vertical foot as measured to the nearest tenth (0.10) of a foot from the invert of the out flowing pipe to the top surface of the manhole rim.

B. Payment

1. Payment of the per unit price bid shall be full compensation for furnishing and installing all 4' diameter precast concrete sewer manholes complete, including connection to proposed sewer mains, all saw-cutting pavement prior to excavation, trenching, excavation support, drainage, dewatering, excavation, removal of existing structures to be replaced, bedding, backfill, compaction, gravel and crushed gravel subbase, waste material disposal, invert, frame and cover and all appurtenances and related work as shown on the Contract Drawings and specified herein.
 - a. No separate payment will be made to vertically adjust the frame and cover from temporary to final surface grades. Castings shall be raised no more than one week in advance of paving.
 - b. Reconnection of existing pipes connecting to the manhole that are not identified for replacement on the Drawings shall be subsidiary to this item. If existing pipes connecting to the manhole that are not identified for replacement on the Drawings are damaged during installation of the new manhole, pipes shall be furnished and replaced in-kind at no additional cost to a limit of 8 feet from the outside face of the manhole at the direction of the Engineer.

1.6 SEWER SERVICE (Bid Item B-2)

A. Measurement

1. Sewer service pipe shall be measured by the linear foot to the nearest tenth (0.10) of a foot, installed, as measured from the bell of the wye on the main sewer to the end of the new pipe. Where chimneys are installed, service lines shall be measured from the bell of the wye branch at the top of the chimney to the end of the new service pipe.

B. Payment

1. Payment of the per unit price bid shall be full compensation for installing sewer service pipe, including interconnection with the proposed fittings, complete, including all saw-cutting pavement prior to excavation, pavement removal, trenching, excavation support, drainage, dewatering, excavation, removal and disposal of existing piping, disposal of existing buried cleanouts not identified to be raised, bedding, backfill, compaction, gravel and crushed gravel subbase, waste material disposal, testing, paving, loam and seed, surface restoration including replacement of sidewalk (restoration of concrete sidewalk to include replacement of sidewalk panel to the nearest joint) replacement of signage, restoration of stone walls and all appurtenances and related work as shown on the Contract Drawings and specified herein to make a complete sewer pipe installation.

1.7 SEWER CLEANOUT (Bid Item B-3)

A. Measurement

1. Measurement shall be by the Engineer as the quantity installed, complete and accepted.

B. Payment

1. Payment of the per unit price bid for sewer cleanouts shall be full compensation for furnishing and installing vertical cleanout pipe, tee-wye fitting, and cleanout sleeve, complete, with cleanout lid as shown on the Contract Drawings, including excavation, bedding, furnishing, placing and compacting backfill and refill, dewatering, disposal of excess material, replacement of signage, restoration of stone walls and surface restoration including replacement of sidewalk (restoration of concrete sidewalk to include replacement of sidewalk panel to the nearest joint) not included in other pay items. Unit shall consist of one sewer service cleanout and one cleanout lid per sewer service.

1.8 4' PRECAST CONCRETE DRAIN MANHOLE, FRAME, AND COVER (Bid Item B-4)

A. Measurement

1. 4' diameter drain manholes shall be measured by the vertical foot as measured to the nearest tenth (0.10) of a foot from the invert of the out flowing pipe to the top surface of the manhole rim.

B. Payment

1. Payment of the per unit price bid shall be full compensation for furnishing and installing all 4' diameter precast concrete drain manholes, including connection to proposed drain lines, complete, including all saw-cutting pavement prior to excavation, trenching, excavation support, drainage, dewatering, excavation, removal of existing structures to be replaced, bedding, backfill, compaction, gravel and crushed gravel subbase, waste material disposal, invert, frame and cover, and all appurtenances and related work as shown on the Contract Drawings and specified herein.
 - a. No separate payment will be made to vertically adjust the frame and cover from temporary to final surface grades. Castings shall be raised no more than one week in advance of paving.

1.9 REMOVAL AND DISPOSAL OF EXISTING CONCRETE STRUCTURES (Bid Item B-5)

A. Measurement

1. Measurement shall be by the Engineer as the quantity removed and legally disposed of offsite.

B. Payment

1. Payment of the per unit price bid shall be full compensation for removal and disposal of existing sewer manhole to a depth of three (3) feet below finish grade where remainder of manhole shall be filled with compacted backfill and abandoned in place, only where sewer manhole is abandoned and not replaced with a new sewer manhole. Payment shall include all saw-cutting pavement prior to excavation, trenching, excavation support, drainage, dewatering, excavation, bedding, backfill, and waste material disposal as required, and all appurtenances and related work as shown on the Contract Drawings and specified herein.

1.10 COPPER WATER SERVICE (Bid Item B-6)

A. Measurement

1. Measurement for water services and fittings will be the unit price bid for this item complete in place.

B. Payment

1. Payment shall constitute full compensation for all work under this item including: excavation, bedding, backfill and refill, disposal of excavated material unsatisfactory for backfill, insulation where 6' of cover is not maintained, all required fittings including corporations and service valves, service pipe used to connect the house services from the curb stop to the water main, maintaining existing water service, dewatering, testing, disinfection of the completed installation, and furnishing all labor, materials, plant, equipment and incidental items necessary to satisfactorily complete this item. Capping/plugging of existing water services to be relocated shall be incidental to this bid item. No additional payment will be made for cleanup or the removal of protective materials ordered to be removed.

1.11 ROCK EXCAVATION (Bid Item C-1)

A. Measurement

1. The quantity for payment under this item is the number of cubic yards of rock excavation measured to the nearest 0.1 cubic yard for any for solid rock or boulders excavated when found to measure two (2) cubic yards or more in excavation for roadways, site grading, grading or structures.
 - a. This item shall not include removal of concrete or other building materials encountered during construction. Such material shall be removed and disposed of under demolition and site preparation.

B. Payment

1. Payment for general rock excavation shall be by the cubic yard and shall constitute full compensation for drilling, fracturing, hammering, removal, disposal, refill and for all labor, equipment, materials and incidental work necessary for the satisfactory completion of the work under this section.

1.12 MISCELLANEOUS BELOW GRADE EXCAVATION (Bid Item C-2)

A. Measurement

1. Measurement for the unit price for test pits performed at the direction of the Engineer, shall be per the dimensions of the completed test pit, measured to the nearest 0.1 cubic yard.

B. Payment

1. Payment for the unit price for test pits performed at the direction of the Engineer, to determine location of subsurface conditions and utilities shall be at the fixed price rate per cubic yard and shall constitute full compensation for all costs involved in connection with and incidental to the work performed in digging test pits including protection of all existing utilities, backfilling, compacting, restoration, and cleanup.
 - a. No separate payment shall be made for test pits performed for the Contractor's convenience and/or without direction of the Engineer.

1.13 UNSUITABLE MATERIAL (Bid Item C-3)

A. Measurement

1. The quantity for payment under this item is the number of cubic yards of unsuitable material removed and replaced.

B. Payment

1. The price for this item is the full compensation for removal, disposal, refill and all labor, materials, equipment, and incidental work.

1.14 CONCRETE – CLASS B (Bid Item E-1)

A. Measurement

1. The quantity for payment under this item is the number of cubic yards of miscellaneous 4,000 psi concrete placed. Miscellaneous concrete will be measured in place, provided that the in-place dimensions do not exceed those approved by the Engineer.

B. Payment

1. The price for this item is the full compensation for furnishing, forming, placing reinforcement and concrete, and finishing as required or directed by the Engineer and all work incidental to and in connection with the satisfactory completion of this item.

1.15 CALCIUM CHLORIDE (Bid Item E-2)

A. Measurement

1. Calcium chloride for dust control shall be as ordered by the Engineer, measured by the ton in accordance with the Standard Specifications, on the basis of delivery slips submitted to the ENGINEER, but in any case, not to exceed the rate ordered. Measurements shall be made to the nearest 0.01 of a ton as approved by the Engineer.

B. Payment

1. The accepted quantity of calcium chloride for dust control will be paid for at the Contract unit price per ton, as stated in the Bid Schedule, complete, delivered, and in place.

1.16 RIGID TRENCH INSULATION (Bid Item E-3)

A. Measurement

1. Measurement for the insulation shall be based on in-place dimensions of continuous insulation with no gaps, by the square foot to the nearest whole square foot. Where two layers of 2-inch rigid board insulation is required or directed by the Engineer, measurement shall be per square foot, per layer of 2-inch insulation.

B. Payment

1. Payment for the unit price bid for 2-inch rigid board insulation shall be full compensation for all costs associated with furnishing and installing insulation. No separate payment shall be made for overlap of insulation, waste, or insulation installed for the Contractor's convenience.

2. PRODUCTS

- 2.1 None used.

3. EXECUTION

- 3.1 None used.

END OF SECTION

SECTION 012973

SCHEDULE OF VALUES

1. GENERAL

1.1 CONTRACT DOCUMENTS

- A. Work included: Provide a detailed breakdown of the agreed Contract Sum showing values allocated to each of the various parts of the Work, as specified herein and in other provisions of the Contract Documents.
- B. Related Work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
 - 2. Schedule of values is required in accordance with the General Conditions.
 - 3. Breakdown shall be made using the Construction Specifications Institute Index.

1.2 QUALITY ASSURANCE

- A. Use required means to assure arithmetical accuracy of the sums described.
- B. When so required by the Engineer, provide copies of the subcontracts or other data acceptable to the Engineer, substantiating the sums described.

1.3 SUBMITTALS

- A. Prior to first application for payment, submit a proposed schedule of values to the Engineer.
 - 1. Meet with the Engineer and determine additional data, if any, required to be submitted.
 - 2. Submit Purchase Orders from vendors for all proprietary equipment, including, but not limited to, return and waste sludge pumps, primary and secondary scum removal equipment, chemical feed pumps, polymer feed system and chemical storage tanks.
 - 3. Secure the Engineer's approval of the schedule of values prior to submitting first application for payment.
 - 4. Submit schedule of values with each pay request indicating the percentage of work completed.
- B. The Schedule of Values shall include, but not limited to, the following detail for the purposes of measuring progress for each item:
 - 1. Procurement - approved submittal
 - 2. Delivery to site
 - 3. Installation
 - 4. Start-up testing, commissioning, and acceptance

2. PRODUCTS

- 2.1 Not used.

3. EXECUTION

3.1 Not used.

END OF SECTION

SECTION 013113

ADMINISTRATION OF WORK

1. GENERAL

1.1 CONTRACT DOCUMENTS

- A. Attention shall be directed to the General Conditions for the definition of the Contract Documents. This division of these specifications is a part of the Contract Documents as defined in the General Conditions. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other parts of these specifications.

1.2 COORDINATION

- A. The Contractor shall coordinate their operations with those of other contractors. Cooperation will be required in the arrangement for the storage of materials and in the detailed execution of the work. The Contractor, including their subcontractors, shall keep informed of the progress and the detailed work of other contractors and shall notify the Engineer immediately of lack of progress or defective workmanship on the part of other contractors. Failure of a Contractor to keep informed of the work progressing on the site and failure to give notice of lack of progress or defective workmanship by others shall be construed as acceptance by them of the status of the work as being satisfactory for proper coordination with their work.

1.3 PRECONSTRUCTION CONFERENCE

- A. The Contractor shall not commence work until a conference has been held at which representatives of the Contractor, Engineer, Owner, and Vermont Department of Environmental Conservation, USDA-Rural Development, and any other applicable funding agencies are present. The preconstruction conference will be arranged by the Engineer.
- B. In attendance shall be:
 - 1. Owner.
 - 2. Engineer.
 - 3. Contractor.
 - 4. Representatives of USDA-Rural Development.
 - 5. Representatives of VTDEC WID.
 - 6. Representatives of utilities or entities listed in Specification Section 011416 – Coordination.
- C. The minimum agenda will consist of the following:
 - 1. Introduction.
 - 2. Designation of responsible personnel from the Town, Contractor, Engineer, and State.
 - 3. Provide a list of all subcontractors to be used on the project.
 - 4. Requirements of Town Departments and other organizations.
 - 5. Relationships and coordination with utilities or entities and/or work.

6. Discuss Davis Bacon wage rates and DBE reporting requirements.
7. Discuss AIS requirements.
8. Distribute and discuss the preliminary construction schedule.
9. Submittal and discussion/acceptance of Schedule of Values.
10. Critical work sequencing.
11. Major material deliveries and priorities.
12. Pre-Construction Documentation.
13. Survey.
14. Staking of work.
15. Submittal of shop drawings, project data and samples.
16. RFI procedures.
17. Processing of field decisions and change orders.
18. Procedure for maintaining record documents.
19. Complete time for contract and liquidated damages.
20. Requests for extension of contract time.
21. Procedures for making partial payments.
22. Guarantee on completed work.
23. Equipment to be used.
24. Project inspection.
25. Testing laboratory services.
26. Location of project offices.
27. Storage of equipment and materials on site.
28. Rights-of-way and easements, and work outside of these.
29. Traffic control plan.
30. Emergency vehicle access.
31. Security procedures.
32. Safety and first aid procedures.
33. Emergency phone numbers.
34. Labor requirements.
35. Hours of work.
36. Public outreach.

1.4 JOB SITE ADMINISTRATION

- A. The Contractor shall keep a competent and authorized supervisory representative at each work location during all working hours whether work is being performed by the General or Subcontractor, who shall act as the agent of the Contractor.
- B. The supervisory representative on the contract work shall be a competent superintendent capable of reading and thoroughly understanding the drawings and specifications, with full authority to promptly fulfill the Contractor's duties and responsibilities on the job. The Contractor's supervisory representative shall be subject to the approval of the Owner. The supervisory representative shall not be removed from the work without prior written consent of the Owner. If in the opinion of the Owner the supervisory representative or any of their successors proves incompetent, not conscientious, or not industrious, then the Contractor shall replace him with another person approved by the Owner. Approval by the

Owner shall not, in any way, relieve or diminish the Contractor's responsibility for supervision of the work.

- C. The Contractor shall only employ competent workers on the job. Whenever the Engineer or the Owner's Representative notify the Contractor in writing that, in their opinion, any worker on the job, whether employed by the Contractor or any of his subcontractors, is incompetent, unfaithful, disorderly, or otherwise unsatisfactory, such workers shall be discharged from the contract work and shall not be employed on it, except with the written consent of the Engineer and Owner's Representative. Plumbers and electricians shall be licensed as required by local and state authorities.

1.5 PROGRESS MEETINGS

- A. Weekly progress meetings shall be held during active construction periods. In attendance shall be a person in responsible charge representing the Contractor, representative of the Owner, resident project representative, Engineer and representative of utilities or entities listed in Specification Section 011416 - Coordination, as needed.
- B. Suggested agenda:
 - 1. Review of work progression since previous meeting.
 - 2. Filed obstructions, problems, conflicts.
 - 3. Review of delivery schedules.
 - 4. Revision to construction schedules.
 - 5. Coordination of schedules.
 - 6. Review of construction procedures proposed for upcoming elements of work.
 - 7. Traffic control plan.
- C. The Contractor will be required to submit a construction schedule monthly prior to the time the construction pay estimate is submitted. One of the weekly meetings will be used as the monthly partial payment request and monthly schedule update.
- D. If in the opinion of the Engineer, the Contractor is not maintaining progress in accordance with the proposed construction schedule they will be required to make an extra effort to provide the additional resources necessary to adhere to the proposed schedule.

1.6 FIELD ENGINEERING

- A. The Contractor shall be responsible for laying out and constructing the work to the lines and grades indicated and specified. The Contractor shall be responsible for complete, timely, and accurate field measurements as necessary for proper coordination, fabrication, and installation of their materials and equipment. All layout and survey work shall be done by a competent agent or employee of the Contractor and shall be subject to the approval of the Engineer. Reference points and benchmarks established by the Engineer are shown on the Contract Drawings.

1.7 SAFETY

- A. The Contractor (and subcontractors) shall be required to comply with all applicable federal, state, and local regulations, codes, rules, laws, and ordinances and shall, at all times, exercise reasonable precautions for the safety of all persons. All rules, regulations, and laws concerning safety that are in effect at the work site, and in particular, all applicable regulations of the Occupational Safety and Health Administration of the U.S. Government, in addition to all the requirements of these Specifications, shall be complied with in all respects.
- B. The Contractor shall provide adequate equipment and facilities as are necessary and required for first aid service to any person who may be injured in the prosecution of the work under this Contract whether they are their own personnel, subcontractor's personnel, the Owner's representative, or other persons who may for any reason enter within the limits of the contract work. The Contractor shall have standing arrangements for removal and hospital treatment of any person who may be injured.
- C. The Contractor agrees to indemnify and hold the Owner and Engineer harmless for, of, and from any loss including but not limited to fines, legal fees, penalties, and corrective measures that the Contractor, Owner, or Engineer may sustain by reason of the Contractor's failure to provide a safe workplace or to comply with all laws, rules, and regulations in connection with the performance of this Contract.
- D. Refer to Specification Section 015000 – Temporary Facilities and Controls for additional site safety requirements.

2. PRODUCTS

- 2.1 None used.

3. EXECUTION

- 3.1 None used.

END OF SECTION

SECTION 013233

PROJECT PHOTOGRAPHS AND VIDEOTAPES

1. GENERAL

1.1 CONTRACT DOCUMENTS

- A. Attention shall be directed to the General Conditions for the definition of the Contract Documents. This division of these Specifications is a part of the Contract Documents as defined in the General Conditions. All applicable parts of the balance of the Contract Documents are equally as binding for this Section as for all other parts of these Specifications.

2. PRODUCTS

- 2.1 Not used.

3. EXECUTION

3.1 PHOTOGRAPHIC DOCUMENTATION OF PRECONSTRUCTION CONDITIONS

- A. Prior to the start of construction, the Contractor shall document and record existing (preconstruction) conditions in a thorough and comprehensive manner. Photographs shall be taken throughout the entire construction site. Photographs shall be taken every fifty (50) feet along the centerline of the route of any sewer, drain, waterline, force main, duct bank and/or roadway being constructed or modified. All photographs shall be numbered and cataloged with photograph number, date, time and identification of object or scene photographed clearly identified in the log.
 - 1. The Contractor shall give sufficient notice to the Engineer when picture taking has been scheduled so that the Engineer's Representative may be present. The Contractor or their project superintendent shall also be present when the photographs are taken to assist the photographer and/or Engineer's Representative with layout and to note any preconstruction conditions requiring additional photographic evidence.
- B. All pictures shall be taken using a digital camera. Poor quality photographs will not be accepted. The Engineer shall be the sole judge of acceptability.
- C. The Contractor shall document the existing conditions located near the proposed work prior to construction, to include but not limited to:
 - 1. All existing buildings, septic tanks, and other structures.
 - 2. Any vegetation to be disturbed, removed, or relocated.
 - 3. Sidewalks, walkways, equipment, driveways, or fences. Close-ups shall be taken as necessary to show existing patches and cracks in pavements, walls, and sidewalks as well as similar conditions.

- a. Failure to document any existing damage such as cracked sidewalks via photographic efforts prior to the start of construction, may result in the Contractor being liable for the repair of any damages.

END OF SECTION

SECTION 013300

SUBMITTALS

1. GENERAL

1.1 SECTION INCLUDES

- A. Requirements for submitting product data, shop drawings and samples, construction schedules, requests for information (RFIs), performance affidavits and Operation and Maintenance (O&M) manuals.
- B. A detailed Schedule of Values, refer to Specification Section 012973 – Schedule of Values, shall be submitted for each lump sum item in the bid. The schedule of values must be submitted and approved by the Engineer prior to any work being initiated. The schedule shall be broken down by specification section and by subject.
- C. “Or Equals” and Substitutions shall be considered as required by Articles 7.04 and 7.05, respectively, of the General Conditions to this Contract.

1.2 CONSTRUCTION SCHEDULES

- A. Planning and progress schedules shall be submitted to the Engineer by the Contractor at the end of each month during the progress of the work for the duration of the project. Revised schedules must be provided along with monthly payment requests. Failure to provide schedules may delay processing of pay requests.
 - 1. The Contractor shall also submit to the Engineer, at the end of each month, itemized estimates of work completed for the purpose of making partial payments thereon. The costs employed in preparing any of these schedules will be used only for determining the basis of partial payments and will not be considered as fixing a basis for additions to or deductions from the contract price.

1.3 SURVEY DATA

- A. The Contractor is wholly responsible for surveying and dimensioning all proposed work and coordinating the installation of proposed work to meet the function intended by these Contract documents.

1.4 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

- A. Attention shall be directed to the applicable articles of the General Conditions concerning shop drawings and samples. Special requirements for shop drawings and samples for various types of work are specified in the technical specifications in those sections for the various types of work.
- B. Before submittal to the Engineer, the Contractor shall check all shop drawings or samples for conformance with the Contract Documents including the plans and specifications, for

suitability for satisfactory incorporation in the completed contract work, and for correct dimensions, ratings and assembly, and shall note legibly on the drawings or samples that they have verified its acceptability and that they approve it. If there are any deviations in the shop drawings or samples from the plans and specifications, the Contractor shall note legibly on the shop drawings or samples and also inform the Engineer separately in writing of any such deviation. If deviations are found by the Engineer during review of the shop drawing, and said deviations were not noted by the Contractor, this shall be grounds for ceasing Engineer's review and returning the submittal marked "Incomplete".

- C. The Contractor shall submit shop drawings and samples in orderly sequence matched to the construction work, with sufficient completeness to enable review, with reasonable promptness, and allowing sufficient time for the Engineer to review them. All shop drawings and samples shall be properly identified as to their location and application in the contract work and as to their association with various parts of the plans and specifications. The Contractor shall not commence work on any portion of contract work requiring shop drawings or samples until the submitted shop drawings or samples have been reviewed and approved by the Engineer.
- D. Shop drawings may include general, assembly and detail drawings, diagrams, illustrations, material and equipment schedules with manufacturer's name and catalog numbers and description, performance charts, catalog cuts, brochures and such other information and data as is necessary and required by the Engineer.
- E. The Contractor shall submit to the Engineer an electronic copy in Portable Document Format (pdf) of all final and approved shop drawings and information submittals required for the work. The Engineer reserves the right to request hard copies of all submittals as the Engineer deems necessary. All drawings and information shall contain sufficient and accurate data to ascertain item-by-item compliance with the Contract Documents. Incomplete, inadequate or unidentified submittals will be rejected. The Engineer will examine submittals only after they have been properly identified, as specified herein, and signed by the Contractor to indicate that he has reviewed and endorsed them.
- F. The Engineer will review the shop drawings and samples with reasonable promptness. The Contractor shall allow fifteen (15) days for review by the Engineer after receipt of shop drawings and samples. The Engineer's review and approval shall be only for conformance with the design concept of the contract work and with information given in the plans and specifications. The Engineer's approval of a separate item shall not indicate approval of an assembly in which the item functions. The Engineer's approval shall not relieve the Contractor of responsibility for conforming to the plans and specifications. The Contractor is responsible for confirming and correlating all quantities, dimensions, fabrication details and techniques, installation methods and performance of the work. The Contractor shall check and verify all field measurements.
- G. Preliminary information for such items as finish hardware and electrical items and for any other items as called for in the technical sections of these specifications shall be submitted.

- H. As soon as practicable and not later than thirty (30) days after the date of notice of award of the contract, but sufficiently in advance of commencement of installation of materials and equipment to allow for approval of the regular submission, the Contractor shall submit preliminary shop drawings in the form of material and equipment schedules which shall contain a complete list of materials, fixtures and equipment to be incorporated in the work. No consideration will be given to partial lists submitted at different times. If any items in the list submitted differ from the item specified in the specifications and plans, the Contractor shall state that the substituted item is of the proper size for the allotted space and will meet the performance requirements of the original item. After approval of the material and equipment schedules, by the Engineer, the Contractor shall submit the regular submission of shop drawings.
- I. The Contractor shall furnish the regular submission of shop drawings after the approval by the Engineer of the preliminary submission if such preliminary submission is required; otherwise, the regular submission of shop drawings shall be submitted to the Engineer with sufficient lead time to allow his review and return of the shop drawings to the Contractor before work is commenced on that portion of the project covered by the shop drawings.
- J. If the shop drawings are not approved by the Engineer, the Contractor shall correct or make changes as noted and shall resubmit revised shop drawings until approved by the Engineer. Work completed by the Contractor pertaining to shop drawings that are not approved will be corrected by the Contractor at no additional cost to the Owner.
- K. Refer to individual specification sections for required submittals. Additions or deletions may be made by the Engineer or the Owner's Representative as may be necessary during the life of the project.
- L. Contractor must submit AIS Certifications for review and approval by the Engineer for all materials which fall under AIS requirements.
- M. Color selection for prefinished mechanical/electrical/plumbing items (e.g. louvers) will not be made until color selections are made via the submittal process on architectural building items such as siding, windows, roofing and interior finishes. Contractor shall prioritize submittals accordingly to reflect this sequence.
- N. All pages within the submittal shall be oriented correctly for the reader. Submittals failing to meet this requirement shall be returned to the Contractor marked "Incomplete" without being reviewed by the Engineer.
- O. Color selection for prefinished mechanical/electrical/plumbing items (e.g. louvers) will not be made until color selections are made via the submittal process on architectural building items such as siding, windows, roofing and interior finishes. Contractor shall prioritize submittals accordingly to reflect this sequence.

1.5 SUBMITTAL RESPONSIBILITIES OF THE CONTRATOR

- A. Submittal Transmittal Form:
 - 1. Each Submittal shall include a Transmittal Form. The Contractor shall submit a proposed Submittal Transmittal Form that meets the following requirements for review and approval by the Engineer prior to the first submittal.

- B. The Submittal Transmittal Form shall identify the Project Name, Location, Contractor, subcontractor, name of item submitted as specified in the Contract Technical Specifications or Drawings, supplier, manufacturer, pertinent Contract Drawing No.(s), Detail Number(s) and applicable Technical Specification Section numbers.
 - 1. Identify each Transmittal Form by the corresponding Technical Specification. Sequentially number transmittal forms. Re-submittals shall have the original number with a suffix. Acceptable form of Submittal Transmittal Form ID is SSSSSS-NN-T where:
 - a. SSSSSS indicates the 6-digit Contract Technical Specification applicable to the equipment/item being Submitted.
 - b. NN indicates different equipment/item submittals for that Contract Technical Specification.
 - c. T indicates the number of times that submittal has been made.
 - d. Examples:
 - i. 310000-01.0 Crushed Stone Bedding Submittal (In this example the submittal is the first Manholes Submittal submitted on the project.)
 - ii. 310000-01.1 Crushed Stone Bedding Submittal (In this example the submittal is the second Manholes Submittal submitted on the project.)
 - iii. 310000-02.0 Sand Blanket Submittal (In this example the submittal is the first Precast Structures Submittal submitted on the project.)

1.6 ELECTRONIC MAIL (EMAIL) SUBMITTALS BY CONTRACTOR

- A. Email Subject shall include the Project Name and the Submittal ID using the following format: Montgomery Center WW - Submittal SSSSSS-NN-T – Name of Item Submitted.

- B. The Name of Item Submitted shall be identified as specified in the Contract Technical Specifications or Drawings.

- C. Email Submittals shall contain one Submittal only.

- D. Email Submittals shall contain one attachment only.

- E. Email Submittal attachment file name shall be the Submittal ID as defined herein.

- F. There shall be no text in the Email body.

- G. The Email attachment shall be a word searchable .pdf file format.

- H. The first page of the Email attachment shall be the Submittal Transmittal Form.

- I. The Submittal content shall be located after the Submittal Transmittal Form.
- J. Submittal content within the .pdf shall be oriented to be read without having to rotate pages.
- K. Email Submittals shall contain attachments less than 25 MB in size.
- L. Submittals that contain Drawings drawn to Scale on paper larger than 11"x17" size, shall be submitted by hardcopy.

1.7 MANUFACTURER'S CERTIFICATIONS

- A. The Contractor shall submit to the Engineer certified records of relevant tests and/or certified statements from the Manufacturer for any material or product which is normally tested by the Manufacturer, indicating the product or material meets the standards as defined within the Contract Documents. A Manufacturer's certificate of conformity to the standards may be acceptable to the Engineer if the quantity of the product or material used for the project is such that testing is unrealistic. All Manufacturer's certificates shall be provided with the Contractor's certificate or endorsement that the product or material meets the standards as defined in the Contract Documents.
- B. The Contractor shall submit a Manufacturer's Certification letter for each applicable product to document compliance with American Iron and Steel (AIS) requirements. Certifications will be submitted during the submittal phase for verification and approval prior to any installation of materials. Any materials requiring an AIS Certification that are incorporated as part of this project and either fail to meet the requirements of the AIS program or a certification is not submitted, shall be removed and replaced with a product meeting the AIS requirements with appropriate certifications at the Contractor's expense.

1.8 SAMPLES

- A. If requested by the Engineer or Owner, the Contractor shall provide samples of products or materials to be used for construction for review. The Contractor may request the return of the provided samples at the time of delivery of the samples to the Engineer/Owner. The cost of the samples shall be borne by the Contractor.

1.9 RECORD DRAWINGS

- A. Refer to Specification Section 017839 – Project Record Documents.

1.10 REQUESTS FOR INFORMATION (RFI's) BY THE CONTRACTOR

- A. The Contractor shall be responsible for coordinating and submitting to the Engineer written Requests for Information (RFI's) on an RFI Form provided or approved by the Engineer.

- B. The RFI shall identify in writing the aspects of the Contract Documents for which clarification is requested by the Contractor.
- C. The RFI shall reference the Contract Drawing Number, Detail Number or Technical Specification Section and Subsection that is the subject of the RFI.
- D. The RFI shall include a description of the desired clarification and a proposed solution. The RFI shall indicate schedule or cost impact, if any. Each RFI shall be sequentially numbered in sequence.
- E. RFI's shall be submitted to the Engineer by Email as specified below:
 - 1. The RFI shall be submitted as a .pdf file attachment to an email.
 - 2. The email Subject Line shall include the Project Name, RFI # and RFI Subject using the following format: Montgomery Center Community Decentralized Wastewater Treatment and Disposal System – RFI-NNN – RFI Subject. Example RFI Email Subject Line:
 - a. Montgomery CWW – RFI-001 – Septic Tank Location Clarification
 - 3. The RFI subject description shall be identified as specified in the Contract Technical Specifications or Drawings.
 - 4. Emailed RFIs shall contain one RFI only.
 - 5. Emailed RFIs shall contain one attachment only.
 - 6. Emailed RFI attachment file name shall be the RFI # and subject using the following format RFI-NNN – RFI Subject. Example:
 - a. RFI-001 – Septic Tank Location Clarification
 - b. In this example the RFI is the first RFI submitted on the project.
- F. There shall be no text in the Email body.
- G. Contractor shall include clarifying sketches or other information in the attached RFI .pdf file, located after the RFI Form.
- H. Submittal content within the .pdf file shall be oriented to be read without having to rotate pages.
- I. Emailed RFI .pdf files shall be less than 25 MB in size.

1.11 CONTACT INFORMATION

- A. The contractor shall submit a listing of contact names and phone numbers of personnel to be contacted in emergency situations.
- B. The contractor shall provide a listing of contact names, addresses and phone numbers of all major subcontractors and suppliers. Contacts shall be cross-referenced by specification sections.
- C. The contractor shall designate an individual who shall be responsible for job safety.

1.12 PERFORMANCE AFFIDAVITS

- A. The contractor shall provide performance affidavits and certificates of compliance for all equipment and as required in Specification Section 016000 – Materials and Equipment.

1.13 OPERATION AND MAINTENANCE MANUALS

- A. The Contractor shall furnish and deliver to the Engineer, prior to the 60 percent completion point of construction and at least 30 days prior to operator training or start-up of equipment, four (4) complete hard copy sets of instructions, manuals, technical bulletins and any other printed material such as diagrams, prints or drawings, containing full and complete information required for the proper operation, maintenance and repair of the equipment. Included in this submission shall be a spare parts diagram, complete spare parts list and recommended lubrication schedules. These requirements are a prerequisite to the operation and acceptance of equipment, and training of the Owner's personnel. Each set of instructions shall be bound together in appropriate three-ring binders. A detailed table of contents shall be provided for each set. Written operations and maintenance instructions shall be required on equipment where called for in other sections of these specifications.
- B. One (1) copy of the O&M manual and drawings shall be provided in Portable Document Format (pdf).
- C. The Owner reserves the right to videotape any manufacturer's operator training sessions for future use.
- D. When written instructions include shop drawings and other information previously reviewed by the Engineer, only those editions thereof which were approved by the Engineer, and which accurately depict the equipment installed, shall be incorporated into the instructions/manuals.
- E. Included in the operations and maintenance manual for each item of equipment shall be a description of its function, normal operating characteristics and limitations, performance curves, engineering data and tests, complete nomenclature and commercial numbers of replacement parts, manufacturer's printed operating procedures to include start-up, break-in and routine and normal operating procedures. Manufacturer and installer contact information for replacement parts or repair services shall also be provided.

2. PRODUCTS

- 2.1 None used.

3. EXECUTION

- 3.1 None used.

END OF SECTION

SECTION 014500

QUALITY CONTROL

1. GENERAL

1.1 INSPECTION AND TESTING

- A. All materials and equipment used in the construction of the project shall be subject to adequate inspection and testing in accordance with accepted standards. The laboratory or inspection agency shall be approved by the Owner.
- B. Materials of construction, particularly those upon which the strength and durability of the structure may depend, shall be subject to inspection and testing to establish conformance with specifications and suitability for uses intended.
- C. The Contractor shall allow the Engineer ample time and opportunity for testing materials and equipment to be used in the work. He shall advise the Engineer promptly upon placing orders for materials and equipment so that arrangements may be made, if desired, for inspection before shipment from the place of manufacture. The Contractor shall at all times furnish the Engineer and his representatives, facilities including labor, and allow proper time for inspecting and testing materials, equipment and workmanship. The Contractor must anticipate that possible delays may be caused in the execution of this work due to the necessity of materials and equipment being inspected and accepted for use. The Contractor shall furnish, at the Contractor's own expense, all samples of materials required by the Engineer for testing, and shall make their own arrangements for providing water, electric power, or fuel for the various inspections and tests of structures and equipment.
- D. The Contractor shall furnish the services of representatives of the manufacturers of certain equipment, as prescribed in other sections of these specifications. The Contractor shall also place orders for such equipment on the basis that, after the equipment has been tested prior to final acceptance of the work, the manufacturer will furnish the Owner with certified statements that the equipment has been installed properly and is ready to be placed in functional operation. Tests and analyses required of equipment shall be paid for by the Contractor, unless specified otherwise in the section which covers a particular piece of equipment.
- E. Where other tests or analyses are specifically required in other sections of these specifications, the cost thereof shall be borne by the Owner, or the Contractor as designated in such sections. The Owner will bear the cost of all tests, inspections, or investigations undertaken by order of the Engineer for the purpose of determining conformance with the Contract Documents if such tests, inspections, or investigations are not specifically required by the Contract Documents, and if conformance is ascertained thereby. Whenever nonconformance is determined by the Engineer as a result of such tests, inspections or investigations, the Contractor shall bear the full cost thereof or shall reimburse the Owner for said cost. In this connection, the cost of any additional tests and

investigations, which are ordered by the Engineer to ascertain subsequent conformance with the Contract Documents, shall be borne by the Contractor.

- F. The expense of any retesting, necessary in the opinion of the Engineer, due to previous tests of materials, equipment or construction not meeting the requirements of the specifications and drawings, shall be borne by the Contractor.
- G. The contract work shall at all times be subject to the observation of the Owner's Representative and the Engineer. Observation or non-observation by the Owner's Representative and the Engineer shall not relieve the Contractor from his contractual obligation to furnish work and material as required, and properly complete the contract work in accordance with these Contract Documents. If the Owner's Representative and the Engineer, consider that the contract work is not being properly accomplished they may condemn or reject all or any part of the work and any materials or equipment incorporated in it. If any material, equipment, or work is condemned or rejected by the Owner's Representative and the Engineer, the Contractor shall bear all expenses for removal and proper replacement of such material, equipment or work required to be provided by these Contract Documents. The expense of replacing any work done by Others which is adversely affected by removal and proper replacement of improper work done by the Contractor shall be borne by the Contractor.
- H. The authorized representatives and agents of the Owner and concerned State and Federal Agencies shall be permitted to inspect all work, materials, payrolls, records of personnel, invoices of materials, and other relevant data and records.
- I. If work to be done away from the construction site is to be observed on behalf of the Owner during its fabrication, manufacture, testing, or shipping, such notice shall be in writing and delivered to the Engineer in ample time so that the necessary arrangements for the observation can be made.
- J. The Contractor shall give proper notice to governing departments and inspectors having jurisdiction and shall have all parts of the work inspected and approved by them as may be required.

1.2 IMPERFECT WORK, EQUIPMENT, OR MATERIALS

- A. The Engineer may order tests of imperfect or damaged work, equipment, or materials to determine the required functional capability for possible acceptance, if there is no other reason for rejection. The cost of such tests shall be borne by the Contractor and the nature, tester, extent, and supervision of the tests will be as determined by the Engineer. If the results of the tests indicate that the required functional capability of the work, equipment or material was not impaired, consistent with the final general appearance of same, the work, equipment or materials may be deemed acceptable. If the results of such tests reveal that the required functional capability of the questionable work, equipment or materials has been impaired, then such work, equipment or materials shall be deemed imperfect and shall be replaced. The Contractor may elect to replace the imperfect work, equipment or material in lieu of performing the tests.

1.3 STANDARDS OF TESTING, MATERIALS, AND DESIGN

- A. Other sections of these specifications frequently require that the quality of materials, dimensions, workmanship, testing and methods of design, fabrication and installation of various items and materials be in accordance with recognized standards, specifications or practices of others. Wherever reference is made to such other standards, they shall be considered to be incorporated in these specifications, and the Contractor shall comply fully with the provisions or latest revisions or issue of such standards which existed at the time of the bid opening, unless specifically modified in other sections of these Specifications. Below is a partial list of those standards which are most frequently utilized in these Specifications, together with their commonly used abbreviations:

AA - Aluminum Association

AASHTO - American Association of State Highway and Transportation Officials

AGMA - American Gear Manufacturers Association

AIA - American Institute of Architects

ASTM - American Society for Testing and Materials

AWWA - American Water Works Association

ANSI - American National Standards Institute (formerly USA Standards)

ASCE - American Society of Civil Engineers

ASME - American Society of Mechanical Engineers

AIEE - American Institute of Electrical Engineers

ACI - American Concrete Institute

AISC - American Institute of Steel Construction

AISI - American Iron and Steel Institute

AMCA - Air Moving and Conditioning Association, Inc.

API - American Petroleum Institute

AREA - American Railway Engineering Association

ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers

AGA - American Gas Association

AWS - American Welding Society

BOCA - Building Officials and Code Administrators International

CRSI - Concrete Reinforcing Steel Institute

EPA - U.S. Environmental Protection Agency

FAA - Federal Aviation Association

Fed.Spec. - Federal Specification

FmHA - Farmer's Home Administration, U.S. Dept. of Agriculture

ISO - Insurance Service Offices (formerly American Insurance Association)

NBFU - National Board of Fire Underwriters

NBS - National Bureau of Standards

NEC - National Electric Code

NEMA - National Electrical Manufacturer's Association

NFIPA - National Fire Protection Association

OSHA - Occupational Safety and Health Administration (Federal Regulations)

UL - Underwriters Laboratories

VTAOT - Vermont Agency of Transportation

VTDEC - Vermont Department of Environmental Conservation

VTL&I - Vermont Labor and Industry

VTOSHA - Vermont Occupational Safety and Health Administration

3. PRODUCTS

2.1 None used.

4. EXECUTION

3.1 None used.

END OF SECTION

SECTION 014523

TESTING AND RESULTS EXPECTED

1. GENERAL

1.1 DESCRIPTION

A. Work Included

1. Furnish all labor, materials, and incidentals required, and perform all tests as described in these Contract Documents. This includes any required corrective actions needed as specified herein.

B. Required Tests by Contractor

1. Non-Pressure Pipes: For all gravity non-pressure pipelines installed under this Contract, the Contractor shall perform a low-pressure air test or non-pressure water infiltration test on each section of pipelines.
2. Pressure Pipes: For pressurized pipes, including sewer force mains and any other pressure pipelines, a hydrostatic and leakage test on each pipeline shall be performed by the Contractor.
3. Concrete Leak Test: Contractor shall perform leak tests on all new cast-in-place concrete structures specified in Specification Section 034100 – Precast Concrete Structures.

1.2 INSPECTION

- A. All materials and equipment used in the construction of the project shall be subject to adequate inspection and testing in accordance with accepted standards. The laboratory or inspection agency shall be approved by the Owner.
- B. Materials of construction, particularly those upon which the strength and durability of the structure may depend, shall be subject to inspection and testing to establish conformance with specifications and suitability for uses intended.
- C. The Contractor must anticipate that possible delays may be caused to them in the execution of this work due to the necessity of materials and equipment being inspected and accepted for use.

1.3 MANUFACTURER'S SERVICES

- A. The Contractor shall furnish the services of representatives of the manufacturers of certain equipment, as prescribed in other sections of these specifications. The Contractor shall also place his orders for such equipment on the basis that, after the equipment has

been tested prior to final acceptance of the work, the manufacturer will furnish the Owner with certified statements that the equipment has been installed properly and is ready to be placed in functional operation. Tests and analyses required of equipment shall be paid for by the Contractor, unless specified otherwise in the section which covers a particular piece of equipment.

1.4 OTHER TESTS

- A. Where other tests or analyses are specifically required in other sections of these specifications, the cost thereof shall be borne by the Owner, or the Contractor as designated in such sections. The Owner will bear the cost of all tests, inspections or investigations undertaken by order of the Engineer for the purpose of determining conformance with the Contract Documents if such tests, inspections, or investigations are not specifically required by the Contract Documents, and if conformance is ascertained thereby. Whenever nonconformance is determined by the Engineer as a result of such tests, inspections or investigations, the Contractor shall bear the full cost thereof or shall reimburse the Owner for said cost. In this connection, the cost of any additional tests and investigations, which are ordered by the Engineer to ascertain subsequent conformance with the Contract Documents, shall be borne by the Contractor.

1.5 RETESTING

- A. The expense of any retesting, necessary in the opinion of the Engineer, due to previous tests of materials, equipment or construction not meeting the requirements of the specifications and drawings, shall be borne by the Contractor.

1.6 WATER AND APPARATUS FOR TESTING

- A. The Contractor shall furnish all water required to complete testing or retesting for the duration of the project. Water shall be potable and sediment free.

1.7 PAYMENT

- A. The Contractor shall not receive separate payment for all tests required by the project and shall include the cost of testing within their bid items located in Measurement and Payment.
- B. Any costs associated with tests required by Manufacturers shall be borne by the Contractor.
- C. If an initial test fails to meet the requirements within the Contract Documents, the Contractor shall retest at their own expense.

1.8 SUBMITTALS

- A. Reports and Certifications

1. Within 7 calendar days of each test being completed, the Contractor shall furnish reports for each test showing results, leakage, and/or other test data.
2. The Contractor shall promptly disseminate all required copies of test reports to the Engineer and Owner.

1.9 QUALITY ASSURANCE

- A. Testing will be performed following all regulations and with American Society of Testing and Materials (ASTM) standards.
- B. The testing laboratory shall follow ASTM E329 – “Recommended Practice for Inspection and Testing Agencies for Concrete and Steel used in Construction”.
- C. Any test not completed in the presence of the Engineer and the Owner’s Representative shall be considered not completed and will be retested at the expense of the Contractor. The Contractor is responsible for scheduling testing times with the Engineer.
- D. The contract work shall at all times be subject to the observation of the Owner's Representative and the Engineer. Observation or non-observation by the Owner's Representative and the Engineer shall not relieve the Contractor from his contractual obligation to furnish work and material as required, and properly complete the contract work in accordance with these Contract Documents. If the Owner's Representative and the Engineer consider that the contract work is not being properly accomplished, he may condemn or reject all or any part of the work and any materials or equipment incorporated in it. If any material, equipment, or work is condemned or rejected by the Owner's Representative and the Engineer, the Contractor shall bear all expenses for removal and proper replacement of such material, equipment or work required to be provided by these Contract Documents. The expense of replacing any work done by others which is adversely affected by removal and proper replacement of improper work done by the Contractor shall be borne by the Contractor.
- E. The authorized representatives and agents of the Owner and concerned State and Federal Agencies shall be permitted to inspect all work, materials, payrolls, records of personnel, invoices of materials and other relevant data and records.
- F. If work to be done away from the construction site is to be observed on behalf of the Owner during its fabrication, manufacture, testing, or shipping, such notice shall be in writing and delivered to the Engineer in ample time so that the necessary arrangements for the observation can be made.
- G. The Contractor shall give proper notice to governing departments and inspectors having jurisdiction and shall have all parts of the work inspected and approved by them as may be required.

1.10 CODE COMPLIANCE

- A. All tests and inspections required by permits and Federal, State, and local municipality regulations shall be the Contractors responsibility and expense unless otherwise noted in the Contract Documents.

1.11 TESTING PERSONNEL

- A. All required testing personnel, irrespective of representing the Contractor or Owner, shall have access to the work at all times. If deemed necessary by the testing agency or representative, facilities shall be provided.
- B. The authorized representatives and agents of the Owner and concerned State and Federal Agencies shall be permitted to inspect all work, materials, payrolls, records of personnel, invoices of materials and other relevant data and records.

1.12 PRODUCT IMPERFECTIONS

- A. The Engineer may order tests of imperfect or damaged work, equipment, or materials to determine the required functional capability for possible acceptance, if there is no other reason for rejection. The cost of such tests shall be borne by the Contractor, and the nature, tester, extent, and supervision of the tests will be as determined by the Engineer. If the results of the tests indicate that the required functional capability of the work, equipment or material was not impaired, consistent with the final general appearance of same, the work, equipment or materials may be deemed acceptable. If the results of such tests reveal that the required functional capability of the question-able work, equipment or materials has been impaired, then such work, equipment or materials shall be deemed imperfect and shall be replaced. The Contractor may elect to replace the imperfect work, equipment or material in lieu of performing the tests.

2. PRODUCTS

2.1 TESTING EQUIPMENT

- A. Contractor shall furnish all equipment necessary for adequate testing meeting the requirements outlined in the Contract Documents, including but not limited to:
 - 1. Adequate labor, plugs and caps able to meet testing pressures, measuring equipment, pumps, testing fluid, thrust blocks, air, nitrogen, temporary flanges, bulkheads, weighing, bracing, and other items necessary to prevent joints from separating, and to maintain project safety.

3. EXECUTION

3.1 LEAKAGE TESTS

- A. Test Preparation
 1. Prior to any testing, the Contractor shall thoroughly clean the pipe section with water and a full gauge sponge.
 2. All leakages tests by the Contractor shall be scheduled so the Engineer and Owner's Representative can witness being performed.
 3. It shall be the Contractor's responsibility to furnish the required test forms and shall document the testing data.
 4. The Contractor shall initiate the leakage test once the pipe has been placed and sufficiently backfilled. The Contractor is authorized to perform an air test on the pipe prior to backfilling but this test shall not eliminate the required leakage test after backfilling.
 5. Tees, stubs, and wyes shall be plugged with a cap with flexible joints, and sufficiently secure to tolerate test pressures. All caps shall be removable without damage to the pipe at the conclusion of the test. Removal of the cap shall provide a plug suitable for flexible jointed lateral extensions and connections.

3.2 AIR TESTS

- A. Once the pipe has been cleaned sufficiently, air shall be injected into the plugged pipe until the air pressure achieves 4.0 pounds per square inch (psi) greater than the typical pressure of groundwater submerging the pipe with an internal maximum of 8 psig. The Contractor shall pause for a minimum of two (2) minutes prior to proceeding with the test to allow for the stabilization of the internal temperature.
- B. Once the two (2) minute stabilization time has passed, the Contractor shall measure the time it takes for the internal pressure to drop to 2.5 psig from its original starting pressure.
- C. For the pipe section being tested to be considered passing, it must decrease in internal pressure from 3.5 to 2.5 psig greater than the typical pressure of groundwater submerging the pipe, greater than the minimum times listed in the table below.

PIPE DIAMETER (IN.)	TIME (MIN)
4	4
6	4
8	5
10	6.5
12	7.5
14	9
15	9.5
18	11.5

- D. The section of small diameter sewer force main shall be limited to a maximum length of 2,000 feet. It is the Contractor's responsibility to establish these testing locations prior to

construction. Once a section has been tested, the Contractor shall connect the tested section to the system.

- E. The Contractor shall furnish the necessary water for testing purposes at their own expense. The Contractor may coordinate with the Owner to provide the necessary water for testing. The Contractor shall reimburse the Owner at the Owner's discretion for any water supplied by the Owner.
- F. The allowable infiltration and exfiltration of the pipe section shall not exceed 150 gallons per inch of pipe diameter per mile of pipe per day.
- G. Any section of pipe that fails the required testing or has an infiltration or exfiltration greater than the allowable listed above, shall be excavated, repair, or replaced to correct the issue. Once the repair or replacement has finalized, the Contract shall backfill and repeat all necessary steps of the test till that pipe section meets the requirements outlined above. Any visible damage done to the pipe section regardless of the effect it has on the pipe section's ability to pass the tests, shall be repaired, or replaced at the Contractor's expense.

3.3 PRECAST STRUCTURE LEAKAGE TESTS

- A. Prior to backfilling, once a new structure has been set in place, all openings and joints have been sealed, and inlet and outlet pipes connected, the Contractor shall perform a vacuum test.
- B. The Contractor shall perform the test with the Engineer and the Owner's Representative as witnesses.
- C. The Contractor shall place the testing equipment on top of the structure. The compression band shall be inflated so an airtight seal between the structure and the vacuum base has been created.
- D. A vacuum pump shall be connected to the outlet and a vacuum of 10" Hg (Mercury) shall be created and the pump valve shall be closed.
- E. The Contractor shall observe the vacuum gage for a pressure drop. If a pressure drop of 1" Hg occurs during the minimum times listed in the table below, the structure shall be resealed and the test performed again at the Contractor's expense.
- F. Once the structure has deemed passing the test, it shall be backfilled. If at any point during the backfilling procedure the structure is damaged or disturbed, the Contractor shall perform another vacuum test at their own expense. If the structure fails the vacuum test as outlined above, the Contractor shall test the structure via the exfiltration test at their own expense.

- G. The Contractor shall furnish all vacuum test reports to the Engineer and Owner’s Representative. All structures shall have a passing testing report prior to building any manhole inverts.
- H. The following are the minimum allowable times for the vacuum test. If the structure maintains a pressure of 10" Hg or has a pressure drop less than 1" Hg within the following times, it shall be considering passing:

Structure Depth (ft)	Time (Min.)
0 to 10	2
10 to 15	2.5
15 to 20	3
20+	3.5

3.4 PRESSURE PIPE LEAKAGE TESTS

- A. Test Preparation
 - 1. The hydrostatic and leakage test shall conform to all provisions of AWWA C600 (latest edition).
 - 2. The Contractor shall initiate the leakage test once the pipe has been placed and sufficiently backfilled.
 - 3. Once concrete thrust blocks have been poured, no pressure tests shall be performed for a minimum of seven (7) days to allow for the concrete to cure.
 - 4. The pipe section being tested shall be slowly filled with potable, clean water ensuring all air from pipelines, fittings, and appurtenances have been expelled. No testing shall occur until all air has been removed from the testing section. The Contractor shall furnish and install corporation stops at their own expense, at all high points within the testing section to expel all air as the section is being filled.
- B. Performance Criteria
 - 1. Refer to the required testing pressure under Section 2.2 – Pipe Testing Schedule.
 - 2. The Contractor shall supply the required pipe pressure via a means of a pump connected to the pipe.
 - 3. Duration of leakage test shall be a minimum of 2 hours.
 - 4. The pressure as measured by a gauge within the pipe section being tested shall not vary by more than 5 psig. If the pressure within pipe section being tested does vary greater than 5 psig at any time during the test, the test shall be considered an immediate failure.
 - 5. Leakage:
 - a. For the purposes of this test, leakage shall be categorized as the volume of water needed to add once the pipe has been filled, pressurized, and the test has begun to maintain the required 5 psig pressure allowance.
 - b. Allowable leakage:
 - i. For fused butt joints, no leakage allowed.

C. Test Failure

1. In the event of a testing failure, the Contractor shall inspect all pipe segments and fittings. Any visible damage and defects found during the inspection shall be replaced or repaired at the Contractor's expense. The section shall be retested again at the Contractor's expense.
2. In the event a pipe section fails the leakage test, the Contractor shall locate the leak, make any necessary repairs or materials replacement, then retest the entire section at their own expense. Any visible leaks, regardless of size or if the section still passes the test, the Contractor shall repair at their own expense.

3.5 TESTS BY OWNER

- A. Tests taken at the discretion of the Owner and the Owner's Representative which fail to meet the specified requirements shall be repeated at the Contractor's expense.

END OF SECTION

SECTION 015000

TEMPORARY FACILITIES AND CONTROLS

1. GENERAL

1.1 GENERAL

- A. All temporary and construction facilities required by the Contractor (and their subcontractors) shall be furnished by them and shall meet all local codes and requirements for such temporary installations. All temporary facilities shall be entirely removed upon completion of the work and the site shall be restored and left in a satisfactory condition.
- B. All temporary and construction facilities shall be provided and maintained so as not to create fire hazards or safety hazards.

1.2 FIELD OFFICES

- A. Contractor's Field Office
 - 1. At the commencement of construction, the Contractor shall supply and maintain a field office until the final completion of the project.
 - 2. The location and type of temporary buildings shall be subject to the approval of the Owner and Engineer.

1.3 ENGINEER'S FIELD OFFICE

- A. The Contractor shall provide a separate field office at the commencement of construction for use by the Engineer and the Owner. The office shall be adequately lit, have at least 300 sq. ft., and be equipped with:
 - 1. Electric convenience receptacles.
 - 2. Solid door with cylinder lock and three (3) keys.
 - 3. Movable locking windows with shades.
 - 4. Screens for all doors and windows for adequate ventilation.
 - 5. Plan table with stool and light.
 - 6. Office desk with a chair.
 - 7. Conference table.
 - 8. One (1) broom.
 - 9. Eight (8) folding chairs.
 - 10. One (1) lockable fire-resistant file cabinet with key.
 - 11. 4 lb. carbon dioxide fire extinguisher.
 - 12. Sufficient heating and air conditioning to maintain inside temperatures between a minimum of 68°F and a maximum of 78°F (20°C to 25°C).
 - 13. One (1) rubbish bin.
 - 14. One (1) telephone with answering machine.
 - 15. Plan rack with 5 plan holders.
 - 16. Compact refrigerator (1.5 cu. ft. volume or greater).

17. Copier, toner, and paper. The copier shall be capable of printing and scanning both 8.5" x 11" and 11" x 17" paper sizes.
 18. Internet connection and modem (DSL or broadband) with a minimum speed of 1.5 Mbps.
 19. A 20 cubic foot (minimum) storage locker with a suitable lock for storing implements and test equipment.
 20. Electric water cooler with a supply of commercial bottled water.
 21. One (1) fully stocked contractor's standard type D first aid kit. Contractor shall verify the first aid kit is still in-date. An expired first aid kit shall be removal and replaced at the Contractor's expense.
 22. One (1) semi-automatic Automated External Defibrillator (AED) intended for public access use. Contractor shall verify the AED is still in-date and certified for use. An expired AED shall be removal and replaced at the Contractor's expense.
- B. The Contractor shall pay all costs for:
1. Providing, maintaining, and removing the office structure.
 2. Electrical service and all energy consumed.
 3. Telephone and internet monthly service.
 4. All heating fuel required.
 5. All charges for janitorial service including trash pick up and disposal.
 6. Commercial bottled water.
- C. The temporary facilities for use by the Resident Project Representative (RPR) shall be fully operational within 15 calendar days from the Notice to Proceed date. The Owner reserves the right to delay processing the first pay request by the Contractor until the Engineer's field office is completely furnished and operational.
- D. The field office shall be oriented so that the windows of the office allow for a general view of the project work.
- E. The Contractor shall loan all keys to the door locks to the Engineer for use during the life of the project.
- F. There shall be adequate parking space, a minimum of three (3) spaces, outside of and next to the field office for the exclusive use of the Engineer.
- G. There shall be signs, at least 2' x 4' in size, differentiating between the Contractor's and the Engineer's field offices.
- H. The field office shall be available for the Engineer's use during the entire life of the project and shall not be disturbed, moved, or interrupted without the Engineer's approval.

1.4 SANITARY FACILITIES

- A. The Contractor shall supply a sufficient number of temporary sanitary facilities for use by any Contractors, Engineers, Owner, Federal and State agencies, and any other

representatives. If the project spans multiple sites, the Contractor is responsible for supplying a sufficient number of sanitary facilities at all sites.

- B. The Contractor is responsible for the cleaning and maintenance of the temporary sanitary facilities at all times.
- C. In the event the Engineer's Field Office is located more than 1/2 mile away, the Contractor shall supply sanitary facilities in close proximity to the field office.
- D. The Contractor is solely responsible for the removal and clean up of the sanitary facilities at the conclusion of the project.
- E. During the life of this contract, the Contractor shall strictly comply with all applicable requirements of the State sanitary code. Particular attention shall be taken to requirements concerning disposal of sanitary sewage in unsewered areas and concerning providing sanitary conveniences.

1.5 UTILITY STRUCTURES

- A. The Contractor shall place a structure, at their own expense, to shelter products or materials that otherwise would be damaged from the weather and elements. The Contractor shall maintain the structure and fully remove it at the conclusion of the project.

1.6 TEMPORARY ENCLOSURES

- A. The Contractor shall provide all temporary roof, wall, door, and window closures, as necessary, to keep out weather or intruders. The Contractor shall take all necessary precautions so that the work may be properly and satisfactorily done during adverse weather conditions and to guard against the possible effects of adverse weather.
- B. Temporary enclosures shall be sufficiently strong to withstand wind and inclement weather and shall be maintained in a secure and weather-tight manner. After permanent windows and doors are installed and glazed, all temporary enclosures shall be removed by the Contractor.

1.7 UTILITY SERVICES

- A. Water Service:
 - 1. Temporary water for construction purposes will be furnished by the Contractor. Temporary drinking water shall be separately provided by the Contractor for their personnel and the personnel of their subcontractors. This is specific to temporary construction facilities and not for residents.
 - 2. The Contractor shall notify and obtain permission from the local water department at least fifteen (15) days prior to using hydrants or tapping into existing water mains.
 - 3. The Contractor shall notify and obtain permission from the Owner and the Engineer prior to pumping any water for construction purposes from any local bodies of water.

- B. Electrical Service:
 - 1. The Contractor shall supply temporary electricity and power for the project during construction and until the Engineer issues a Certificate of Completion on the project.
 - 2. All temporary electrical facilities shall conform to the National Electrical Code.
 - 3. All electrical receptacles shall be protected with ground fault indicators in accordance with National Electrical Code, latest edition. One receptacle shall cover a maximum of 2,500 sq. ft. At a minimum, receptacles shall be a two (2) duplex.
 - 4. The Contractor shall provide sufficient lighting and wiring for satisfactory and safe accomplishment of the work when there is not enough daylight. Temporary wiring shall conform to any pertinent codes and regulations and shall be installed and maintained to provide safe systems.
 - 5. At the sole discretion of the Owner, the Contractor may be allowed to use existing electrical services. The Contractor shall reimburse all electrical usage to the Owner in the event the Owner allows the use of their electrical service.
 - 6. Temporary electricity shall be provided for the duration of the contract or until substantial completion has been granted in writing, for areas and/or buildings complying with Contract documents.

- C. Telephone and Internet Service:
 - 1. The Contractor shall supply temporary telephone and internet service for the Engineer's Field Office and the Owner temporary office space for the project during construction and until the Engineer issues a Certificate of Completion on the project. The Contractor shall bare all costs associated with the telephone and internet services.

- D. Temporary Heat:
 - 1. The Contractor shall supply all heating equipment and fuel at their own expense to facilitate work in inclement weather. The method of heating and fuel shall be approved by the Owner's representative.
 - 2. Temporary electric heaters, open fire, and salamanders are prohibited.

1.8 TEMPORARY WORK ACCESS ITEMS

- A. All temporary items required for access to and around the project shall be furnished by the Contractor. All safety items such as fencing, railings, scaffolding, and other protective items shall be furnished by the Contractor.

- B. The Contractor shall removal all temporary structures, grades, and restore the site to preexisting conditions at their own expense.

1.9 TEMPORARY ACCESS ROADS

- A. When required, the Contractor shall build temporary roads to the project site for the transportation thereto of persons and materials. Temporary roads shall be built along the route of permanent access roads, considering lands and easements made available for the project. Such roads shall be for the free use of all personnel involved with the project and shall be maintained by the Contractor in serviceable condition for vehicular traffic,

free of obstructions, until completion of the project or until the permanent access roads are installed.

1.10 PROJECT SIGN

- A. The Contractor shall furnish and maintain a project sign at the project site and shall follow the sign template located at the end of this specification.
- B. The project sign shall be installed up to 15 calendar days from the Notice to Proceed date on this Contract. The first Contractor's pay request shall not be processed until the project sign has been installed.
- C. The project sign shall be installed so that it is visible.

1.11 SAFETY

- A. The Contractor (and their subcontractors) shall, at all times, exercise reasonable precautions for the safety of all persons, and shall be wholly and completely responsible for site safety. All rules, regulations, and laws concerning safety that are in effect at the job site, shall be complied with in all respects.
 - 1. The Contractor shall make at least one person available as an assistant for all inspections in confined areas.
 - 2. The Contractor shall designate a responsible member of its organization on the work, whose duty shall be the prevention of accidents. The name and position of the person so designated shall be submitted to the Engineer with a copy to the Owner (refer to Specification Section 013000 – Submittals).
 - 3. The Contractor shall immediately report in writing, giving full details, to the Owner all serious accidents which arise out of or in connection with the performance of the Work, whether on or adjacent to the site, which cause death, serious personal injury, or substantial property damage. In addition, if death or serious injury or substantial property damage is caused, the accident shall be reported immediately by telephone or messenger to the Engineer. If a claim is made or suit is filed by anyone against the Contractor or any subcontractor on account of any accident, the Contractor shall promptly report the facts in writing to the Engineer, with a copy to the Owner, giving full details of the claim.
- B. The Contractor shall comply with all applicable O.S.H.A. safety requirements. The Contractor is obligated to meet all O.S.H.A. requirements for safe trenching and excavation procedures. The Contractor is hereby referred to the latest revised O.S.H.A. standards as published in Title 29 of the Code of Federal Regulations (29 CFR), Part 1926 and as published in the Federal Register on Tuesday, October 31, 1989. The Contractor shall be solely responsible for compliance with these latest O.S.H.A. standards for work on this project.
- C. The Contractor shall comply with all safety requirements set forth in the latest edition of the U.S. Army Corps of Engineers Safety and Health Requirements Manual.

- D. The Contractor shall comply with all requirements of the latest edition of the "Manual of Accident Prevention in Construction" published by the Associated General Contractors.
- E. Confined Space Entry Procedures. The Contractor shall be aware of and follow proper confined space entry procedures as outlined by the National Institute for Occupational Safety and Health (NIOSH).
 - 1. Confined spaces are generally defined as spaces which:
 - a. Are NOT designed for continuous worker presence.
 - b. Have limited openings for entry or exit.
 - c. Have less than ideal natural ventilation.
 - 2. The Contractor shall, as a minimum, have the following equipment on hand for use by their employees and subcontractors, and for use by representatives of the Owner and Engineer:
 - a. 3 Harnesses
 - b. 3 40' Lengths of 5/8" Nylon Rope
 - c. 3 Sets of Leather Gloves
 - d. 3 Sets of Safety Glasses
 - e. 1 Ventilation Blower
 - f. 1 Tripod w/Winch designed for confined space entry
 - g. 1 Tri-Gas Detectors of the latest approved models.
- F. The Contractor shall not load or permit any part of any structure to be loaded with a weight that would endanger its safety.
- G. The Contractor shall take all necessary precautions for the safety of employees on the work, and shall comply with all applicable provisions of Federal, State, and local safety laws and building codes to prevent accidents or injury to persons on, about, or adjacent to the premises where the work is being performed. The Contractor shall erect and properly maintain at all times, as required by the conditions and progress of the work, all necessary safeguards and barricades for the protection of employees on the work and the safety of others employed near the work and the public and shall post danger signs and warning lights warning against the hazards created by such features of the construction as protruding nails, hoists, excavations, scaffoldings, stairways, and falling materials.
- H. Refer to the General Conditions of this Contract for additional safety requirements.

1.12 SITE SECURITY

- A. The Contractor shall take all precautions to prevent damage to the work by the elements including storms, wind, freezing, water entering the site of the Work directly or through the ground, and other elements which would be harmful to it. The Contractor shall furnish heat or protective shelters, or temporary buildings as required for the prosecution and protection of the work. In case of damage the Contractor shall make such repairs or replacements or rebuild such parts of the work as the Engineer may require in order that the Work may be completed as required by the Contract Documents.

- B. The Contractor shall post illuminated warning and danger signs so as to apprise all persons against any hazards created by the Work being done under their contract.
- C. Wherever necessary or required, and at their own expense, the Contractor shall maintain fences, furnish full-time or part-time watchmen, guards, flagman and/or like protective personnel, maintain lights, and take such additions and precautions as may be necessary to protect life and property.
- D. The Contractor shall assume all risks of loss or damage of any kind to vehicles, machinery, equipment, materials, or supplies which he shall provide in doing the work.

1.13 PROTECTION OF PUBLIC

- A. The Contractor shall conduct their work so as to interfere as little as possible with the activities of residents, private businesses, public businesses, and the traveling public. They shall be responsible for all damages suffered by others as a result of operations.

1.14 FIRE PROTECTION

- A. All operations on the Owner's premises shall be so performed that no fire hazards are needlessly created or permitted to exist. If the contract work involves a fire hazard, sufficient firefighting equipment with trained, capable operators shall be in the area to contain any fire until the local fire department is able to arrive. Particular care shall be exercised with regard to the disposition of waste materials, the nature or quantity of which might create or increase a fire hazard. The Contractor shall make sure that persons employed directly or indirectly by them, while on the Owner's premises, comply with any fire prevention regulations of the Owner. The Contractor shall also have a procedure for promptly notifying local firefighting organizations in case of fire or burning that starts to get out of control. The Contractor shall be responsible for compliance by personnel of their organization for their cooperation in fire prevention, fire reporting, and protection measures to minimize loss.
- B. When fire or explosion hazards are created or exist in the vicinity of the work as a result of the locations of gas mains, fuel tanks, gas tanks, or similar hazardous utilities or devices, the Contractor shall immediately alert the local Fire Marshall, the Engineer, and the Owner of such utility, tank, or device. The Contractor shall exercise all safety precautions and shall comply with all instructions issued by the Fire Marshall, and shall cooperate with the owner of the utility, tank, or device to prevent the occurrence of fire or explosion.
- C. No burning of trash or debris will be permitted.

1.15 PROTECTION OF EXISTING FACILITIES

- A. The Contractor shall conduct their operations and take all special precautions necessary to protect and sustain all existing structures, equipment, utility lines, roadways, and sub-surface, submerged, and overhead facilities which are to remain in place and undisturbed by the Contractor's operations under this Contract. When power poles, light poles,

fences, or portions of any other visible, existing structures or utilities constitute an unavoidable interference to their operations, the Contractor shall consult with the owner of such facility prior to performing any work at or near same. If permitted by the owner of the facility, the Contractor shall relocate, or temporarily remove and later restore the interfering portion of the facility, as directed by said owner and the project Owner, through the Engineer. If the owner of the facility so elects, they will perform such work with their own forces. Under either arrangement, the work shall be done at the Contractor's expense unless stated otherwise in the Contract Documents.

- B. Care shall be exercised to avoid damaging existing trees, shrubbery, poles, signs, fences, walls, lawns, etc., and any damage to these facilities or features as a result of work performed by the Contractor shall be promptly repaired or replaced by the Contractor at their expense to the satisfaction of the Owner's Representative.
- C. The Contractor shall immediately notify the owner of any facilities which are disturbed, damaged, or injured as a result of the Contractor's operation. The Contractor shall consult with the owner of such facility as to the proper method of replacing, repairing, or restoring the affected facilities to the conditions which existed prior to the Contractor's operations. If permitted by the owner of the facility, the Contractor shall, at their own expense, replace, repair, or restore the affected facilities to their original condition, to the satisfaction of said owner.

1.16 PROTECTION OF PROPERTY

- A. Under this contract, the Contractor shall be required to protect all property on which the contract work is done and all adjoining property and to satisfactorily repair or replace any such properties damaged or destroyed by their employees through the construction operation. The Contractor shall provide fences and watchmen, maintain warning and safety devices and lights, and take other such precautions as may be necessary to protect life and property.
- B. The Contractor (and their subcontractors) shall rigorously prohibit nuisances within, on, or about the work. Any employee found violating these provisions shall be discharged and not again employed on the work without the express consent of the Engineer.

1.17 EROSION AND DRAINAGE CONTROL

- A. The Contractor shall comply with all of the requirements of the Vermont Department of Environmental Conservation (DEC) that require that sufficient precautions be taken to minimize the runoff, due to construction, of polluting substances such as silt, clay, fuels, oils, bitumens, chemicals, raw sewage or other polluting materials that are harmful to humans, fish or other life, into the water supplies and surface waters of the State.
- B. The Contractor shall be responsible for controlling erosion of and sediment runoff from disturbed lands or excavations in connection with the construction operations. Such control measures may be in the form of specific construction practices combined with a planned sequence of operations, including but not limited to the construction and

maintenance of berms, dikes, temporary diversion barriers, siltation ponds, sedimentation basins, filter bags, collars on structures, temporary vegetation, pumping systems, and other anti-erosion and anti-sediment runoff measures and devices as necessary.

- C. The Contractor shall be responsible for controlling the tracking of material from the site through the use of construction entrances that meet the requirements of the State of Vermont DEC BMPs.

1.18 TEMPORARY DRAINAGE

- A. The Contractor shall provide temporary drainage as necessary and/or as ordered by the Engineer to keep the working area dry.

1.19 AIR POLLUTION CONTROL

- A. The Contractor (and their subcontractors) shall conduct all construction operations so as not to violate any applicable Federal, State and local ordinances in effect in the locality of the project pertaining to air pollution.
- B. Dust shall be controlled and eliminated throughout the course of the work. Upon the instruction of the Owner or the Owner's Representative, immediate steps will be taken, as directed, to allay and control dust. Dust control will be continuous and thorough during all phases of the work.
- C. Watering may be used for dust control. The Contractor shall be responsible for any and all damage to flooring, carpets, etc., caused by the tracking in of these materials.
- D. Dust control shall be the responsibility of the Contractor. The Owner may require additional dust control as impaired air quality may affect the operations and/or neighboring landowners and abutters.

1.20 PEST CONTROL

- A. All soil moving or handling equipment that has operated in or will operate in regulated areas shall be subject to plant quarantine regulations. In general, these regulations require the thorough cleaning of soil from equipment before such equipment is moved from regulated areas to non-infested areas. For information concerning interstate movement of soil moving equipment, the U.S. Department of Agriculture, Animal and Plant Health Inspection Service, should be contacted.

1.21 TRAFFIC CONTROL

- A. Contractor is referred to the Manual of Uniform Traffic Control Devices, as published by the Federal Highway Administration.

- B. The Contractor shall arrange for trained, competent flag persons as required and/or as directed by the Engineer or the Owner to maintain traffic and to protect the public from all damage to persons and property within the Contract Limits, easements and right of ways, in accordance with the Contract Documents and all applicable state and local regulations. The Contractor shall conduct operations so as to maintain and protect access, for vehicular and pedestrian traffic, to and from all properties adjoining or adjacent to those streets affected by their operations, and to subject the public to a minimum of delay and inconvenience. Suitable signs, barricades, railings, etc., shall be erected and the work outlined by adequate lighting at night. Danger lights shall be provided as required. Watchmen and flagmen shall be provided as may be necessary for the protection of traffic.
- C. The Contractor shall, at the Owner's or the Engineer's option, hire uniformed policemen, in lieu of flagmen, to direct and maintain traffic on heavily traveled thorough-fares on which traffic is subject to delays or detours caused by the Contractor's operations. Locations and conditions requiring such uniformed policemen shall be as directed by the local governing authority, Engineer, or Owner.
- D. The Contractor shall assume full responsibility for providing access to any dwelling, building, or hospital in case of fire or other emergency. Contractor shall review with, and obtain approval from, the local fire and police departments regarding any anticipated detours, obstruction to the flow of traffic, fire apparatus, ambulances, or otherwise.
- E. When the normal route of vehicular access to any property must be temporarily obstructed, the Contractor shall notify the affected property owner at least 24 hours in advance of the intended operations at the location. The route shall subsequently re-opened not later than one day following the start of construction at that location, unless otherwise directed by the Engineer. Vehicular access to hospitals, fire departments, and police departments must be provided at all times.
- F. The Contractor must keep all streets open for public access at all times. If the Contractor wishes to close a street and set up a detour, they must submit the proposed detour route to the Engineer and obtain the approval of the Owner, police, fire, and other public safety personnel at least seven (7) days prior to closing the street to public access. No public way may be closed to police, fire, ambulance, or other public safety vehicles at any time. Submittal for the proposed detour route shall include samples of signage, samples of lighting, hours that the street will be closed, forms intended for notification of residents, and approval of the fire, police, and other public safety personnel.
- G. The Contractor shall arrange parking areas and facilities for their employees and the employees of all of their subcontractors away from actual work sites to eliminate disorder and hazards at all work sites. Only Contractor owned and subcontractor owned vehicles will be allowed at any work sites.
 - 1. The Contractor will provide transportation for all Contractor and subcontractor employees for whom designated parking areas are greater than one quarter (1/4) mile from the work site.

- H. Failure of the Contractor to comply with the requirements of this section will be considered a sufficient cause for the Owner to shut down the work. The Contractor will not be entitled to any extra compensation or any extension of time, therefore.

1.22 PRESERVATION OF NATURAL RESOURCES

- A. All construction operations, contract work, cleanup, and the condition of the adjacent terrain upon completion of the work shall fully comply with all applicable rules, regulations, and laws concerning the preservation of natural resources.

1.23 PREVENTION OF WATER POLLUTION

- A. The Contractor shall take all such precautions in the conduct of their operations as may be necessary to avoid contaminating water in adjacent water courses or water storage areas whether natural or manmade. All earthwork, moving of equipment, water control of excavations, and other operations likely to create silting, shall be conducted so as to minimize pollution of water courses or water storage areas. Water used during the contract work which has become contaminated with oil, bitumen, harmful or objectionable chemicals, sewage, or other pollutants shall be collected and taken to a facility that is licensed to dispose of the contaminant.
 - 1. Should the Contractor seek to utilize water from natural sources in the Contract work, intake methods shall be such as to avoid contaminating the source of supply. The Contractor shall obtain approval from the Engineer and Vermont DEC, in addition to any federal authorities having jurisdiction, prior to utilizing water from natural sources.

1.24 SALVAGE AND PERIODIC CLEAN UP

- A. Unless stated otherwise in these specifications, all items, components, or materials which are required to be removed from existing structures; and all equipment, utility lines, underground pipes, conduits, and their appurtenances, or articles of value found in the excavation on the site of the work, shall be brought to the attention of the Engineer, and, if they so orders, shall become or remain the property of the Owner. Waste materials, not so claimed by the Owner, shall be disposed of by the Contractor without additional payment by the Owner.
- B. During construction, the Contractor shall regularly collect and remove from the site of the work all accumulated debris and surplus materials of any kind which result from their operations. Where appropriate, trash collection receptacles shall be provided at various locations, and all employees and subcontractors shall be instructed to deposit their debris in same. Unused equipment and tools shall be stored at the Contractor's yard or base of operations for the project.
- C. When the work involves installation of sewers, drains, water mains, underground structures, or other disturbance of existing features in or across streets, rights-of-way, easements, or private property, the Contractor shall (as the work progresses) promptly backfill, compact, grade, and otherwise restore the disturbed area to a basic condition

which will permit resumption of pedestrian or vehicular traffic and any other critical activity or function consistent with the original use of the land. The requirements for temporary paving of streets, walks, and driveways are specified elsewhere. Unsightly mounds of earth, large stones, boulders, and debris shall be removed so that the site presents a neat appearance.

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

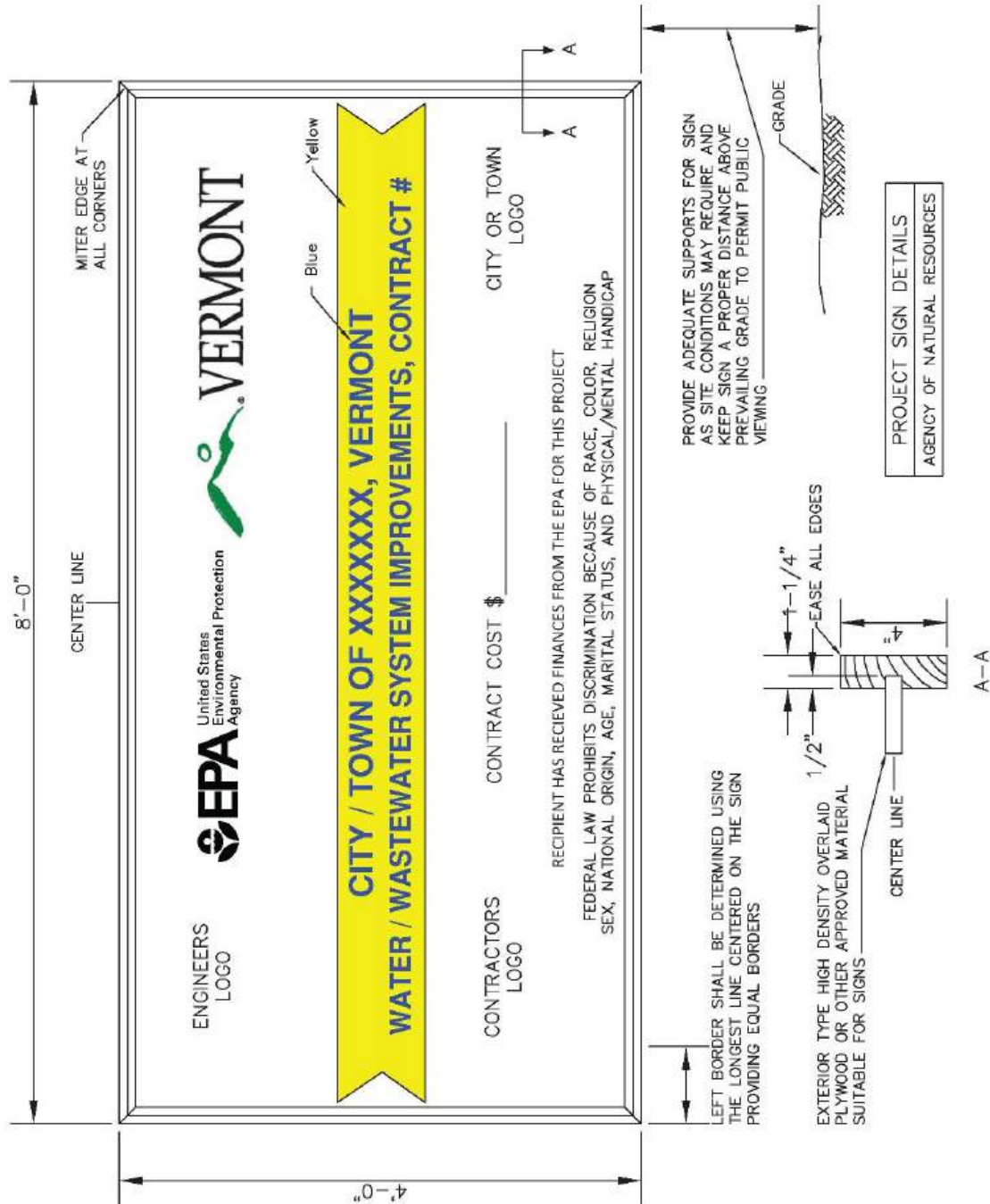
2. PRODUCTS

- 2.1 None used.

3. EXECUTION

- 3.1 None used.

END OF SECTION



SECTION 015726

SITE WATERING FOR DUST CONTROL

1. GENERAL

1.1 GENERAL

- A. The Contractor shall furnish all labor, materials, tools and equipment necessary to apply water on roads or traveled surfaces within the construction site when directed by the Engineer and/or as necessary to control dust. Applications shall be as ordered or required at such locations as the Engineer may direct for the purpose of reducing the dust nuisance to the traveling public or adjacent residences.
- B. When dust control is not included as a separate item in the Contract, the work shall be considered incidental to the appropriate items of the Contract.

2. PRODUCTS

2.1 MATERIALS

- A. Water for sprinkling shall be clean, free of salt, oil and other injurious materials. Calcium chloride shall not be used.

3. EXECUTION

3.1 DUST CONTROL

- A. Water shall be applied by equipment approved by the Engineer. As a minimum it shall consist of a tank, a spray bar, and a gauge equipped pump. Water shall be dispersed through nozzles at a minimum pressure of 20 psi.

END OF SECTION

SECTION 016000

MATERIALS AND EQUIPMENT

1. GENERAL

1.1 GENERAL

- A. All equipment, materials, instruments, or devices incorporated in this project shall be new and unused, unless indicated otherwise in the Contract Documents.
- B. Materials and equipment to be incorporated in the work shall be delivered sufficiently in advance of their installation and use to prevent delay in the execution of the work and they shall be delivered as nearly as feasible in the order required for executing the work.
- C. Materials shall not be delivered to the site or incorporated into the project prior to the completion and approval of the shop drawings for that material.

1.2 STORAGE AND PROTECTION

- A. All materials and equipment at the job site that are to be incorporated in the contract work and that are the responsibility of the Contractor, shall be adequately stored and protected from damage until completion of the contract work.
- B. The Contractor shall be responsible for protecting all materials and equipment furnished by them and for protecting materials and equipment for the contract work which are furnished by the Owner or Others. Responsibility shall be vested in the Contractor for materials and equipment furnished by the Owner when they have been delivered to the job site by the transporting vehicle. The Contractor shall report in writing to the Owner's Representative, within 24 hours after receipt at the job site of the materials and equipment, whether there is any shortage or damage. Unless specified otherwise in these specifications, responsibility shall be vested in the Contractor for materials and equipment furnished by Others when such items are ready to be incorporated in or connected to the work of the Contractor.
- C. The Contractor shall be responsible for all and any damage to any of the work covered by the Contract Documents until the final acceptance of the work.
- D. Any materials, equipment, instruments, or devices of whatever kind which may have become damaged or deteriorated from any cause, shall be removed, and replaced by good and satisfactory items at the Contractor's expense for both labor and materials.
- E. Equipment and materials awaiting installation shall be stored on a dry base at least six inches above ground or floor and shall be properly covered and secured to prevent damage from wind, rain, snow, or flooding. Equipment with moving parts and/or subject to moisture damage such as electrical and instrumentation devices, motors, etc., shall be

stored in a dry, heated enclosure and in accordance with the manufacturer's recommendations.

- F. Store lime and cement in a roofed shelter and off the ground.
- G. All equipment shall be stored fully lubricated with oil, grease, etc., unless otherwise instructed by the manufacturer.
- H. Moving parts of stored equipment shall be rotated a minimum of once weekly to ensure proper lubrication and to avoid metal-to-metal "welding". Upon installation of the equipment, the Contractor shall start the equipment and operate it at least half load once each week for an adequate period of time so as to ensure that the equipment does not deteriorate from lack of use.
- I. Store all mechanical equipment subject to corrosive damage from the atmosphere in a building.
- J. Lubricants shall be changed upon completion of installation and as frequently as required thereafter, according to manufacturer's recommendations, during the period between installation and final acceptance. New lubricants, oil, grease, etc., shall be put into the equipment at the time of acceptance.
- K. Prior to acceptance of the equipment, the Contractor shall have the manufacturer inspect the equipment and certify that its condition has not been detrimentally affected by the long storage period. Such certifications by the manufacturer shall be deemed to mean that the equipment is judged by the manufacturer to be in a condition equal to that of equipment that has been shipped, installed, tested, and accepted in a minimum time period. As such, the manufacturer will guarantee the equipment equally in both instances. If such a certification is not given, the equipment shall be judged to be defective. It shall be removed and replaced at the Contractor's expense.
- L. The storage and handling of equipment and materials shall be done in such a manner that prevents damage, bending, breaking, twisting, warping, rusting, or any other damage.
- M. The Contractor shall have all materials and equipment unloaded and secured to the project site in a manner to prevent any interference with regular construction operations or to disrupt the local vehicle and pedestrian traffic.

1.3 INSTALLATION

- A. All materials and equipment shall be installed in accordance with the recommendations of the manufacturer and in accordance with the requirements of these specifications, to perform properly in the completed contract work and to the satisfaction of the Owner and the Engineer.

- B. All systems shall be completed and left in working order by the Contractor. All requirements of the Owner's Representative and the Engineer shall be satisfied by the Contractor.
- C. The Contractor shall obtain written installation manuals from the equipment manufacturer prior to installation. A copy of all installation instructions shall be furnished to the Engineer's field representative at least one week prior to installation of the equipment.
- D. The contract prices for equipment shall include the cost of furnishing a competent and experienced engineer or mechanic who shall represent the manufacturer and provide help and guidance at the project site during installation of the equipment. For equipment such as pumping units, which require field alignment and connections, the Contractor shall provide the services of the manufacturers qualified mechanic, millwright, or machinist to align the pump and motor prior to making piping connections or anchoring the pump base.
- E. The Contractor shall provide the first fill of any fuel or chemical as part of the portion of the work delivered for use by the Owner. Such fills may include but are not limited to; heating oil, propane, or treatment chemicals such as polymer, caustic, and sodium hypochlorite.

1.4 STANDARD PRODUCTS AND SUBSTITUTIONS

- A. Standard Products:
 - 1. Unless otherwise mentioned in these specifications or shown on the drawings, the materials, fixtures, and equipment to be furnished for the contract work shall be standard products of those manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest design.
 - 2. All materials, fixtures and equipment shall comply with the requirements of these specifications and shall be suitable for proper performance in the completed contract work.
 - B. Substitutions:
 - 1. No request for substitutions will be considered after submission of proposals except for written emergency requests made because of nonavailability of specified items, delay in delivery, or to adjust to unforeseen field conditions.
 - 2. The written emergency request for substitutions shall be accompanied by a photocopy of the letters from the supplier and manufacturer stating the reasons that they are unable to furnish the specified materials.
 - 3. No substitutions for those items mentioned in these specifications or shown on the plans shall be incorporated in the finished work unless written approval is received from the Engineer before purchase of those items and at least thirty (30) days prior to the scheduled time the item is to be incorporated in the work.
- [3.4. Refer to Specification Section 013300 – Submittals for requirements related to substitutions.](#)

- C. Considering of Equals:
1. Whenever in the Plans and Specifications any item of equipment or material is designated by reference to a particular brand, manufacturer, or tradename, it is understood that an approved equal product, acceptable to the Engineer and the Owner, may be used by the bidder or Contractor.
 2. In the event of acceptance of any alternate or substitution, it shall be the responsibility of the Contractor to coordinate such alternate or substitute items with all other items to be furnished to assure the proper fitting together of all items.
 3. Any additional cost incident to the coordination and/or fitting together of alternate or substitute items shall be borne by the Contractor at no extra cost to the Owner. Similar responsibility applies to items which are left to the Contractor's option.

1.5 DISPOSAL OF UNDESIRABLE MATERIALS

- A. All unsuitable and waste materials shall be disposed of off the Owner's property in approved locations, in accordance with all rules, regulations and ordinances governing such disposal. All excess materials that are not the property of the Contractor shall be disposed of as directed by the Owner's Representative and all excess materials belonging to the Contractor shall be removed from the Owner's property. Unsuitable, waste, excess or other undesirable material shall not be disposed of in a manner so as to become a nuisance to other property users or owners, shall not be disposed of so as to cause a health hazard or ecological damage and shall not be disposed of so as to cause an eyesore to the public.
- B. The Owner does not wish to retain possession of excess or unsuitable fill, unless otherwise explicitly stated in written correspondence to the Contractor. It is the Contractor's responsibility to dispose of it in an approved and acceptable manner.

1.6 PRODUCT LISTS

- A. Refer to Specification Section 013300 – Submittals.
- B. The Contractor shall submit to the Engineer a list of all products and materials which are proposed for installation within thirty (30) calendar days from the date of the contract agreement.

1.7 ELECTROLYTIC CORROSION PREVENTION

- A. In the course of the contract, the Contractor shall install the work to prevent galvanic action, bimetallic corrosion, anodic or cathodic action, and electrolysis at all electrical grounds and for all piping. The contact of dissimilar metals further apart than 0.3 on the galvanic scale (electromotive series or table of oxidation potentials) shall be avoided.
1. For convenience, common metals in this type of construction are listed below in their order on the galvanic scale:

Metal	Electrode Potential (V) [Relative to Hydrogen]
Magnesium	+2.37
Aluminum	+1.70
Zinc	+0.76
Chromium	+0.56
Iron and Steel	+0.44
Cadmium	+0.40
Nickel	+0.25
Tin	+0.14
Lead	+0.13
Copper	-0.34

- B. Unless otherwise indicated or required, dielectric insulators between ferrous and nonferrous pipe and equipment shall be provided.
- C. The Contractor shall comply with all requirements in the technical section of these specifications and on the drawings to prevent such corrosion.

1.8 EQUIPMENT IDENTIFICATION

- A. Each piece of equipment shall be provided with a substantial nameplate of stainless steel or other noncorrosive metal. Each nameplate shall be securely fastened in a conspicuous place to the equipment and clearly and permanently inscribed with the manufacturer's name, the year of manufacture, model or type designation, the serial number, principal rating data, electrical or other power characteristics, and similar information as may be appropriate.
- B. Each pump and other piece of mechanical equipment shall also be identified as to name and number by a suitable, substantial nameplate of non-corrosive metal which is permanently and securely attached to the unit. The Contractor shall coordinate the name and number of each unit with same on remotely located controls, control panel, etc. Nameplates shall not be painted over.

1.9 OPENINGS, SLEEVES, AND CHASES

- A. The General Contractor shall provide all openings, channels, sleeves, chases, inserts, etc. and install anchor bolts and other items to be embedded in concrete, as required to

complete the contract work, including that which is required in the work of all other prime contractors (subcontractors) to ensure adequate coordination and responsibility of coordination is the General Contractors. All such openings or chases shown on the Contract Drawings, or reasonably implied thereby, or as confirmed or modified by shop, setting or erecting drawings approved by the Engineer, shall be provided by the General Contractor. The General Contractor shall do all cutting and patching, except cutting and patching of materials of a specified trade and as stated otherwise in these specifications.

- B. Where pipes or conduits are to pass through slabs or walls, or where equipment frames or supports are to be installed as an integral part of an opening, the sleeves, opening forms, or frames shall be furnished by the contractor responsible for installing the pipes conduits or equipment, but shall be placed by the General Contractor. Subcontractors shall furnish all sleeves, inserts, hangers, supports, anchor bolts, etc., required for the execution of their work. It shall be the responsibility of each subcontractor, before the work of the General Contractor is begun, to furnish the General Contractor with the above items and with templates, drawings or written information covering chases, sleeves, openings, etc., which they require. Each subcontractor shall follow up the work of the General Contractor as it progresses, making sure that their written instructions and drawings are followed. When such items are secured in position, and prior to construction of the surrounding slab or wall, the subcontractor for whom the items are installed shall inspect and ascertain the proper number, locations and settings thereof, and the General Contractor shall schedule his operations so as to provide a reasonable opportunity and ample time for such inspection.
- C. Any cost resulting from correction of defective, ill-timed or mislocated work, or for subsequent work which becomes necessary because of omitted openings, chases, sleeves, frames, inserts, etc., shall be borne by the subcontractor responsible for such items. No Contractor shall arbitrarily cut, drill, alter, damage or otherwise endanger the work of another Contractor. The nature and extent of any corrective or additional work shall be subject to the approval of the Engineer following consultation with the Contractors involved. In no case, shall beams, lintels, or other structural members be cut without the approval of the Engineer.

1.10 LUBRICANTS

- A. The Contractor shall provide a one (1) year supply of all lubricants required for the proper maintenance of the equipment specified herein. Proper maintenance shall be defined as that maintenance suggested by the equipment manufacturer. Lubricants shall be of the type recommended by the manufacturer of the equipment or machinery.
- B. The Contractor shall provide all lubricants necessary for the lubrication of stored equipment prior to installation, as specified herein before in paragraph 2.G in this section of these specifications. The Contractor shall also supply all lubricants necessary for the proper lubrication of all equipment, furnished under this Contract, during testing and prior to acceptance. These lubricants shall be removed from the equipment and replaced with new lubricants to be placed into the equipment at the time of acceptance.

1.11 EQUIPMENT DESIGN

- A. Equipment and appurtenances shall be designed in conformity with USA, USME, AIEE, NEMA, and other generally accepted applicable standards and shall be of rugged construction and of sufficient strength to withstand all stresses which may occur during fabrication, testing, transportation, installation and all conditions of operation. All bearings and moving parts shall be adequately protected by bushings or other approved means against wear, and provision shall be made for adequate lubrication by readily accessible devices. Details shall be designed for appearance as well as utility. Protruding members, joints, corners, gear covers, etc., shall be finished in appearance. All exposed welds or machinery shall be ground smooth, and the corners of structural shapes shall be rounded or chamfered.
- B. Machinery parts shall conform within allowable tolerances to the dimensions shown on the working drawings. The corresponding parts of identical machines and pieces of equipment shall be made interchangeable.
- C. All machinery and equipment shall be safeguarded in accordance with the safety codes of the USA, OSHA, and the State of Vermont. All equipment driven by open shafts, belts, chains, or gears or which contains rotating shafts, couplings or other moving parts shall be provided with acceptable all-metal guards enclosing the moving mechanism. Guards shall be secured rigidly in position by steel braces or straps which will permit easy removal of the guards for servicing or repairs to the equipment. The guards shall conform in all respects to all applicable safety codes and regulations.

1.12 ACCESSORIES AND SPARE PARTS

- A. Spare parts for equipment shall be furnished where indicated in the detailed equipment specifications or when recommended by the equipment manufacturer. Spare parts shall be identical to and interchangeable with the original parts. Parts shall be supplied in clearly identified containers, except that large and bulky items may be neatly wrapped in polyethylene. Spare parts and accessories shall be stored separately in a locked area, maintained by the Contractor, and shall be turned over to the Owner at start-up.

1.13 ELECTRIC MOTORS

- A. General. All electric motors supplied as part of the Contract work and furnished and installed by the Contractor shall, as a minimum, conform to all of the requirements of this section of these specifications unless otherwise specified. All electric motors shall conform to ANSI Standards for Rotating Electrical Machinery, to NEMA Standards for Motors and Generators (NEMA Standard Publication, latest revision) and to requirements of the National Electrical Code (NEC), applicable provisions. The rating of the motors furnished shall in no case be less than the horsepower required as specified in other sections of these Contract Documents. Motors shall operate without any undue noise or vibration and shall show no signs of electrical imbalance. Motor efficiency shall be a prime

consideration in the selection of all motors. NEMA Premium® efficiency motors shall be provided, where available. Unless otherwise specified in the individual equipment specifications, motors shall meet all of the requirements set forth hereinafter in this section of these specifications.

- B. Shop Drawings. Shop drawings of all electric motors shall be submitted in accordance with the requirements in Specification Section 013300 – Submittals of these specifications. Shop drawings for all electric motors shall include electrical characteristics, design specifications, mechanical construction, manufacturer's name and type, and pertinent specifications for the intended use, along with the name of the equipment or machinery to be driven.

1. The following information shall be tabulated in one location on each electric motor shop drawing submittal:

Motor manufacturer	Nameplate horsepower
Model	Motor rpm, full load nameplate
Frame Number	Insulation Class
Type of enclosure	Service factor
Volts	Max. ambient temperature
Hertz	Max. temperature rise
Phase	Shop painting
NEMA Design	Guaranteed minimum efficiency

- C. Insulation. Insulation shall, as a minimum be NEMA Class B unless otherwise noted in the individual equipment specifications. Class F insulation shall be provided if required by the manufacturer to meet specified energy requirements.
- D. Ratings of Motors. All motors shall be of adequate capacity to accelerate and drive the connected equipment under all load and operating conditions without exceeding their rated nameplate current or power and without exceeding the specified temperature limit. When the horsepower rating is specified for a motor, the motor furnished shall meet the requirements of the output specified. When the horsepower rating is not specified, the motor furnished shall have sufficient capacity to operate the connected equipment being driven, as required in the individual equipment specifications.
- E. Types of Motors. All motors shall be of a type having starting characteristics and ruggedness as may be necessary under the actual conditions of operation and, unless otherwise specified, shall be suitable for full voltage starting. Explosion-proof motors shall meet all of the requirements for Class I, Division 1 hazardous locations as defined in Article 500 of the National Electrical Code and shall also meet the requirements of all other safety codes pertaining thereto.
- F. Design of Motors. Motors shall comply with all the latest NEMA Standards for Motors and Generators, unless otherwise specified in other sections of these Specifications.
1. Electric motors shall be furnished with service factors in accordance with NEMA Standards as follows, unless otherwise specified in the individual equipment specifications.

<u>Type of Machine</u>	<u>Minimum Service Factor (SF)</u>
Mill and Chemical Duty	1.15
Open Drip-proof	1.15
All Others	1.0

2. Motors shall operate satisfactorily under normal operating conditions at rated load and frequency with a voltage variation up to 10 percent, at rated load and voltage with a frequency variation up to 5 percent, and at rated load with a combined variation in voltage and frequency of not more than 10 percent above or below the rated voltage and frequency provided that the frequency variation does not exceed 5 percent of the rated frequency.
3. Voltage unbalance shall be assumed to be one (1) percent. Altitude shall be assumed to be plant elevation plus 10 percent. Ambient temperature shall be assumed to be 40° centigrade (C).
4. Unless otherwise specified, all three-phase motors shall be constant speed, squirrel cage induction type. The Contractor shall provide variable speed motors (multiple windings, consequent poles, wound rotor) where required as specified in the individual equipment specifications. All motors shall be designed to withstand full voltage starting.
5. Unless otherwise specified, all single-phase motors shall be NEMA Design Letter N or O, designed to withstand full voltage starting. Motors shall be in accordance with NEMA Standards for Definite Purpose Motors. In general, capacitor start induction run or split phase type motors shall be used unless otherwise approved by the Engineer. Shaded pole motors larger than 1/8 horsepower shall not be allowed. Thermal overload protectors and any auxiliary components necessary to provide the required starting characteristics, including capacitors, resistors and automatic switching devices shall be furnished and mounted integrally unless motor starters with overload protection are provided.
6. Motor windings shall be braced to successfully withstand the stresses resulting from the method of starting. The windings shall be treated thoroughly with acceptable insulating compound suitable for protection against moisture and slightly acid or alkaline conditions.
7. Bearings shall be of the self-lubricating type, designed to ensure proper alignment of rotor and shaft and to prevent leakage of lubricant. Bearings for open motors shall be of the sleeve or ball type, as specified under the respective items of mechanical equipment. Bearings for completely enclosed and explosion-proof motors shall be of the ball type.
8. Vertical motors shall be provided with thrust bearings adequate for all thrusts to which they can be subjected during motor operation. Vertical motors of the open type shall be provided with drip hoods of acceptable shape and rugged construction. When the drip hood is too heavy to be easily and readily removed, provision shall be made for access for testing.

- G. Vertical motors shall be provided with thrust bearings adequate for all thrusts to which they can be subjected during motor operation. Vertical motors of the open type shall be provided with drip hoods of acceptable shape and rugged construction. When the drip hood is too heavy to be easily and readily removed, provision shall be made for access for testing.
- H. Motor Rotors. Rotors shall be statically and dynamically balanced. Rotors shall have secondary bars of heavy copper, silver-brazed to one-piece end rings or they shall have rotor windings or shall be one-piece cast aluminum. Where applicable, rotors shall be constructed with integral fans.
- I. Motor Terminal Boxes. Motors shall be furnished with oversize conduit terminal boxes to provide for making and housing the connections and shall be furnished with flexible leads of sufficient length to extend for a distance of not less than four (4) inches beyond the face of the terminal box. The size of cable terminals and conduit terminal box holes shall be as approved by the Engineer. An acceptable type of solderless lug shall be furnished. Completely enclosed and explosion-proof motors shall be furnished with cast iron terminal boxes.
- J. Motor Nameplates. Nameplates shall be furnished with all motors and shall be permanently inscribed with all information required in accordance with the latest revision of NEMA Standards.
- K. Control Data. The Contractor shall furnish to the Engineer five (5) certified copies of characteristic curves of each motor furnished, except 115-volt motors, and all other data required for designing the control equipment.
- L. Painting. All motors shall be given a shop application of paint filler or enamel sealer, a flat coat of undercoating for enamel, and two coats of enamel or, in lieu of this treatment, shall have the manufacturer's standard shop machinery finish. The minimum acceptable finish shall consist of a rustproofing priming coat and a finish coat of paint. Nameplates shall not be painted over.

2. PRODUCTS

2.1 None used.

2. EXECUTION

3.1 None used.

END OF SECTION

SECTION 016510

ADVERSE CONDITIONS

1. GENERAL

1.1 NIGHT WORK

- A. Work after dark will not be permitted except under extreme emergency, or only under special directions, or if directed by the Engineer.
- B. Whenever the Contractor finds it necessary or expedient to do work at night, such night work shall be performed by the Contractor without additional or extra cost to the Owner, and only with the Owner's approval. The Contractor shall provide all lights required for the proper and expeditious carrying on of any work.
- C. The placing of concrete shall be started early enough in the daylight hours to ensure completion of the section under construction before dark.

1.2 WEATHER CONDITIONS

- A. No work shall be done when the weather is unsuitable. The Contractor shall take necessary precautions (in the event of impending storms) to protect all work, materials, or equipment from damage or deterioration due to floods, driving rain, temperature fluctuations, or wind and snowstorms. The Owner reserves the right, through the opinion of the Engineer, to order those additional protective measures over and beyond those proposed by the Contractor, be taken to safeguard all components of the project. The Contractor shall not claim any compensation for such precautionary measures so ordered, nor claim any compensation from the Owner for damage to the work from weather elements.
- B. The mixing and placing of concrete, grout, mortar or pavement courses, the laying of masonry, and installation of water mains shall be stopped during rainstorms; all freshly placed work shall be protected by canvas or other suitable covering in such manner as to prevent running water from coming in contact with it. Sufficient coverings shall be provided and kept ready at hand for this purpose. Placement of concrete or laying of masonry shall be completed in accordance with good construction practice and the installation instructions of the material supplier. The limitations and requirements for mixing and placing concrete, or laying of masonry, in cold weather shall be as described elsewhere in these specifications.

2. PRODUCTS

- 2.1 None used.

3. EXECUTION

3.1 None used.

END OF SECTION

SECTION 016600

PRODUCT STORAGE AND HANDLING REQUIREMENTS

1. GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Provide secure storage and protection for products to be incorporated into the work and maintenance and protection for products after installation and until completion of work.

1.2 RELATED REQUIREMENTS

- A. Section 016000 – Materials and Equipment
- B. The respective Section of Specifications: Special requirements for specific products.

1.3 STORAGE

- A. Store products immediately on delivery and protect until installed in the work.
 - 1. Store in accordance with manufacturer’s instructions, with seals and labels intact and legible.
- B. Store products subject to damage by elements in substantial weathertight enclosures.
 - 1. Maintain temperatures within ranges required by manufacturer’s instructions.
 - 2. Provide humidity control for sensitive products, as required by manufacturer’s instructions.
 - 3. Store unpacked products on shelves, in bins or in neat piles, accessible for inspection.
- C. Exterior Storage: Provide substantial platform, blocking or skids to support fabricated products above ground; prevent soiling or staining.
 - 1. Cover products, especially PVC, HDPE and polybutylene pipe which are subject to discoloration or deterioration from exposure to the elements, with impervious opaque sheet coverings. Clear plastic (“Visqueen”) will not be allowed. Provide adequate ventilation to avoid condensation.
 - 2. Prevent mixing of refuse or chemically injurious materials or liquids.
- D. Arrange storage in manner to provide easy access for inspection.
- E. Coordinate with Owner if Owner’s building or facilities are to be used for storage of Contractor equipment or materials. Contractor’s use of Owner’s buildings or facilities for storage, if allowed by the Owner, shall in no way hinder the Owner’s operations or maintenance procedures.

1.4 MAINTENANCE OF STORAGE

- A. Maintain periodic system of inspection of stored products on scheduled basis to assure that:
 - 1. State of storage facilities is adequate to provide required conditions as stated above and as required by the manufacturer.
 - 2. Required environmental conditions are maintained on continuing basis.
 - 3. Surfaces of products exposed to elements are not adversely affected.
 - a. Any weathering of products, coatings and finishes is not acceptable under requirements of these Contract Documents.

- B. Mechanical and electrical equipment, which requires servicing during long-term storage, shall have complete manufacturer's instructions for servicing accompanying each item, with notice of enclosed instructions shown on exterior of package.
 - 1. Equipment shall not be shipped until approved by the Engineer. The intent of this requirement is to reduce on-site storage time prior to installation and/or operation. Under no circumstances shall equipment be delivered to the site more than one month prior to installation without written authorization from the Engineer.
 - 2. All equipment having moving parts such as gears, electric motors, etc. and/or instruments shall be stored in a temperature and humidity-controlled building approved by the Engineer until such time as the equipment is to be installed.
 - 3. All equipment shall be stored fully lubricated with oil, grease, etc. unless otherwise instructed by the manufacturer.
 - 4. Manufacturer's storage instructions shall be carefully studied by the Contractor and reviewed with the Engineer. These instructions shall be carefully followed.
 - 5. Moving parts shall be rotated a minimum of once weekly to ensure proper lubrication and to avoid metal-to-metal "welding". Upon installation of the equipment, the Contractor shall start the equipment, at least half load once weekly for an adequate period of time to ensure that the equipment does not deteriorate from lack of use.
 - 6. Lubricants shall be changed upon completion of installation and as frequently as required, thereafter during the period between installation and acceptance.
 - 7. Prior to acceptance of the equipment, the Contractor shall have the manufacturer inspect the equipment and certify that its condition has not been detrimentally affected by the long storage period. Such certifications by the manufacturer shall be deemed to mean that the equipment is judged by the manufacturer to be in a condition equal to that of equipment that has been shipped, installed, tested and accepted in a minimum time period. As such, the manufacturer will guaranty the equipment equally in both instances. If such a certification is not given, the equipment shall be judged to be defective. It shall be removed and replaced at the Contractor's expense.

1.5 PROTECTION AFTER INSTALLATION

- A. Provide protection of installed products to prevent damage from subsequent operations. Remove when no longer needed, prior to completion of work.

- B. Control traffic to prevent damage to equipment and surfaces.

- C. Provide coverings to protect finished surfaces from damage.

- D. Materials or equipment damaged after installation shall be replaced by the Contractor at no additional expense to the Owner.

2. PRODUCTS

2.1 None used.

2. EXECUTION

3.1 None used.

END OF SECTION

SECTION 017329

CUTTING AND PATCHING

1. GENERAL

1.1 DESCRIPTION

- A. Work Included: This Section establishes general requirements pertaining to cutting (including excavating), fitting, and patching of the Work required to:
 - 1. Make the several parts fit properly.
 - 2. Uncover work to provide for installing, inspecting, or both, of ill-timed work.
 - 3. Remove and replace work not conforming to requirements of the Contract Documents.
 - 4. Remove and replace defective work.

- B. Related Work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
 - 2. In addition to other requirements specified, upon the Engineer's request uncover work to provide for inspection by the Engineer of covered work and remove samples of installed materials for testing.
 - 3. Do not cut or alter work performed under separate contracts without the Engineer's written permission.

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary trades and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.3 SUBMITTALS

- A. Request for Engineer's Consent:
 - 1. Prior to cutting, which effects structural safety, submit written request to the Engineer for permission to proceed with cutting.

- B. Notices to Engineer:
 - 1. Submit written notice to the Engineer designating the time the work will be uncovered, to provide for the Engineer's observation.

2. PRODUCTS

2.1 MATERIALS

- A. For replacement of items removed, use materials that comply with pertinent Sections of these Specifications.

2.2 PAYMENT FOR COST

- A. For replacement of items removed, use materials that comply with pertinent Sections of these Specifications.

3. EXECUTION

3.1 SURFACE CONDITIONS

- A. Inspection:
 - 1. Inspect existing conditions including elements subject to movement or damage during cutting, excavating, patching, and backfilling.
 - 2. After uncovering the work, inspect conditions affecting installation of new work.
- B. Discrepancies:
 - 1. If uncovered conditions are not as anticipated, immediately notify the Engineer and secure needed directions.
 - 2. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION PRIOR TO CUTTING

- A. Provide required protection including, but not necessarily limited to, shoring, bracing, and support to maintain structural integrity of the Work.

3.3 PREPARATION PRIOR TO CUTTING

- A. Perform required excavating and backfilling as required under pertinent other Sections of these Specifications.
 - 1. Perform cutting and demolition by methods, which will prevent damage to other portions of the Work and provide proper surfaces to receive installation of repair and new work.
 - 2. Perform fitting and adjusting of products to provide finished installation complying with the specified tolerances and finishes.
 - 3. Sidewalks, which are cut through, shall be re-poured so that entire sections are replaced, from expansion joint to expansion joint. Simple in-fill work in a trenched-out section will not be accepted.

END OF SECTION

SECTION 017700

PROJECT CLOSEOUT

1. GENERAL

1.1 CONTRACT DOCUMENTS

- A. Attention shall be directed to the General Conditions for the definition of the Contract Documents. This division of these specifications is a part of the Contract Documents as defined in the General Conditions. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other parts of these specifications.

1.2 USE OF FACILITIES BEFORE COMPLETION

- A. The Owner reserves the right to enter and use any portion of the constructed facilities before final completion of the whole work to be done under this contract. However, only those portions of the facilities which have been completed to the Engineer's satisfaction, as evidenced by issuance of a Certificate of Substantial Completion covering that part of the work, shall be placed in service. Refer to Specifications Section 018010 – Special Requirements for further description of Partial Substantial Completion.
- B. Consistent with the approved progress schedule, the Contractor shall cooperate with the Owner, his agents, and the Engineer to accelerate completion of those facilities, or portions thereof, which have been designated for early use by the Owner.

1.3 FINAL CLEAN-UP/SITE RESTORATION

- A. At all times, the Contractor (and their subcontractors) shall keep the contract work area free from the accumulation of waste materials or rubbish caused by construction operations. At the completion of the contract work, the Contractor shall remove all waste materials and rubbish from the Owner's property as well as all tools, construction equipment, machinery and surplus materials and shall leave the contract work area "broom clean". The Contractor shall leave surfaces of the contract work free from foreign matter. The exterior and interior of all equipment and systems shall be kept clean at all times.
- B. Equipment delivered to the job site with temporary protective coating shall have these removed and the equipment cleaned up satisfactorily. If a dispute arises between the Contractor and Others as to the responsibility for cleaning up, the Owner's Representative shall determine who shall be responsible. If the Contractor fails to clean up, the Owner may do so, and the cost thereof shall be paid by the Contractor.
- C. Before finally leaving the site, the General Contractor shall wash and clean all exposed surfaces which have become soiled or marked. Each contractor shall remove from the site of the work all accumulated debris and surplus materials of any kind which result from their operations, including construction equipment, tools, sheds, sanitary enclosures, etc.

Each Contractor shall leave all equipment, fixtures, and work, which they have installed, in a clean condition. The completed project shall be turned over to the Owner in a neat and orderly condition.

- D. Before completion of the contract work, ruts and scars caused by construction operations under this contract shall be removed and smoothly re-graded to the surrounding area. Damage to features of the land resulting from the Contractor's operations shall be corrected and the land and its features restored as nearly as practicable to its original condition or to any approved changes indicated on the drawings before final acceptance of the work. Any hazardous conditions that could endanger or hinder the Owner's or user's utilization of the land shall be corrected immediately. Any drainage ditches or pipes plugged due to the Contractor's operations shall be restored to allow free flow and removal of surface water. The Contractor shall be entirely responsible for any unnecessary or excessive damage to lands resulting from their operations.

1.4 INSPECTIONS

- A. The Contractor shall inform the Engineer when they believe that the constructed facilities are Substantially Complete and shall request an Engineer's inspection. The Engineer shall not perform the inspection until the conditions of Section 1.5.B. below have been met in full.
 - 1. If the Contractor prematurely requests the Engineer's inspection, and the facilities are found to be inadequately installed or not Substantially Complete for whatever reason, as required by Section 1.5.B. below, the Contractor shall be responsible for reparations made to the Owner to cover the cost of Engineer's inspection.
- B. The Engineer will make their final inspection of the work during the progress of final cleaning and repairing, and any portion of the work finally inspected and accepted by the Engineer shall be kept clean by the Contractor, until the final acceptance of the entire work. Final cleaning and repairing shall be arranged so as to be finished upon completion of the construction work.
- C. When the Contractor has finally cleaned and repaired the whole, or any portion of the work, they shall notify the Engineer that they are ready for final inspection of the whole or a portion of the work, and the Engineer will thereupon inspect the work. If the work is not found satisfactory, the Engineer will order further cleaning, repairs or replacement.
- D. When such further cleaning or repairing is completed, the Engineer, upon further notice, will again inspect the work. The "Final Payment" will not be processed until the Contractor has complied with the requirements set forth and the Engineer has made their final inspection of the entire work and is satisfied that the entire work is properly and satisfactorily constructed in accordance with the requirements of the Contract Documents.

1.5 PROJECT CLOSE-OUT

- A. As construction of the project enters the final stages of completion, the Contractor shall, in conjunction with accomplishing the requirements set forth in the Contract Documents, attend to or have already completed the following items as they apply to their contract:
1. Scheduling equipment manufacturers' visits to site.
 2. Required testing of project components.
 3. Scheduling start-up and initial operation.
 4. Scheduling and furnishing skilled personnel during initial operation.
 5. Correcting or replacing defective work, including completion of items previously overlooked or work which remains incomplete, all as evidenced by the Engineer's "Punch" Lists.
 6. Attend to any other items listed in the Special Requirements or brought to the Contractor's attention by the Engineer.
- B. Prior to issuance of the Engineer's Certificate of Substantial Completion, the Contractor shall submit to the Engineer all required records, certifications, etc., as specified in other sections of the Contract Documents. Missing, incomplete, or unacceptable items, as determined by the Engineer or the Owner, shall constitute grounds for withholding of payment to the Contractor. A partial listing of such items appears below, but it shall be the Contractor's responsibility to ensure that any and all other such items which are required as specified in the Contract Documents are submitted.
1. Acceptable Equipment Operation & Maintenance Manuals have been submitted and accepted by the Owner.
 2. Operator training by qualified manufacturer representatives has been completed and accepted by the Owner.
 3. Automated controls are complete, functioning and tested. Electrical panels, including PLCs, have all wires and cables labeled and color coded as required by these specifications. Electrical panel as-built drawings have been submitted and accepted by the Owner. Electrical panels have been cleaned and are ready for Owner use.
 4. Acceptable manufacturer field test reports, performance affidavits and certification that the equipment has been installed, inspected, tested and is ready for permanent operation by the Owner with no warranty exceptions.
 5. All equipment safeguards completed.
 6. The Owner is receiving full beneficial use.
- C. Prior to issuance of the Engineer's Certificate of Final Completion, the Contractor shall accomplish the cleaning and final adjustment of the various building components as specified in the detailed technical specifications and as follows:
1. Clean all finish hardware after adjustment for proper operation.
 2. Touch up marks or defects in painted surfaces and touch up any similar defects in factory finished surfaces.
 3. Remove bitumen from gravel stops, fascia and other exposed surfaces.
 4. Remove all stains, marks, fingerprints, soil, spots and blemishes from all finished surfaces, tile, stone, brick and similar surfaces.
 5. Clean all equipment, including electrical panels, so that they are free from dust, stains, spots and blemishes. Clean inside of electrical and control panels so that only

items required by the Owner to operate the equipment are left inside (i.e., panel drawings, etc.)

- D. Prior to issuance of the Engineer's Certificate of Final Completion, the Contractor shall submit the following:
 - 1. One set of neatly marked up drawings recording all changes and additions to the work under this contract (see requirements of Specification Section 017839 – Project Record Documents).
 - 2. Employee payroll records and other labor certifications required by the Federal or State Government on projects receiving Federal and/or State grants or loans, including the records of all subcontractors. –These records shall be submitted to the Owner. –These submittals shall also be made periodically during the life of the Contract when so ordered by the Owner.
 - 3. Any special guarantees, warranties, or bonds, submitted to the Owner.

- E. The Contractor shall make note of the fact that required certifications and information above, must actually be submitted early on in the life of the project as required in other sections of these Specifications.

2. PRODUCTS

2.1 None used.

3. EXECUTION

3.1 None used.

END OF SECTION

SECTION 017839

PROJECT RECORD DOCUMENTS

1. GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Throughout progress of the work, maintain an accurate record of changes in the Contract Documents, as described in Part 3, Section 1 below.
2. Upon completion of the Work, transfer the recorded changes to a set of Record Documents, as described in Part 3, Section 2 below.

B. Related Work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
2. Other requirements affecting Project Record Documents may appear in pertinent other Sections of these Specifications.

1.2 QUALITY ASSURANCE

- A. Delegate the responsibility for maintenance of Record Documents to one person on the Contractor's staff as approved by the Engineer.

B. Accuracy of Records:

1. Thoroughly coordinate changes within the Record Documents, making adequate and proper entries on each page of Specifications and each sheet of Drawings and other Documents where such entry is required to show the change properly.
2. Accuracy of records shall be such that future searches for items shown in the Contract Documents may rely reasonably on information obtained from the approved Project Record Documents.

- C. Make entries within 24 hours after receipt of information that the change has occurred.

1.3 SUBMITTALS

- A. Comply with pertinent provisions of Specifications Section 013300 – Submittals.

- B. The Engineer's approval of the current status Project Record Documents shall be a prerequisite to the Engineer's approval of requests for progress payment and request for Final Payment under the Contract.

1. The Contractor will provide one (1) record copies of all project record documents with the locations indicated (by cross ties or latitude/longitude, and including elevations) for all constructed facilities, above and below ground, including but not limited to pipelines, conduit, saddles, sleeves, repair clamps, valves, hydrants, air release valves,

and taps made for pressure/leakage tests or for chlorination purposes for all work included in each application for payment made in accordance with Specification Section 012000 – Measurement and Payment.

- C. Prior to submitting each request for progress payment, the Contractor shall secure the Engineer's approval of the current status of the Project Record Documents.

1.4 PRODUCT HANDLING

- A. Maintain the job set of Record Documents completely protected from deterioration and from loss and damage until completion of the Work and transfer of all recorded data to the final Project Record Documents.
- B. In the event of loss of recorded data, use means necessary to again secure the data to the Engineer's approval.
 - 1. Such means shall include, if necessary, in the opinion of the Engineer, removal and replacement of concealing materials.
 - 2. In such case, provide replacements to the standards originally required by the Contract Documents.

2. PRODUCTS

2.1 RECORD DOCUMENTS

- A. Job set: Promptly following receipt of the Owner's Notice to Proceed, secure from Owner or Engineer one complete set of all Documents comprising the Contract.
- B. Final Record Documents: At a time nearing the completion of the work, Contractor shall submit one (1) complete set of all Final Record Drawings. The Final Record Drawings shall be a complete Contract Drawing Set, including details of all items changed in the field. The Record Drawings shall be neatly prepared, with deviations from the design clearly marked on the drawings by hand. Upon Engineer's approval of the Final Record Documents, the Contractor shall provide one hard copy and one electronic copy (.pdf format).
- C. The Contractor shall certify each Record Drawing with the following statement:
 - 1. "(Name of Contractor) hereby certifies that these final Record Drawings represent the actual "as-built" condition and location of all project components."

3. EXECUTION

3.1 MAINTENANCE OF JOB SET

- A. Immediately upon receipt of the job set described in Paragraph 2.1.A above, identify each of the Documents with the title, "RECORD DOCUMENTS - JOB SET".

- B. Preservation:
 - 1. Considering the Contract completion time, the probable number of occasions upon which the job set must be taken out for new entries and for examination, and the conditions under which these activities will be performed, devise a suitable method for protecting the job set to the approval of the Engineer.
 - 2. Do not use the job set for any purpose except entry of new data and for review by the Engineer, until start of transfer of data to final Project Record Documents.
 - 3. Maintain the job set at the site of work as the Engineer designates that site.
- C. Making Entries on Drawings:
 - 1. Date all entries.
 - 2. Call attention to the entry by a "cloud" drawn around the area or areas affected.
 - 3. In the event of overlapping changes, use different colors for the overlapping changes.
- D. Make entries in the pertinent other Documents as approved by the Engineer.
- E. Conversion of Schematic Layouts:
 - 1. In some cases, on the Drawings, arrangements of conduits, circuits, piping, and similar items, is shown schematically and is not intended to portray precise physical layout.
 - a. Final physical arrangement is determined by the Contractor, subject to the Engineer's approval.
 - b. However, design of future modifications of the facility may require accurate information as to the final physical layout of items, which are shown only schematically, on the drawings. Therefore, the record documents shall include conversion of schematic layouts to the final physical locations.
 - 2. Show on the job set of Record Drawings, by dimension accurate to within one inch, the centerline of each run of items such as those described in subparagraph 3.1.E.1.
 - a. Clearly identify the item by accurate notes such as "process water", "drain", etc.
 - b. Show, by symbol or note, the vertical location of the item ("under slab", "in ceiling plenum", "exposed", etc).
 - c. Make all identification sufficiently descriptive that it may be related reliably to the Specifications.

3.2 FINAL PROJECT RECORD DOCUMENTS

- A. The purpose of the final project Record Documents is to provide factual information regarding all aspects of the work, both concealed and visible, to enable future modification of the work to proceed without lengthy and expensive site measurement, investigation, and examination.
- B. Review and Submittal:
 - 1. Submit the completed set of Project Record Documents to the Engineer as described in Paragraph 1.3.C above.
 - 2. Participate in review meetings as required.
 - 3. Make required changes and promptly deliver the final Project Record Documents to the Engineer.

3.3 FINAL PROJECT RECORD DOCUMENTS

- A. The Contractor has no responsibility for recording changes in the work subsequent to Final Completion, except for changes resulting from work performed under Warranty.

END OF SECTION

SECTION 018010

SPECIAL REQUIREMENTS

1. GENERAL

1.1 CONTRACT DOCUMENTS

- A. Attention shall be directed to the General Conditions for the definition of the Contract Documents. This division of these specifications is a part of the Contract Documents as defined in the General Conditions. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other parts of these specifications.

1.2 LIMITS OF WORK

- A. The Contractor shall confine his operations to property owned by the Town of Montgomery as shown on the Contract Drawings. The Contractor shall notify the Engineer and shall obtain prior written approval of any effected property owner prior to conducting any construction related activities on private property.
- B. The Contractor shall take all necessary measures to minimize interference with the normal activities of residents and businesses in the vicinity of the proposed work. Interruption of traffic or essential services such as electricity, sewer, water, etc. shall be avoided. If essential services must be interrupted due to construction activities, the out-of-service time shall be coordinated with the respective utility, residents and businesses, and shall be confined to daylight hours. If the Contractor finds that services cannot be restored in the allotted time frame, a course of action approved by the Owner shall be implemented and paid by the Contractor.

1.3 DEMOLITION DEBRIS

- A. The Contractor shall be responsible for disposal of demolition debris. All costs including hauling and disposal shall be borne by the Contractor.

1.4 WORK HOURS

- A. Normal work hours shall be between 7 A.M. to 7 P.M. There shall be no work performed outside of normal work hours, or on Saturdays, Sundays, and State or Federal legal holidays, unless written permission is granted by the Owner.
- B. No work shall be performed during a Fourth of July holiday weekend.

1.5 SALVAGEABLE EQUIPMENT

- A. Materials and equipment salvaged and not wanted by the Owner shall become the property of the Contractor and the Contractor shall be responsible for proper disposal.

1.6 FUEL OIL AND HAZARDOUS WASTE HANDLING

- A. Should fuel oil, contaminated soils or other contaminated or hazardous materials be encountered during construction, the Contractor shall follow the requirements specified herein as well as the requirements of relevant health and safety codes and regulations.
- B. The Contractor shall have an OSHA-certified health and safety representative at the job site during all times when construction work is taking place. The health and safety person shall be fully trained and capable of identifying potential health and safety hazards and the appropriate measures to follow in response to such hazards should they be encountered.
- C. The limits of work with respect to contaminated or hazardous materials that may be encountered during construction are limited to the confines of the excavation for pipe, structures, and treatment facilities.
- D. The Contractor shall designate a responsible person within their employ on a daily basis to initiate remedial action should it become necessary if contaminated or hazardous materials are encountered during construction.
- E. Upon encountering contaminated or hazardous materials, the Contractor's on-site designated health and safety person shall take such measures as necessary to secure the immediate area for protection of lives and property and, if possible, to prevent the spread of contaminants. The Contractor or their designated health and safety person shall immediately notify the following:
 - 1. The Engineer
 - 2. The Owner
 - 3. The Vermont Department of Environmental Conservation.
- F. The specific course of action to be taken, such as remedial measures, modification of construction procedures, etc. shall be determined, if and when contaminants are encountered, as appropriate, based on the type, nature and extent of materials encountered.

2. PRODUCTS

- 2.1 None used.

3. EXECUTION

- 3.1 None used.

END OF SECTION

SECTION 020100

GENERAL PROVISIONS

1. GENERAL

1.1 DESCRIPTION

- A. Attention shall be directed to Specification Section 011000 – Summary of Work.
- B. The work of this Division covers site work for the construction of manholes, catch basins and appurtenant structures including but not limited to clearing and grubbing, excavation, stripping and (conservation) of topsoil, demolition of existing and or abandoned structures, excavation of all materials encountered , shoring, backfill, fill, providing borrow, compaction, grading, paving, landscaping and, in addition, such other site work as many be necessary.
- C. Without limiting the generality of the above, work not mentioned here that is indicated or reasonably implied on the drawings shall be included in the work of this Division unless specifically stated as under the scope of other Divisions or by others.

1.2 CONTRACT DOCUMENTS

- A. This division of these specifications is a part of the Contract Documents as defined in the General Conditions. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other parts of these specifications.

1.3 RELATED SECTIONS

- A. The following items appurtenant to the work are a part of the contract work specified under other sections of these specifications but are mentioned here for cross reference purposes.
 - 1. Specification Section 024100 – Demolition and Abandonment.
 - 2. Specification Section 024119 – Selective Demolition.
 - 3. Specification Section 129243 – Landscaping.
 - 4. Specification Section 310000 – Earthwork.

1.4 PROTECTION

- A. General: Extreme care shall be exercised to avoid existing trees, shrubs, facilities and utilities that are to remain, and all necessary precautions taken to preclude damage to these areas and items. Any damage to these items as a result of work performed by the Contractor shall be repaired by the Contractor at his/her own expense.
- B. Existing Utilities: Existing utilities shall be supported and protected and the Engineer shall be notified when encountered. Ample time shall be allowed for such measures as may be required for the continuance of such services. Services to be abandoned within excavation areas shall be removed by the Contractor. Permanent existing utilities near the excavation

and/or construction work shall be properly protected during construction work and any damage to such permanent utilities shall be repaired by the Contractor without expense to the Owner. Reference is made to Specification Section 015000 – Temporary Facilities and Controls in Division 1 of these specifications.

- C. Obtain Information: The Contractor shall obtain information from the proper sources and authorities concerning locations of all utilities within the scope of the work of this project, prior to commencement of Contract work, in order to prevent damage to such utilities. Neither the Owner nor the Engineer shall be responsible for any such damage and the Contractor shall restore and repair any resultant damage without additional compensation.
- D. Miscellaneous: Rules and regulations governing the respective utilities and local ordinances shall be observed. Utilities shall be adequately protected from damage and shall not be removed or relocated except as indicated or directed.
- E. Traffic Control: Streets, roads and private drives, in which work is to be done shall be maintained passable for vehicles at all times, except as permitted by the Engineer. Property shall be accessible at night, on weekends and at all times when work is not actively proceeding in front of it.
- F. Preserving Survey Markers: Any existing property boundary markers, control points and datum elevation markers or benchmarks shall be preserved and all such established survey points which are displaced or destroyed by the Contractor shall be replaced by a Vermont licensed land surveyor with all expenses for such replacement paid by the Contractor.

1.5 GRADES AND ELEVATIONS

- A. The drawings indicate, in general, the alignment and finished grade elevation and underground utility and piping invert grades. The Engineer, however, may make such adjustments in grades and alignment as are found necessary in order to avoid interference and to adapt the piping to other special conditions encountered. Grading between indicated final grades shall be smooth even surfaces, except as otherwise required. Cover over pipes shall, in any case, conform to requirements of the Governmental Agencies having jurisdiction. Said agencies shall be notified at least 24 hours prior to backfilling of pipe trenches.

1.6 TOPSOIL CONSERVATION

- A. All topsoil existing within areas in which earthwork will be done shall be removed and stockpiled in locations free from interference with the work. The stockpiled topsoil shall be kept free of trash, brush, roots, stones over two inches in diameter, subsoil and other excavated materials.

1.7 MAINTENANCE OF UTILITY SERVICE

- A. Existing utility services must be maintained by the Contractor, at all times during construction, by pumping or piping flows through or around work areas, or by other

approved means. The Contractor's work shall be considered incidental to the base bid and require no separate payment. Means of maintaining flow shall be submitted to the Engineer for approval prior to work. Standby equipment shall be at hand for all bypass operations. Every attempt shall be made to avoid pumping overnight or during weekends. A qualified pump operator shall be on hand whenever pumping is required. The Contractor shall keep additional pumping equipment on standby in case of failure of operating equipment.

2. PRODUCTS

2.1 None used.

3. EXECUTION

3.1 None used.

END OF SECTION

SECTION 024100

DEMOLITION AND ABANDONMENT

1. GENERAL

1.1 DESCRIPTION

A. Work Included:

1. The Contractor shall furnish all materials, labor, supervision and equipment required for the orderly demolition, abandonment, removal and/or salvaging of existing structures, foundations, septic tanks, piping, fittings, appurtenances and other equipment, to the extent shown on the drawings and described herein, or as required by the Engineer.
2. The work shall also consist of backfilling any resultant pits, holes or trenches; furnishing and erecting temporary barricades; and cleaning up and rough grading for safe accessibility of any disturbed area.
3. The Contractor's work includes the removal of all obstructions encountered for construction of new facilities, whether or not indicated and/or located on the Drawings. Every attempt has been made to provide such indication of locations but no warranty is made as to the accuracy or completeness of the information provided.

1.2. QUALITY ASSURANCES

- A. All demolition methods shall be in full compliance with municipal, county, state and federal ordinances. Demolition work shall comply with the requirements of the Occupational Safety and Health Administration (OSHA).
- B. The Contractor shall comply with all municipal, county, state and federal ordinances regarding the disposal of rubble, scrap metal and refuse.
- C. Demolition procedures shall provide for safe conduct of the work, protection of existing property and structures which are to remain undisturbed and coordination with other work in progress.
- D. Demolition shall be phased throughout construction to maintain proper operation of existing facilities. The Contractor shall prepare a detailed schedule of proposed demolition and abandonment for review and approval by the Owner and Engineer prior to commencing work.

1.3. QUALITY ASSURANCES

- A. General: It shall be the responsibility of the Contractor to visit the site and inspect the nature and condition of the items to be removed and salvaged before submitting his bid.

- B. Dust Control: The Contractor shall be responsible for controlling the amount of dust resulting from demolition activities in order to prevent the spread of dust to occupied portions of buildings and to avoid creation of a nuisance in the surrounding area. Water shall not be used when it could result in or create hazardous or objectionable conditions such as flooding and pollution.
- C. Protection of Existing Work: The Contractor shall be responsible for protecting existing work. Work damaged by the Contractor shall be repaired to match existing work.

2. PRODUCTS

2.1 GENERAL

- A. Materials used in the repair or replacement of existing work to remain shall be identical or equal to the materials used in existing work.

3. EXECUTION

3.1 GENERAL

- A. The Contractor shall not proceed with the removal of any equipment, piping or appurtenances from service without specific approval of the Owner. Any equipment, piping or appurtenances removed from service without proper authorization, and which are necessary for the operation of the existing utilities or for the new facilities, shall be replaced to the satisfaction of the Owner at the Contractor's expense.
- B. The method of demolition and removal is left to the discretion of the Contractor, however, no structures or piping in use by the Town shall be damaged or have their proper functioning and operation disturbed by the demolition, nor shall any surrounding structures, homes or properties suffer any damage.
- C. All existing equipment, piping and materials identified for demolition and not required to be reused shall become the property of the Contractor immediately upon removal from their present locations. The Contractor shall remove such material from the project site at their own expense and it shall not be reused.
- D. All existing items identified on the drawings to be salvaged shall remain the property of the Owner. The Contractor shall furnish all labor and material to identify, clean, protect, crate and box and store the items at a location approved by the Owner.
- E. The Owner reserves the right to retain any and all existing materials and equipment including all items not identified for salvage within the Contract Documents. Existing materials and equipment identified by the Owner to be retained shall remain the property of the Owner and shall be stored at a location approved by the Owner as directed by the Engineer/Owner. Any property not wanted by the Owner shall become the property of the Contractor who shall be responsible for their disposal.

- F. The Contractor shall take all necessary precautions against damaging the material and equipment to be stored. The Contractor shall repair any damage resulting from their operations, as directed by and to the satisfaction of the Owner. Itemized lists of materials removed and stored shall be given to the Owner daily. Six (6) typed copies of the final itemized list shall be furnished to the Owner at the completion of construction. The list shall include items, method of packaging and place of storage.
- G. Drains, curbs, fences and similar structures shall be removed and/or relocated as indicated on the Drawings, or as required and approved for the work. Unless otherwise shown on the plans, structures removed and/or relocated for the work shall be restored equal to their original condition to the satisfaction of the Engineer.

3.2 DECOMMISSIONING OF EXISTING SEPTIC TANKS

- A. The Contractor shall abandon septic tanks indicated on the Contract Drawings only after the Water Resource Recovery Facility (WRRF), all effluent pump stations, all effluent sewer flush tanks, and all sewer mains have been accepted and placed in service.
- B. The decommissioning of the existing septic tanks shall be accomplished by one of the three (3) approved methods listed below in this section. The Contractor is required to pump the existing septic tank at least one day but not more than 3 days prior to decommissioning for either of the three (3) approved methods listed below.
 - 1. Abandonment in place:
 - a. The Contractor shall break the bottom of the tank and completely fill the tank with bank run gravel or flowable fill.
 - i. The Contractor shall ensure the abandoned tank will present no collapse or confined-space hazard.
 - b. Air pockets shall be removed to the best of the Contractor's ability to avoid the tank "floating" during any high-water table events.
 - c. The Contractor shall remove all risers and septic tank covers.
 - d. The surface shall be restored to match existing surrounding conditions.
 - 2. Tank removal:
 - a. The Contractor shall either remove the entire tank as is or break apart and then entirely remove the debris.
 - b. If the new septic tank will not be installed in the same location as the existing tank, the Contractor shall fill the area to grade with approved backfill and compact to minimum requirements.
 - c. The surface shall be restored to match existing surrounding conditions.
 - 3. Tank demolition and left in place:
 - a. The Contractor shall remove all risers and septic tank covers before demolition.
 - b. The Contractor shall crush the existing septic tank in place and leave the debris to act as backfill.
 - i. The Contractor shall ensure the bottom of the tank has been broken to ensure it will drain.

- c. The area shall be backfilled with approved backfill material to within 12" of the existing ground elevation.
 - d. The surface shall be restored to match existing surrounding conditions.
- C. Each existing septic tank shall be evaluated on a case-by-case basis to determine the most effective method of decommissioning to be agreed upon by the Contractor and RPR. If the Contractor and RPR cannot come to an agreement, the Engineer shall have final determination on the method.
- D. Any disposal fields encountered during construction will be decommissioned and removed as needed. The Contractor shall consider this work incidental to the cost of decommissioning of the existing septic tank.

3.3 STRUCTURES AND BUILDINGS

- A. Remove all parts of existing structures to be demolished to a depth of 36" below finished grade, or as indicated on the Drawings in specific areas.
- B. Completely remove all pipes located beneath areas designated for new structures.

3.4 EQUIPMENT

- A. Completely remove equipment which is designated to be removed.
- B. Completely remove concrete equipment bases if the existing bases are not to be used for new equipment. Completely remove isolated equipment bases.
- C. Pieces of equipment weighing 150 lbs or more shall be provided with suitable skids before storing.
- D. Equipment to be retained by the Owner shall be carefully removed from the present location, cleaned and immediately stored on site as designated by the Owner.

3.5 DISPOSAL

- A. All removed equipment and materials not specifically designated to remain the property of the Owner shall become the property of the Contractor and shall be removed from the site. Refer to Specification Section 028100 - Waste Material Disposal for disposal requirements.
- B. If the Owner elects not to retain ownership of a certain item, the item shall become the property of the Contractor and shall be removed from the site at the Contractor's expense.
- C. The Contractor shall not allow debris and rubbish to accumulate on the site. Remove debris and rubbish from the site.

- D. The Contractor shall provide the Engineer and the Owner receipts for all disposed material.

3.6 FILLING

- A. Backfill of excavations more than three (3) feet deep, more than five (5) cubic yards or beneath proposed structures or roadways shall be as specified in Specification Section 310000 – Earthwork.
- B. Backfill excavations which will not be beneath new structures, buildings, piping, or other new work, shall have an adequate foundation for grassing.
- C. Backfill all excavations resulting from demolition to match existing grade unless shown otherwise.

3.7 CLEAN-UP

- A. Clean-up in areas where other work is to be done following demolition shall be as specified in the applicable Sections.
- B. Clean-up the job site in areas where no other work is to be done under this Contract following demolition. Remove all debris and rubbish, temporary facilities, and equipment. Level surface irregularities to eliminate depressions. Leave the work in a neat and presentable condition.

END OF SECTION

SECTION 028100

WASTE MATERIAL DISPOSAL

1. GENERAL

1.1 DESCRIPTION

- A. The Contractor shall remove and dispose of all debris and excess spoil resulting from clearing, demolition and excavation operations. Natural waterways or bodies of water shall not be used for disposal of debris.

2. PRODUCTS

- 2.1 None used.

3. EXECUTION

3.1 DISPOSITION OF DEBRIS

- A. All trees, brush, logs, leaves, sawdust, bark, excess excavation and refuse shall be collected and transported to, and deposited in, a legal refuse disposal landfill or other approved material stockpile areas.
- B. All non-biodegradable material shall be disposed in accordance with all Federal, State and local provisions. The Contractor shall provide the Engineer with receipts from approved disposal facilities.
 - 1. The Contractor shall recycle metal debris to the extent possible.
 - 2. Under the 10/31/2020 Vermont Solid Waste Rules, unpainted asphalt, brick, and concrete can be buried on the site of generation.
 - 3. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws and ordinances concerning removal, handling and protection against exposure or environmental pollution. Contractor is referred to the following for wastes that are banned from landfills:
 - a. <https://dec.vermont.gov/sites/dec/files/wmp/SolidWaste/Documents/2015-LandfillBan-Poster-FINAL.pdf>
- C. Debris shall be removed from the site as soon as practical and debris shall not be left on site for more than five (5) working days and shall not be left to accumulate until the completion of the job.
 - 1. If the Contractor should fail to do this, the Owner will make the necessary arrangements to affect the clean up by others and will reimburse the costs by the Contractor. If such action becomes necessary on the part of and in the opinion of the Owner, the Owner will not be responsible for the inadvertent removal of material which the Contractor would not have disposed of had he affected the required clean-up.

- D. The Contractor shall obtain and pay for any and all permits required thereof.

END OF SECTION

SECTION 033000

CAST-IN-PLACE CONCRETE

1. GENERAL

1.1 GENERAL

- A. This Section applies to all cast-in-place concrete placed for anchors, thrust restraints or blocks, foundation walls, slabs, pole bases, equipment pads, supports and other similar structures. This specification does not apply to any other concrete products or applications.

1.2 RELATED SECTIONS

- A. Section 034100 – Precast Concrete Structures.
- B. Section 036000 – Non-Shrink Grout

1.3 RELEVANT STANDARDS

- A. The Contractor shall refer to the following standards (or newer versions when available) when performing the described work within the Contract Documents:
 - 1. ACI (American Concrete Institute) 301-20 – Specifications for Concrete Construction.
 - 2. ACI (American Concrete Institute) PRC 302.1-15 – Guide to Concrete Floor and Slab Construction.
 - 3. ACI PRC 304-00 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.
 - 4. ACI PRC 305-20 - Guide to Hot Weather Concreting.
 - 5. ACI PRC 306-16 - Guide to Cold Weather Concreting.
 - 6. ACI PRC 308-16 - Guide to External Curing of Concrete.
 - 7. ACI PRC-309-05 - Guide to Consolidation of Concrete.
 - 8. ACI PRC 309.2-15 - Guide to Identification and Control of Visible Surface Effects of Consolidation on Formed Concrete Surfaces.
 - 9. ACI Code 318-19(22) - Building Code Requirements for Structural Concrete and Commentary.
 - 10. ASTM C31/C31M-22 – Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - 11. ASTM C33-07 – Standard Specification for Concrete Aggregates.
 - 12. ASTM C94/C94M-22a – Standard Specification for Ready-Mixed Concrete.
 - 13. ASTM C138/138M – Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
 - 14. ASTM C143/C143M – Standard Test Method for Slump of Hydraulic Cement Concrete.
 - 15. ASTM C150-00 – Standard Specification for Portland Cement.
 - 16. ASTM C171-20 – Standard Specification for Sheet Materials for Curing Concrete.
 - 17. ASTM C172/C172M – Standard Practice for Sampling Freshly Mixed Concrete.
 - 18. ASTM C231-09a – Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
 - 19. ASTM C260-10 – Standard Specification for Air-Entraining Admixtures for Concrete.

20. ASTM C295-08 – Standard Guide for Petrographic Examination of Aggregates for Concrete.
21. ASTM C330 – Standard Specification for Lightweight Aggregates for Structural Concrete.
22. ASTM C494/C494M – Standard Specification for Chemicals Admixtures for Concrete.
23. ASTM C618-23 – Standard Specification for Coal Ash and Raw or Calcinated Natural Pozzolan for Use in Concrete.
24. ASTM C1064/C1064M-17 – Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
25. ASTM C827/C827M-16 - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.
26. ASTM C1107-05 – Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
27. ASTM D994/D994M-11(2022) – Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
28. ASTM D1751-18 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
29. ASTM D1752-18 – Standard Specification for Preformed Sponge Rubber, Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
30. ASTM D6690-21 – Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.

1.4 SUBMITTALS

- A. The Contractor shall submit the following to the Engineer for approval:
 1. Name and address of Contractor's testing laboratory firm. Accreditation and a brief description of prior work, which is similar to that proposed for this project. Provide prior work owner's full name, address and telephone number. ASTM E329 will also be used as one of the bases for evaluating the testing laboratory firm.
 2. Concrete design mixes, material test results, and results of strength tests from the trial concrete mixes by the Contractor's testing laboratory firm.
 3. Manufacturer's cement mill test reports for each shipment of cement, regardless of quantity, prior to incorporation into the work.
 4. Product data for proprietary materials and items, including forming accessories, admixtures, curing compounds, non-shrink non-metallic grout and others requested by the Engineer.
 5. Installation Instructions: Submit installation procedures and interface required with adjacent Work.

2. PRODUCTS

2.1 MIXTURE

- A. It is the responsibility of the Contractor to have their design mix tested at an approved laboratory. A minimum of three (3) batches shall be tested indicating the mix meets the 7-day and predicted 28-day compressive strengths. The Contactor shall bare the costs

associated with the mix design and testing. The Contractor may choose to submit the Manufacturer's certificate indicating the design mix will meet all requirements listed within this Specification instead of completing trial batches.

B. Design Requirements:

Minimum Compressive Strength	4,000 psi at 28 days, 3,000 psi at 7 days
Maximum Aggregate Size	¾"
Air Entrainment	4% (min.) to 6% (max.)
Cement-Water Ratio	1 lbs. of cement to .44 lbs. of water
Slump	2 in. to 4 in.

C. Materials

1. Portland Cement

- a. ASTM C150, Type II, free of lumps. Use one approved brand of uniform colored cement from one mill throughout the project unless otherwise approved by the ENGINEER. Reject entire shipment when cement is lumpy, wetted, partially or wholly set.

2. Fine and Course Aggregates

- a. ASTM C33. Course aggregates shall have a sieve distribution of ¾" to No. 4 sieve. Select aggregate which is not considered susceptible to Alkali-Silica Reactivity (ASR), in accordance with ASTM C295-08 referenced above.

3. Water

- a. Conform to ASTM C94. Potable and free from injurious amounts of oil, acid, alkali, organic matter or other deleterious substances. Heat or cool water to obtain concrete temperatures specified and in accordance with the cold and hot weather concreting standards referenced in 1.3 above.

4. Admixtures

- a. Air Entrainment: Air entrain all concrete. Use admixtures conforming to ASTM C260-10 referenced in 1.3 above.
- b. Water Reducing Admixtures: Use admixture conforming to ASTM C494, Type A.
- c. High-Range Water-Reducing Admixtures: Use admixture conforming to C494, Type F.
- d. Curing Compound: Conform to ASTM C309. Provide in liquid form which, when applied to fresh concrete by means of a spray gun, will form an impervious membrane over exposed surface of concrete. Use Type I-D compound with red fugitive dye, Class B, having 18 percent minimum solids.
- e. Bonding Agent: Two-component modified epoxy resin.
- f. Cloth, Burlap, Jute or Kenaf. CCC-C-476C
- g. Non-Shrink, Non-Metallic Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 5000 psi in 48 hours, with zero percent volume change for plastic state in accordance with ASTM C827.

5. Calcium Chloride: Use prohibited.

6. Joint Filler: ASTM D1752 Closed cell polyvinyl chloride foam, resiliency recovery of 95 percent if not compressed more than 50 percent of original thickness.

7. Waterstops: Conform to the requirements of Army Corps of Engineers specification CRD C-572.

3. EXECUTION

3.1 STORAGE AND DELIVERY

- A. Contractor shall maintain the Manufacturer's original storage method for the Portland cement. The cement shall be stored in a cool, dry, environment. Any cement exposed to moisture so that it becomes unusable prior to mixing, shall be replaced at the Contractor's expense.
- B. Contractor shall store aggregates in a well-draining area, separate from other materials preventing mixing of unwanted matter.
- C. Order concrete from batching plant so that trucks arrive at discharge locations when the concrete is required. Avoid excessive mixing of concrete or delays in placing successive layers of concrete in forms.
- D. The concrete supplier shall deliver concrete to discharge locations in watertight agitator or mixer trucks without altering the specified properties of water-cement ratio, slump, air-entrainment, temperature and homogeneity.
- E. Deliver concrete in order that the Contractor can accept delivery within 90 minutes after batching or earlier during hot weather concreting as specified. Do not add retempering water, nor exceed the specified water-cement ratio.
- F. The Contractor or Engineer shall reject concrete not conforming to specification, unsuitable for placement, exceeding time limitation restraints, and not having a complete delivery batch ticket.

3.2 PLACING CONCRETE

- A. Unless otherwise approved by the Engineer, concrete shall be placed during normal working hours. When concrete placement schedules require concrete placement at times other than normal working hours, notify Engineer of special conditions at least 48 hours in advance of placement.
- B. Notify Engineer a minimum of 48 hours prior to commencement of concrete placement operations. Include within this notification, the quantity of concrete, method and placement location, frequency of trucks, ordered slump and time of initial delivery.
- C. Concrete forms shall be cleaned and wet immediately prior to concrete placement.
- D. Place no concrete in standing water. Where concrete is placed on earth, moisten earth prior to concrete placement.

- E. Provide a delivery batch ticket to the Engineer's field representative, written in ink or computer printed, with each batch delivered to the discharge location, and as specified in ASTM C94 and in addition, state the following:
 - 1. Load number, truck number and driver's name
 - 2. Compression strength of concrete
 - 3. Amount of concrete (Cubic Yards)
 - 4. Time truck is charged with cement
 - 5. Reading of revolution counter at first addition of water
 - 6. Type, brand and amount of cement
 - 7. Type, brand and amount of admixture
 - 8. Information necessary to calculate total mixing water
 - 9. Maximum size of aggregate
 - 10. Weights of fine and coarse aggregates
 - 11. Signature of ready-mix representative

- F. Convey concrete from mixer to place of final deposit as rapidly and continuously as practical until pouring is completed; avoid segregation and loss of ingredients. Deposit concrete in forms as nearly as possible in final position for minimum re-handling. Horizontal travel of concrete within forms shall be limited to 4 feet.

- G. Ensure reinforcement, inserts, embedded parts, and construction joints, are not disturbed during concrete placement.

- H. Do not interrupt successive placement; do not permit cold joints to occur.

- I. No concrete shall be dropped more than four feet inside a form unless through a concrete pump hose or a tremie hopper and elephant trunk.

- J. Immediately following deposit of concrete, consolidate by vibrating with mechanical vibrator or other means acceptable to the Engineer. Do not vibrate or disturb concrete after initial set. Consolidate concrete in accordance with ACI 309.

- K. Finish concrete floor surfaces in accordance with ACI 301.

- L. Steel trowel surfaces which are indicated to be exposed.

- M. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains as indicated on drawings.

- N. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

3.3 METALWORK IN CONCRETE

- A. Set anchor bolts by means of templates. Coring and grouting of anchor bolts is prohibited.

- B. Secure castings, inserts, conduits, and other metalwork encased in concrete to prevent metalwork from being displaced or deformed during concrete work.

3.4 COLD WEATHER PLACEMENT

- A. Place no concrete when ambient temperature is less than 40°F or where temperatures below freezing temperatures are likely during the curing period without specific acceptance of the Engineer.
- B. Where cold weather placement is permitted, comply with the code referenced in 1.3 above. Provide enclosures, insulating materials, supplemental heat, and other materials as may be required to protect the concrete from damage due to freezing.
- C. Concrete shall not be placed on frozen concrete, nor on or against any surface which is frozen or contains snow and ice.
- D. The use of salts or chemicals to melt ice or snow on forms, concrete, or ground surface is prohibited.
- E. Use accelerating admixtures in cold weather only when approved by the Engineer. Use of admixtures will not relax cold weather placement requirements.

3.5 HOT WEATHER PLACEMENT

- A. Place no concrete when ambient temperatures are greater than 85°F without specific acceptance of the Engineer.
- B. When permitted, placement of concrete when the ambient temperature is near or above 85°F shall comply with the code referenced in 1.3 above.
- C. Use set retarding admixtures during hot weather only when approved by Engineer.

3.6 CURING AND PROTECTION

- A. Immediately after placement, protect concrete from heavy rain, sun, premature drying, excessively hot or cold temperatures, and mechanical injury. Maintain temperature of concrete surface between 50°F and 90°F for 72 hours after placing concrete. Preheat all enclosures and maintain for at least 2 hours, a minimum surface temperature of 45°F on all steel and form surfaces to come in contact with the fresh concrete.
- B. Except as specifically outlined above, adhere to all applicable recommended practices of ACI 305, ACI 306, and ACI 308.
- C. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- D. Maintain concrete with minimal moisture loss at relatively constant temperature for

period necessary for hydration of cement and hardening of concrete.

- E. Cure floor surfaces in accordance with ACI 301.
- F. Ponding: Maintain 100 percent coverage of water over floor slab areas continuously for 7 days.
- G. Spraying: Spray water over floor slab areas and maintain wet for 7 days.

3.7 FIELD QUALITY CONTROL

- A. The Contractor will notify the testing laboratory firm of scheduled concrete deliveries.
- B. Reject concrete delivered without a complete concrete delivery batch ticket as specified. Copies of the signed batch ticket will be furnished by the concrete supplier to the Contractor and Engineer.
- C. Inspect the concrete transit truck's barrel revolution counter and gauge for measuring water added to the concrete. Reject concrete which exceeds the maximum barrel revolution of 300 or which has had water added during transit.
- D. Reject concrete exceeding specified time limitations.
- E. Concrete not conforming to these Specifications shall be rejected by the Contractor or the Engineer before discharging into the forms.
- F. Testing at Discharge:
 - 1. The Contractor's testing laboratory firm will use concrete samples, provided by the Contractor at the point of truck discharge to perform slump, air content, and temperature tests for field control test specimens. The testing laboratory firm will take measurements of slump, air content, and temperature not less than once per day, nor less than once per 50 cubic yards of concrete. Tests measurements shall be in accordance with ASTM C143, ASTM C231, and ASTM C1064, respectively.
 - 2. The testing laboratory firm will immediately submit test reports of concrete field measurements sampled above to the Contractor and the Engineer.
 - 3. Accept or reject concrete on the basis of conformity with the Specifications contained herein for slump, air content and temperature.
 - 4. Reject concrete in excess of 90 degrees F.
- G. Control Test Specimens:
 - 1. The Contractor's Testing Laboratory firm shall cast not less than four concrete test specimens, in accordance with ASTM C31, for each 150 cubic yards, or not less than once each day, whichever is less. Testing Laboratory personnel shall record the load number, truck number and driver's name from the delivery batch ticket as well as the concrete placement location of each test specimen. Record the slump, air content and temperature.

2. The Testing Laboratory shall perform compression tests on two of the test specimens at seven days, and if the seven-day strength is deficient, immediately notify the Contractor and the Engineer. The two remaining test specimens shall be tested at twenty-eight days. Compression test results of the control test specimens shall be submitted to the Contractor and the Engineer. Evaluation and acceptance of concrete shall be in accordance with ACI 301 and ACI 318.
- H. Concrete Coring: Should the test specimen's compression test fail to be in compliance with the Specifications contained herein, or if the Engineer detects deficiencies in the cast concrete, the Contractor will be directed by the Engineer to take concrete cores from the structure in accordance with ASTM C42. Core, size, quantity and location will be determined by the Engineer, and in conformance with ACI 301 and ACI 318. The Contractor's testing laboratory firm will compression test the cores taken from the structure in conformance ASTM C39 and will submit the results to the Contractor and Engineer.
 - I. Load Testing: Should the compression test of the cores taken from the structure fail to be in compliance with these Specifications, the Contractor will be directed by the Engineer to conduct a load test of the structure in conformance with ACI 318 under the direction of the Contractor's laboratory testing firm. Should the load test fail, the structure shall be removed from the site and replaced. All tests associated with the load testing and removal and replacement of the structure will be by the Contractor, at no cost to the Owner or Engineer.

3.8 PATCHING

- A. Allow Engineer to inspect concrete surfaces immediately upon removal of forms.
- B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Engineer immediately upon discovery.
- C. Patch imperfections as directed by Engineer in accordance with ACI 301.
- D. Core holes shall be roughened, cleaned and dampened. Fill core holes with 4000 psi (minimum) concrete and wet cure for 7 days after placement.

3.9 DEFECTIVE WORK

- A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- B. The Owner's representative will verify the acceptability of the concrete, the finish, the curing of the concrete, and the compliance with the requirements of the Specifications. Concrete that does not meet the requirements of the Specifications shall be removed and replaced at no expense to the Owner.
- C. Patch or remove, all concrete having honeycombed surfaces at the direction of Engineer.

- D. All concrete that fails to meet the required compressive strength after 28 days shall be removed and replaced at the Contractor's expense.

END OF SECTION

SECTION 034100

PRECAST CONCRETE STRUCTURES

1. GENERAL

1.1 GENERAL

- A. This Section applies to all precast concrete structures including but not limited to pump stations, equalization tanks, wet wells, flush tanks, and septic tanks as specified herein and shown on the Contract Drawings.

1.2 REFERENCE STANDARDS

- A. Contractor shall refer to the following standards:
1. ACI Code 318-19(22) – Building Code Requirements for Structural Concrete and Commentary.
 2. ACI PRC 350.4-04 – Design Considerations for Environmental Engineering Concrete Structures
 3. ASTM A185-02 – Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
 4. ASTM A615/A615M-22 – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
 5. ASTM C109C109M-21 – Standard Test Method for Compressive Strength of Hydraulic Cement Mortars
 6. ASTM C827/C827M-16 – Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures
 7. ASTM C890-21 – Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures
 8. ASTM C913 – Standard Specification for Precast Concrete Water and Wastewater Structures
 9. ASTM C1227-22 – Standard Specification for Precast Concrete Septic Tanks
 10. PCI MNL-116-21 – Manual for Quality Control for Plants and Production of Structural Precast Concrete Products
 11. PCI MNL-120-17 – PCI Design Handbook

1.3 SUBMITTALS

- A. The Contractor shall submit the following to the Engineer for approval:
1. Fabricator name, location, and contact information
 2. Product data
 3. Design mixtures
 4. Delegated-Design Submittal: For precast structural concrete structures verify the loads indicated on the Plans comply with performance requirements and design criteria, including analysis data signed and sealed by a professional engineer licensed in the State of Vermont and responsible for their preparation.
 5. Shop Drawings

- a. Include member locations, plans, elevations, dimensions, shapes and sections, openings, support conditions, and types of reinforcement, including special reinforcement.
 - b. Detail fabrication and installation of precast structural concrete units, including connections at member ends and to adjoining construction.
6. Lifting and buoyancy analysis, as applicable.
 7. Stamped by a professional engineer with expertise in structural engineering licensed in the State of Vermont.

1.4 RELATED SECTIONS

- A. The following items appurtenant to this work are specified under other sections of these specifications and are mentioned here for cross reference purposes only.
 1. Specification Section 014030 – Testing and Inspecting Services
 2. Specification Section 036000 – Non-Shrink Grout
 3. Specification Section 083100 – Access Hatches
 4. Specification Section 333416 – Effluent Filters
 5. Specification Section 333419 – Septic Tank Accessories

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm shall assume responsibility for engineering precast structural concrete units to comply with performance requirements. Responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a licensed professional engineer.
- B. Quality-Control Standard: For manufacturing procedures, testing requirements, and quality-control recommendations for types of units required, comply with PCI MNL 116.
- C. For structures under traffic loading such as manholes or catch basins and as indicated on the Plans, the structures shall be designed to carry an AASHTO H-20 wheel loading with a minimum 1.3 safety factor and a soil overburden loading of 120 lbs/ft³, as applicable.
- D. All precast structures shall be made available for inspection by the Engineer. The Engineer reserves the right to reject any structure that fails to meet the standards as described in this Specification, regardless of the Manufacturer's determination. Any structure or section that has been determined to be unsatisfactory by the Engineer shall be marked so as to identify it as unsatisfactory and removed from the project site to prevent it being used in construction. Any structure or section deemed unsatisfactory by the Engineer and still incorporated into the project shall be removed and replaced by the Contractor at no expense to the Owner. If a structure or section has been damaged during delivery or while being incorporated into the project, it shall be sufficiently repaired or replaced to the Engineer's satisfaction at no cost to the Owner.
- E. Any imperfections in the face of the structure or section shall be permanently repaired to the satisfaction of the Engineer. Concrete grout is the preferred method of repair however epoxy grout may be used with the Engineer's written approval.

- F. The Contractor and Engineer shall perform a general inspection of all precast structures and sections prior to being incorporated into the project. The inspection shall include attention to any cracks, exposed reinforcement, texture, and the dimensions and locations of penetrations.

1.6 COORDINATION

- A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction before starting that Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

1.7 HANDLING AND STORAGE

- A. The Manufacturer may not ship precast structures or sections until the concrete has achieved a minimum compressive strength of 3,000 psi to prevent damage during the shipping process.
- B. The Contractor shall follow all Fabricator's lifting and handling procedures including utilizing the specified lift points.

2. PRODUCTS

2.1 GENERAL

- A. Concrete structures shall include pump stations, equalization tanks, wet wells, flush tanks, septic tanks, and others as specified herein and shown on the Contract Drawings.
- B. Septic tanks shall be either standard duty or heavy duty as specified on the Contract Drawings.
- C. Tank sizing shall be as specified herein and on the Contract Drawings.

2.2 FLEXIBLE PRECAST TO PIPE CONNECTIONS

- A. Precast concrete manufacturers shall incorporate flexible pipe sleeves within the construction of the precast sections as required in such size to accommodate the size pipe(s) being used.

2.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a professional engineer, licensed in the State of Vermont, to design precast structural concrete units.
- B. Design Standards: Comply with ACI 318 and with design recommendations in PCI MNL 120, applicable to types of precast structural concrete units indicated.

- C. Structural Performance: Precast structural concrete units and connections shall withstand design loads indicated within limits and under conditions indicated.

2.4 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A615, Grade 60, deformed.
- B. Epoxy-Coated Reinforcing Bars:
 - 1. Steel Bars: ASTM A615, Grade 60, deformed bars.
 - 2. Epoxy Coating: ASTM A775 with less than 2 percent damaged coating in each 12-inch (305-mm) bar length.
- C. Steel Bar Mats: ASTM A184, fabricated from ASTM A615, Grade 60, deformed bars, assembled with clips.
- D. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 116.

2.5 CONCRETE MATERIALS

- A. Portland Cement: ASTM C150, Type I or Type III, gray, unless otherwise indicated.
- B. Supplementary Cementitious Materials:
 - 1. Fly Ash: ASTM C618, Class C or F, with maximum loss on ignition of 3 percent.
 - 2. Metakaolin: ASTM C618, Class N.
 - 3. Silica Fume: ASTM C1240, with optional chemical and physical requirement.
 - 4. Ground Granulated Blast-Furnace Slag: ASTM C989, Grade 100 or 120.
- C. Normal-Weight Aggregates: Except as modified by PCI MNL 116, ASTM C33. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.
- D. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 116.
- E. Air-Entraining Admixture: ASTM C260, certified by Fabricator to be compatible with other required admixtures.
- F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.

2.6 STEEL CONNECTION MATERIALS

- A. Galvanized Carbon-Steel Through Bolts and Studs: ASTM A307, Grade A; carbon-steel, hex-head bolts and studs; carbon-steel nuts, ASTM A563; and flat, unhardened steel washers, ASTM F844, galvanized.
- B. Shapes and Plates: ASTM A36.

2.7 GROUT MATERIAL

- A. Non-shrink grout shall feature a 28-day compressive strength of 5,000 psi in accordance with ASTM C109 when tested.

2.8 CONCRETE MIXTURES

- A. Prepare design mixtures for each type of precast concrete required.
 - 1. Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of Portland cement, which would otherwise be used, by not less than 40 percent.
 - 2. Limit use of fly ash to 20 percent replacement of Portland cement by weight and ground granulated blast-furnace slag to 20 percent of Portland cement by weight; metakaolin and silica fume to 10 percent of Portland cement by weight.
- B. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at precast structural concrete Fabricator's option.
- C. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 or PCI MNL 116 when tested according to ASTM C1218.
- D. Normal-Weight Concrete Mixtures: Proportion by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:
 - 1. Compressive Strength (28 Days): 5000 psi.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
- E. Water Absorption: Limit water absorption to 6 percent by weight or 14 percent by volume, tested according to ASTM C642, except for boiling requirement.
- F. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 116.
- G. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.
- H. Concrete Mix Adjustments: Concrete mix design adjustments may be proposed if characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

2.9 FABRICATION

- A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.
 - 1. Weld-headed studs and deformed bar anchors used for anchorage according to AWS D1.1 and AWS C5.4, "Recommended Practices for Stud Welding."
- B. Cast-in reglets, slots, holes, and other accessories in precast structural concrete units as indicated on the Contract Drawings.
- C. Cast-in sleeves for through bolts in structural connections. Do not drill or cut openings or prestressing strand without Engineer's approval.
- D. Reinforcement: Comply with recommendations in PCI MNL 116 for fabricating, placing, and supporting reinforcement.
- E. Reinforce precast structural concrete units to resist handling, transportation, and erection stresses and specified in-place loads.
- F. Comply with requirements in PCI MNL 116 and in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.
- G. Place concrete in a continuous operation to prevent cold joints or planes of weakness from forming in precast concrete units.
- H. Thoroughly consolidate placed concrete by vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air voids on surfaces. Use equipment and procedures complying with PCI MNL 116.
- I. Comply with PCI MNL 116 procedures for hot- and cold-weather concrete placement.
- J. Where applicable risers shall be cast 3" into the concrete tank as specified herein and shown on the Contract Drawings, refer to Specification Section – 333419 Septic Tank Accessories.
- K. Identify pickup points of precast structural concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each precast structural concrete unit on a surface that does not show in finished structure.
- L. Cure concrete, according to requirements in PCI MNL 116, by moisture retention without heat or by accelerated heat curing using live steam or radiant heat and moisture.

units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.

- M. Discard and replace precast structural concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 116 and meet Engineer's approval.

2.10 FABRICATION TOLERANCES

- A. Fabricate precast structural concrete units to shapes, lines, and dimensions indicated so each finished unit complies with PCI MNL 116 product dimension tolerances as well as position tolerances for cast-in items.

2.11 COMMERCIAL FINISHES

- A. Standard Grade: Normal plant-run finish produced in molds that impart a smooth finish to concrete. Surface holes smaller than 1/2 inch caused by air bubbles, normal color variations, form joint marks, and minor chips and spalls are permitted. Fill air holes greater than 1/4 inch in width that occur more than once per 2 sq. in. Major or unsightly imperfections, honeycombs, or structural defects are not permitted. Limit joint offsets to 1/8 inch.
- B. Smooth, steel trowel finish unformed surfaces. Consolidate concrete, bring to proper level with straightedge, float, and trowel to a smooth, uniform finish.

2.12 SOURCE QUALITY CONTROL

- A. Testing: Test and inspect precast structural concrete according to PCI MNL 116 requirements and ASTM C1610, ASTM C1611, ASTM C1621, and ASTM C1712.
- B. Defective Units: Discard and replace precast structural concrete units that do not comply with requirements, including strength, manufacturing tolerances, and color and texture range. Chipped, spalled, or cracked units may be repaired, subject to Engineer's approval.

2.13 WATERPROOFING

- A. Waterproofing shall be applied with two (2) coats to all exterior faces of precast structures and sections. Waterproofing shall be applied per the Manufacturer's specifications.
- B. Once a precast structure or section has been set, all exterior joints shall be waterproof coated. Contractor shall apply the waterproof coating per the Manufacturer's specifications.

3. EXECUTION

3.1 INSTALLATION

- A. Install clips, hangers, bearing pads, and other accessories as applicable and as required for connecting precast structural concrete units to supporting members and backup materials.
- B. Prior to installation of precast concrete structures, a base of bedding material shall be compacted. Refer to Specification Section 310000 – Earthwork for back fill material. Prior to backfill compaction of material shall be inspected. Any deficiencies in compaction shall be corrected prior to final backfill.
- C. Erect precast structural concrete level, plumb, and square within specified allowable tolerances. Provide temporary structural framing, shoring, and bracing as required to maintain position, stability, and alignment of units until permanent connections are complete.
 - 1. Remove projecting lifting devices and use plastic patch caps or sand-cement grout to fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.
- D. Connect precast structural concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.
- E. Sections shall have tongue and groove joints with butyl mastic rope installed between sections. Sections and cones of the appropriate combination of heights shall then be placed, using manufacturers recommended procedure for sealing the horizontal joints, and as shown on the Standard Details. A double ring of mastic sealant shall be used to seal the joints between precast sections. One ring of sealant shall be placed on the flat horizontal surface of the joint near the sloped portion of the joint. The second ring of sealant shall be placed on the inclined part of the joint. All joint surfaces shall be thoroughly cleaned prior to placement of the sealant so as to be completely free of stones, sand, soil, debris and other materials that could adversely affect sealing of the joints. See approved methods on Detail drawings.
- F. Field cutting of precast units is not permitted without approval of Engineer.
- G. Welding: Comply with applicable requirements in AWS D1.1 and AWS D1.4 for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.
- H. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.
- I. Grouting: Grout where required or indicated on Contract Drawings.
- J. Interior concrete fill shall only be placed once the leakage test has been completed and the structure has passed. Refer below for leakage testing procedures. Structure shall be clean and dry prior to installation of the interior concrete.

- K. Each septic tank opening shall be installed with sufficient risers to adjust to finished grade. All risers and covers shall be watertight. The Contractor shall install the riser kit per the Manufacturers recommendations.

3.2 ERECTION TOLERANCES

- A. Erect precast structural concrete units level, plumb, square, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 135.
- B. Minimize variations between adjacent slab members by jacking, loading, or other methods recommended by fabricator and approved by Engineer.

3.3 REPAIRS

- A. Repair precast structural concrete units if permitted by Engineer.
 - 1. Repairs may be permitted if structural adequacy, serviceability, durability, and appearance of units have not been impaired.
- B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet.
- C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A780.
- D. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.
- E. Remove and replace damaged precast structural concrete units that cannot be repaired or when repairs do not comply with requirements as determined by Engineer.

3.4 CLEANING

- A. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.
- B. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.
 - 1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's written recommendations. Protect other work from staining or damage due to cleaning operations.
 - 2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

3.5 CONCRETE STRUCTURE TESTING

- A. Each precast concrete structure, to include septic tanks, shall be tested by the Contractor with the Engineer present as witness. Any test done without the presence of the Engineer shall be considered incomplete and shall be repeated in the presence of the Engineer at the Contractor's cost. The Contractor may choose to perform either a vacuum test or an exfiltration test. Any structure that has passed a test then disturbed or moved during construction shall be retested via either method at cost to the Contractor.
- B. After backfilling the precast concrete structure, the structure shall be retested using a vacuum test to confirm structure was not damaged during the backfilling process.
- C. Contractor shall refer to Specification Section 014523 – Testing and Results Expected for vacuum and exfiltration test procedures.

END OF SECTION

SECTION 034100 – PRECAST CONCRETE STRUCTURES

APPENDIX A – EXISTING SEPTIC TANK INFORMATION COLLECTION WORKSHEET

PROPERTY ADDRESS (No. and Street Name): _____

OWNER: _____

CONTACT INFORMATION: _____

EXISTING SEPTIC TANK LAYOUT SKETCH:

Include approximate house boundary, any identifying structures or landscaping, septic tank location, layout, and connection to building location. Sketch information into the space below:

Flip over for additional information:

BUILDING CONNECTION / SEPTIC TANK INFLUENT PIPE:

NOMINAL PIPE DIAMETER: _____

PIPE MATERIAL: _____

ELEVATION OF GRADE AT SEPTIC TANK (feet): _____

VERTICAL DEPTH OF INFLUENT PIPE FROM GRADE (inches): _____

INFLUENT PIPE ELEVATION (feet): _____

NOTES: _____

SEPTIC TANK EFFLUENT PIPE:

NOMINAL PIPE DIAMETER: _____

PIPE MATERIAL: _____

ELEVATION OF GRADE AT SEPTIC TANK (feet): _____

VERTICAL DEPTH OF EFFLUENT PIPE FROM GRADE (inches): _____

EFFLUENT PIPE ELEVATION (feet): _____

NOTES: _____

SECTION 129243

LANDSCAPING

1. GENERAL

1.1 CONTRACT DOCUMENTS

- A. Attention shall be directed to the General Conditions for the definition of the Contract Documents. This division of these specifications is a part of the Contract Documents as defined in the General Conditions. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other parts of these specifications.

1.2 WORK INCLUDES

- A. Work under this section includes supplying all labor, equipment, appliances and materials, and performing all operations in connection with furnishing and applying loam, seed, fertilizer, lime, mulch and wood chips, and with watering and maintaining grassed areas until their acceptance, in accordance with the specifications as required for satisfactory completion.
- B. Replacement trees shall be the same caliper and of the same species as the tree to be replaced to the extent practicable. Shrubs shall be of the same type and species as the shrub to be replaced and at least five years old. Plants shall be of the same type and species as the plants to be replaced and shall be planted in sufficient quantity so as to reproduce the appearance of the original planting bed in a time period of two years.
- C. The Contractor shall be responsible for the replacement of all dead, defective or otherwise unacceptable plant material throughout the life of the Contract.

1.3 RELATED SECTIONS

- A. The following items appurtenant to this work are specified under other sections of these specifications and are mentioned here for cross reference purposes only.
 - 1. Specification Section 310000 – Earthwork.

1.4 APPLICABLE STANDARDS

- A. The work in this section shall be performed in accordance with all applicable provisions of the following technical Reference Standards.
 - 1. VTrans Standard Specifications for Construction (VTrans Standard Specifications), latest edition.
 - 2. VTDEC, Vermont Stormwater Manual, latest edition.
 - 3. "STANDARDIZED PLANT NAMES", 1942 Edition, American Joint Committee on Horticultural Nomenclature.

4. "AMERICAN STANDARD FOR NURSERY STOCK", 1996 edition, American Nursery and Landscape Association.

1.5 SUBMITTALS AND CERTIFICATIONS

- A. Submittals and certifications for the following items of work in this section shall be furnished in accordance with Specification Section 013300 – Submittals:
 1. Loam
 2. Fertilizer
 3. Grass seed mixtures
 4. Mulch
 5. Plant materials
 6. Erosion Control
- B. Certificates of inspection shall accompany the invoice for each shipment of plants as may be required by law for transportation. File certificates with the Engineer prior to acceptance of the material. Inspection by Federal or State Government at the place of growth does not preclude rejection of the plants at the project site.
- C. The Engineer shall be furnished with duplicate copies of invoices for all soil amendments used in the project. All products shall be delivered to the site in manufacturer's standard containers showing weight, analysis, name of the manufacturer and warranty. A summary of this product's information shall be appended to the invoice. Each lot shall be subject to sampling and testing at the discretion of the Engineer.

2. PRODUCTS

2.1 PLANT MATERIALS

- A. Plant Material. Plants shall be nursery grown in accordance with good horticultural practices and grown under climatic conditions similar to those in the locality of the project for at least two years. They shall have been root pruned within the last two years.
- B. Plants shall be freshly dug. No heeled-in plants or plants from cold storage will be accepted.
- C. Unless specifically noted otherwise, all plants shall be of specimen quality, exceptionally heavy, symmetrical, tightly knit plant, so trained or favored in its development and appearance as to be unquestionably and outstandingly superior in form, number of branches, compactness and symmetry.
 1. Plants shall be sound, healthy and vigorous, well branched and densely foliated when in leaf. They shall be free of disease, insect pests, eggs or larvae, and shall have healthy, well developed root systems. They shall be free from physical damage or adverse conditions that would prevent thriving with the specified result.
 2. Plants shall be true to species and variety and shall conform to measurements specified except that plants larger than specified may be used if approved by the

- Engineer. Use of such plants shall not increase the Contract Price. If larger plants are approved, the ball of earth shall be increased in proportion to the size of the plant.
3. Plants shall be measured when branches are in their normal position. Height and spread dimensions specified refer to the main body of the plant and not from branch tip to tip.
 4. Caliper measurement shall be taken at a point on the trunk 6 inches above natural ground line for trees up to 4-inches in caliper and at a point 12 inches above the natural ground line for trees over 4 inches in caliper.
 5. If a range of size is given, no plant shall be less than the minimum size and not less than 50% of the plants shall be as large as the maximum size specified. The measurements specified are the minimum size acceptable and are the measurements after pruning where pruning is required.
 6. Plants that meet the measurements specified, but do not possess a normal balance between height and spread, shall be rejected.
 7. Plants shall not be pruned before delivery. Trees which have a damaged or crooked leader, or multiple leaders, unless specifically specified, will be rejected. Trees with abrasion of the bark, sunscalds, disfiguring knots, or fresh cuts of limbs over 1-1/4 inches which have not completely calloused, will be rejected.
 8. No change in quantity, size, kind or quality of plants from those requiring replacement or those specified will be permitted without the written approval of the Engineer. When requesting permission to substitute, the Contractor shall submit in writing evidence from a minimum of three competent sources that the plants specified are not available and he shall suggest plants which conform to the requirements of the contract as to size, type and function. He shall indicate the reduced cost, if any, accruing to the Owner as a result of said substitution.

2.2 TOPSOIL

- A. Topsoil shall be fertile, friable, natural loam capable of sustaining vigorous plant growth. It shall be free of any admixture of subsoil, stones one inch in diameter or larger, clods of hard earth, plants or rocks, sticks or other extraneous material. It shall have a pH value range of 6.0 to 6.5. If the topsoil does not have the pH value as specified above, it shall be amended by the Contractor at their own expense, to bring it within the specified limits. Topsoil shall have an organic content of 5 to 7 percent as determined by ignition loss.
- B. Topsoil shall meet the following mechanical analysis:

3/4-inch mesh	100 percent passing
No. 4 sieve	90 – 100 percent passing
No. 200 sieve	0 – 10 percent passing

The clay content of the material passing the #200 sieve shall not be greater than 60 percent as determined by hydrometer tests.

- C. If the condition of the soil is unsuitable due to excessive moisture, frost or other conditions, the Contractor shall cease work until the soil is in a suitable condition.

2.3 PEAT

- A. Peat shall be sphagnum moss peat. It shall be finely shredded free from lumps and extraneous matter and be of such consistency to pass through a 1/2" mesh. Peat shall contain not less than 90 percent organic matter by weight on an oven-dried basis and possess from 150 percent to 200 percent water holding capacity. Peat shall have a minimum of 35 percent moisture content at the time of incorporation into the soil.

2.4 COMMERCIAL FERTILIZER

- A. Commercial Fertilizer shall be a complete fertilizer. A minimum of 75 percent of the nitrogen shall be derived from natural organic sources or urea, 40-50 percent of the nitrogen shall be water insoluble. Available phosphoric acid shall be from superphosphate, bone or tankage. Potash shall be derived from muriate of potash containing 60 percent potash. It shall be uniform in composition, free-flowing and suitable for application with approved equipment.

- B. Fertilizer shall contain the following percentage by weight:

10 percent – Nitrogen
6 percent – Phosphoric Acid
4 percent – Potash
Application Rate: 20 lbs per 1,000 sq. ft.

- 1. With written approval of the Engineer the Contractor may use a complete commercial fertilizer with a different N-P-K analysis provided that the nitrogen content meets the specified rate for application and that the sources for the component parts meet the above requirements.

2.5 LIMESTONE

- A. Limestone shall be an approved agricultural limestone and shall contain not less than 85 percent of total carbonates. Limestone shall be ground to such fineness that 50 percent will pass a 100-mesh sieve and 90 percent will pass through a 20-mesh sieve.

2.6 ALUMINUM SULFATE

- A. Aluminum Sulfate shall be unadulterated and delivered in containers with the name of the material, name of the manufacturer and net weight of contents.

2.7 SAND

- A. Sand for amending soils shall be sand wherein 100 percent shall pass the 1/4" mesh sieve and not more than 10 percent shall pass the 200-mesh sieve.

2.8 PLANTING SOIL

- A. Mix all materials at the proportions or amounts specified herein. Mixing shall be done offsite and by an approved method. Under no conditions shall mixing be done if materials are wet, or in otherwise satisfactory condition, as determined by the Engineer.

1. Soil Mixture

Percent by Volume	Material
33-1/3 percent	Screened topsoil
33-1/3 percent	Peat
33-1/3 percent	Sand

2. The pH value of the soil shall be 6.0 to 6.5. Adjust the above mixes accordingly with ground limestone or aluminum sulfate. For spring planting only, add 5 pounds 10-6-4 commercial fertilizer per cubic yard of planting soil; mix thoroughly. The stated mixture must be thoroughly mixed so that there is no visible segregation of material. Condition after mixing must be acceptable to the Engineer.

2.9 PLANTING ACCESSORIES

- A. Top mulching for trees shall be:
1. Pine bark mulch furnished with "chip" size of 1" to 2".
 2. Material other than above must be approved by the Engineer in writing.
- B. Guying Cable shall be a minimum of five strand, steel cable.
- C. Turnbuckles shall be galvanized or dip-painted, having a 3-inch minimum lengthwise opening fitted with eyebolts.
- D. Hose shall be suitable length, two ply, reinforced black rubber hose, 3/4" in diameter.
- E. Locations stakes shall be 2-1/2 feet long, 2" to 2-1/2" in diameter or 2" x 3", pointed.
1. Stakes for securing the trees shall be 10'-12' long, 2" to 2-1/2" in diameter or 2" x 3" pointed painted green. Stakes shall be driven a minimum of 2'-2 1/2' into undisturbed material.
- F. Wrapping material shall be a standard manufactured tree wrapping paper, brown in color, two layers cemented together by asphaltum, crepe surface. Twine for tying shall be a lightly tarred medium coarse sisal (lath) yarn.
- G. Tree Paint shall be "Cabot Tree Paint" or an approved equal.
- H. Bonemeal shall be commercial grade finely ground with a minimum analysis of 4 percent nitrogen and 20 percent phosphoric acid.
- I. Anti-desiccant shall be an emulsion which provides a protective film over plant surfaces, permeable enough to permit transpiration, delivered in containers of the manufacturer,

and shall be mixed according to manufacturer's directions. Wiltpruf, manufactured by Nursery Specialty Products, Inc., or approved equal).

2.10 CERTIFICATION, INSPECTION, AND TESTS

- A. Certificates of inspection shall accompany the invoice for each shipment of plants as may be required by law for transportation. File certificates with the Engineer prior to acceptance of the material. Inspection by Federal or State Government at the place of growth does not preclude rejection of the plants at the project site.
- B. Topsoil stockpiled for reuse or proposed for use will be inspected by the Engineer. At the time of inspection, the Engineer may require representative soil samples to be tested for physical properties, hydrogen-ion value, for organic matter and for available phosphoric acid or potash. 20-pound samples shall be supplied, and tests made at the Contractor's expense. A certified analysis of the topsoil, from each source shall be submitted to the Engineer for approval before use in the work. If deficiencies in the topsoil are found as a result of this analysis, they shall be corrected at no additional expense to the Owner.
- C. Sampling and Testing will be in accordance with the current methods of the Association of Official Agricultural Chemists.
- D. Soil Amendments. The Engineer shall be furnished with duplicate copies of invoices for all soil amendments used in the project. All products shall be delivered to the site in manufacturer's standard containers showing weight, analysis, name of the manufacturer and warranty. A summary of this product information shall be appended to the invoice. Each lot shall be subject to sampling and testing at the discretion of the Engineer.

2.11 SEEDING MATERIALS

- A. Materials for seeding disturbed areas shall conform to VTrans Standard Specifications as follows:
 - 1. Loam: Section 641
 - 2. Limestone: Section 651
 - 3. Fertilizer for Grasses: Section 651
 - 4. Grass Seed: Section 651
 - 5. Mulching Hay for Seeded Areas: Section 653
 - 6. Erosion Control: Section 653
- B. The Contractor shall use the following grass types with the indicated locations:
 - 1. Turf Establishment, General Seed
 - a. Shall be used in all permanent turf establishment areas such as lawns or yards.
 - 2. Turf Establishment, Specialty Seed
 - a. Conservation Mix shall be utilized in all other areas not identified as a lawn or yard.

2.12 SELECTION AND TAGGING

- A. All plants shall be subject to inspection and approval by the Engineer at their place of growth and upon delivery for conformity to specification requirements. Such approval shall not impair the right of inspection and rejection during progress of the work.
- B. Representative samples of each species of plant material from each source shall be inspected by the Engineer at their place of growth. Permanent tags shall be installed by the Engineer for each representative sample which has been approved. The approved representative sample shall be used on the site by the Engineer as a basis for judging the acceptability of the remaining plant material. Tags shall be removed only by the Engineer.

3. EXECUTION

3.1 CONTRACTOR'S RESPONSIBILITIES

- A. Prior to construction, the Contractor shall document all existing vegetation to include gardens, flower beds, trees, shrubs, flowers, and plants that will be either disturbed or removed required for the installation of the new wastewater system.
 - 1. Applicable methods of documentation are photos, video, and sketches. The Contractor shall submit their documentation to the Engineer and Owner for approval prior to beginning construction.
- B. Once vegetation has been documented, the Contractor shall coordinate with the property owners regarding the vegetation to be disturbed and develop a planting schedule to replace or move the vegetation.
 - 1. The Contractor shall submit their planting schedule for each property to the Engineer and Owner for approval.
- C. The Contractor shall retain a qualified landscape designer for all work related to the restoration of areas impacted by the Contractor's operations. The Contractor shall not be paid separately for any work and costs associated with the documentation, coordination with property owners, development of planting schedules, and the replacement or replanting of disturbed vegetation, completed either by the Contractor or their landscape designer Subcontractor. The above-described work shall be considered incidental to the cost of the base bid of this Contract. All applicable landscaping work shall be installed by the landscape designer Subcontractor.

3.2 DIGGING AND HANDLING OF PLANT MATERIALS

- A. Immediately before digging, spray all evergreen or deciduous plant material in full leaf with anti-desiccant, applying an adequate film over trunks, branches, twigs and/or foliage.
- B. Dig ball and burlap (B & B) plants with firm, natural balls of earth, of diameter not less than that recommended by American Standard for Nursery Stock and of sufficient depth

to include fibrous and feeding roots. Plants moved with a ball will not be accepted if the ball is cracked or broken before or during planting operations.

- C. Unless otherwise authorized by the Engineer, the Contractor shall notify the Engineer at least 48 hours in advance of the anticipated delivery date of any plant material. A legible copy of the invoice, showing kinds and sizes of materials included for each shipment shall be furnished to the Engineer. A copy of the current Certificate of Nursery Inspection must accompany each shipment of plant material.
- D. Plants transported to the project in open vehicles shall be covered with tarpaulins or other suitable covers securely fastened to the body of the vehicle to prevent injury to the plants. Closed vehicles shall be adequately ventilated to prevent overheating of the plants. Evidence of inadequate protection following digging, carelessness while in transit, or improper handling or storage shall be cause for rejection. All plants shall be kept moist, fresh and protected at all times. Such protection shall encompass the entire period during which the plants are in transit, being handled or in temporary storage.
- E. Plants shall be dug up and prepared for shipment in a manner that will not cause damage to the branches, shape and future development of the plants after replanting. Plant material labels shall be securely attached by wire to all plant material delivered to the planting site, for the purpose of inspection and plant identification.
- F. All root balls of all plants shall be adequately protected at all times from sun and drying wind. All balled and burlapped plants which cannot be planted immediately upon delivery shall be set on the ground and shall be well protected with soil, or other acceptable material. Plants shall not remain unplanted for longer than three days after delivery.

3.3 PLANTING SEASONS

- A. Planting shall be done within the following dates:
 - 1. Deciduous Trees & Shrubs:
 - a. May 15 to September 15
 - 2. Evergreen Trees & Shrubs:
 - a. May 15 to September 15

3.4 PLANTING PREPARATION

- A. Stake out on the ground locations for trees and outlines of shrub beds to be planted and obtain approval of the Engineer before excavation is begun.
- B. Rock, underground construction work, tree roots or obstructions encountered in the excavation of shrub and tree pits shall be brought to the attention of the Engineer. Proceed with work after alternate locations have been designated or approved by the Engineer.

- C. Notify the Engineer in writing of all soil or drainage conditions which the Contractor considers detrimental to growth of plant material.
- D. Planting areas shall be free of debris or other deleterious matter prior to the placing of planting soil mixture.

3.5 PLANTING

- A. Plants shall be set as existed prior to construction or as indicated on the drawings, if applicable. Use planting soil to backfill plant pits and beds, however, do not backfill plant pits or beds until approved by the Engineer. When plant pits have been backfilled approximately 2/3 full, water thoroughly before installing remainder of the planting soil to top of pit, eliminating all air pockets. Set plants plumb and brace rigidly in position until the planting soil has been tamped solidly around the ball and roots.
- B. Protect plants at all times from sun or drying winds. Plants that cannot be planted immediately on delivery shall be kept in the shade, well protected with soil, wet moss or other acceptable material and shall be kept well-watered. Plants shall not remain unplanted for longer than three days after delivery.
- C. Plants shall not be bound with wire or rope at any time so as to damage the bark or break branches. Plants shall be lifted and handled from the bottom of the ball only.
- D. Cut ropes or strings from top of ball after plant has been set. Leave burlap or cloth wrapping intact around balls. Turn under and bury portions of burlap exposed at top of ball.
- E. Form a four (4) inch deep saucer around tree pits.
- F. Mulch all planting areas and beds three (3) inches deep immediately after planting. Shrub planting beds and ground cover beds shall have continuous mulch.
- G. Water all plants immediately after planting.
- H. Reshape planting areas to conform to specified grades after full settlement has occurred and restore the mulch.
- I. Wrap trunks of deciduous trees of 1-1/2 inch caliper or more with a spiral wrapping to a minimum height of the third level of branches or 2/3 of the height of the trees, whichever is highest. Wrap from base up and tie wrapping securely in place. Remove wrapping when directed by the Engineer.
- J. Guy or stake all trees immediately after planting. Plants shall stand plumb after guying.
- K. Prune new plants only at time of planting and according to standard horticultural practice to preserve the natural character of the plant. Pruning shall be done under supervision of the Engineer. Pruning and trimming shall include the following: Remove all dead wood,

suckers and broken or badly bruised branches. Use only clean, sharp tools. Paint cuts over 3/4 inch in diameter, covering all exposed, living tissue.

- L. All remedial measures required to correct weakened conditions, where, in the opinion of the Engineer, such conditions are the result of improper pruning techniques, shall be done at no cost to the Owner. Such measures may include pruning as directed by the Engineer, watering and/or root feeding in the manner and at the rates specified by the Engineer.

3.6 RESPONSIBILITY FOR LOSSES, REJECTED, WEAKENED PLANTS

- A. The Contractor shall be responsible for the replacement of all dead, defective or otherwise unacceptable plant material throughout the life of the contract.

3.7 CONSTRUCTION METHODS

- A. Loaming. Handling, placing, preparing, finish grading and compacting shall conform to Section 641 of the VTrans Standard Specifications. Depth of loam shall be 6 inches in its final position. Any topsoil stockpiled on the site from earthwork operations shall be utilized and all additional loam required shall be provided by the Contractor. Loam shall be placed under all wood chip mulch.
- B. Seeding. Preparation of seed bed and application of lime, fertilizer and seed shall conform to Section 651 of the VTrans Standard Specifications.
- C. Mulching for Seeded Areas. Mulching shall be done on all seeded slopes and shall conform to the VTrans Standard Specifications.
- D. In order to prevent unnecessary erosion of newly graded slopes and unnecessary siltation of drainage ways, the Contractor shall carry out erosion control items of work such as seeding and mulching as soon as he has satisfactorily completed a unit or portion of the project.
- E. When immediate protection of newly graded areas is necessary at a time which is outside of the normal seeding season, hay mulch shall be applied, with the seeding done at the same time or done later, or both, as ordered.
- F. Areas of the Project which are to be left temporarily and which will be regraded or otherwise disturbed later during construction may be ordered to be seeded with erosion seed to obtain temporary control. Ryegrass shall be spread at the rate of approximately 1 pound per 1,000 square feet, on a pure live seed basis.
- G. The Engineer may require erosion seed be applied in addition to the particular seed mixture required permanently for the area.

- H. The Engineer reserves the right to prohibit the use of any equipment that is unsuitable or inadequate for the proper performance of the work. The Contractor must immediately remove all rejected equipment from the project.
- I. After grading of areas has been completed and before applying fertilizer and ground limestone, areas to be seeded shall be raked, fine graded and otherwise cleared of stones larger than 1 inch in any diameter, sticks, stumps and other debris which might interfere with sowing of seed, growth of grasses or subsequent maintenance of grass-covered areas. If any damage by erosion or other causes has occurred after the completion of grading and before beginning the application of fertilizer and ground limestone, the Contractor shall repair such damage. They may include filling gullies, smoothing irregularities and repairing other incidental damage. Loam shall be brought to a true, even surface, meeting the required grade.
- J. An area to be seeded shall be considered a satisfactory seedbed if immediately prior to seeding, the top 3 inches of loam is loose, friable and free from large clods, rocks, large roots or other undesirable matter.
- K. When an area outside the work limits disturbed by the Contractor's operations is sparsely sodded, weedy, barren and unworked, or packed and hard, any grass and weeds, shall first be cut or otherwise satisfactorily disposed of and the soil then scarified or otherwise loosened to a depth not less than 5 inches. Clods shall be broken, and the top 3 inches of soil shall be worked into a satisfactory seedbed by discing, or by use of cultipackers, rollers, drags, harrows, or other appropriate means.

3.8 PROTECTION AND MAINTENANCE

- A. Maintenance of grass areas shall consist of watering, weeding, cutting, repair of all erosion and reseeding as necessary to establish a uniform stand of the specified grasses and shall continue until acceptance. All areas greater than 4 inches square which fail to show a uniform stand of grass for any reason whatsoever shall be reseeded repeatedly until all areas are covered with a satisfactory growth of grass.
- B. Maintenance shall also include all temporary protection fences, barriers, signs and all other work incidental to proper maintenance. The Contractor shall protect all seeded areas against traffic or other use by warning signs or barricades, as approved by the Engineer. Surfaces gullied or otherwise damaged following seeding shall be repaired by regrading and reseeding as directed. The Contractor shall water as required and otherwise maintain seeded areas in a satisfactory condition until final inspection and acceptance of the work.
- C. When new seeded grass reaches a height of 3 inches, it shall be cut back to 2-inch height. Repeat same procedure for a second cutting. All subsequent mowing shall be done when the grass reaches a height of 3 inches. Maintain lawn areas for at least three mowings.

3.9 ACCEPTANCE

- A. The Engineer shall inspect all work for Substantial Completion upon written request of the Contractor. The request shall be received at least ten (10) calendar days before the anticipated date of inspection. Lawns and planting may be accepted separately. For lawns and grass areas, at least three (3) cuttings must be made prior to inspection.
- B. Acceptance of plant material by the Engineer shall be for general conformance to specified size, character and quality and shall not relieve the Contractor of responsibility for full conformance to the contract documents including correct species.
- C. Upon completion and re-inspection of all repairs or renewals necessary in the judgment of the Engineer, the Engineer shall certify in writing to the Owner as to the substantial completion of the project.

3.10 GUARANTEE PERIOD AND REPLACEMENTS

- A. The Contractor shall guarantee all plants for a period of one year from the date of Substantial Completion to be in a good, healthy and flourishing condition.
- B. The Contractor shall replace, without cost to the Owner and as soon as weather conditions permit and within a specified planting period, all dead plants and all plants not in a vigorous, thriving condition, as determined by the Engineer during the guarantee period and at the end of the guarantee period. The plants shall be free of dead or dying branches and branch tips, and shall bear foliage of a normal density, size and color. Replacement shall closely match adjacent specimens of the same species. Replacement shall be subject to all requirements stated in their Specification.
- C. The Contractor shall make all necessary repairs due to plant replacements. Such repairs shall be done at no extra cost to the Owner.
- D. The Guarantee of all replacement plants shall extend for an additional period of one year from the date of their acceptance after replacement. Trees shall be placed in the same location only twice. If, after the first placement, a plant fails to survive, the Engineer will be notified. If replacement plant material is not acceptable during or at the end of the said extended guarantee period, the Engineer will determine whether the plant will be relocated, at no cost to the Owner, or deleted from the Contract, based on established unit prices where credit to the Owner will be established for such deletions.

3.11 PLANT MATERIAL GUARANTEE INSPECTION

- A. At the end of the guarantee period, the Engineer shall inspect all guaranteed work upon written request of the Contractor. The request shall be received at least ten (10) calendar days before the anticipated date of plant material guarantee inspection.
- B. Upon completion and re-inspection of all repairs or removals necessary, in the judgment of the Engineer, the Engineer shall certify in writing to the Owner as to the acceptance of the project.

END OF SECTION

SECTION 15010

BASIC MECHANICAL REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes general administrative and procedural requirements for mechanical installations. The following administrative and procedural requirements are included in this Section to expand the requirements specified in Division 1:

- 1. Submittals.
- 2. Record Documents.
- 3. Maintenance Manuals.
- 4. Coordination.
- 5. Code Conformance.
- 6. Manufacturers and Equals
- 7. Guarantee

1.3 SUBMITTALS

- A. General: Follow the procedures specified in Division 1 Section "SUBMITTALS".
- B. Provide product data and shop drawings for all equipment, trim, devices and materials. Submittals shall be project specific indicating all models, specialties and accessories intended to be provided. Clearly indicate the precise items submitted. Poorly prepared or reproduced submittals will be rejected.
- C. Provide installation instructions and operation and maintenance data for all equipment in a manual format.
- D. Provide complete "as-built" record document mechanical drawings.
- E. Provide complete copies of all air and water system testing, adjusting and balancing reports.

1.4 QUALITY ASSURANCE

- A. Secure and pay for all necessary fees, permits and approvals, as required for the work of Division 15.
- B. Before commencing work, review the project with the Local and State inspectors. Conform, in every respect, with their separate recommendations, unless the recommendations are inferior to, or in conflict with, the Contract Documents, then Engineer's acceptance will be required before proceeding with the work.

1.5 RECORD DOCUMENTS

- A. During the progress of the work, the Contractor shall furnish and keep on file at all times a complete and separate set of black or blue line print record documents. Each shall be clearly, neatly and accurately noted, promptly, as the work progresses, all mechanical changes, revisions, additions, deletions and deviations from the work. Wherever the work was installed, otherwise than as shown on the Contract Drawings, the changes shall be so noted. In addition to the requirements specified in Division 1 section on "SUMMARY OF WORK" and "PROJECT CLOSEOUT", indicate the following installed conditions:
- B. Prepare record documents in accordance with the requirements in Division 1 Section "PROJECT RECORD DOCUMENTS." In addition to the requirements specified in Division 1, indicate installed conditions for:
 - 1. Ductwork mains and branches, size and location, for both exterior and interior; locations of dampers and other control devices; filters, boxes, and terminal units requiring periodic maintenance or repair.
 - 2. Mains and branches of piping systems, with valves and control devices located and numbered to correspond with installed tag numbers, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, expansion compensators, tanks, etc.). Indicate actual inverts and horizontal locations of underground piping.
 - 3. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
 - 4. Contract Modifications, actual equipment and materials installed.
- C. At the completion of the work, the Contractor shall submit these marked-up prints to the Engineer for his comments and/or approval. Final payment will be held until the record prints are received and approved by the Engineer.

1.6 OPERATION & MAINTENANCE MANUALS

- A. Prepare operation & maintenance manuals in accordance with Division 1 Section "SUBMITTALS". In addition to the requirements specified in Division 1, include the following information for equipment items:
1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
 2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
 3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
 4. Servicing instructions and lubrication charts and schedules.
 5. One complete set of non-reproducible (black or blue print) record documents.
 6. A copy of all of the satisfactorily reviewed product and equipment submittals.
 7. Valve tag charts.
 8. Satisfactorily reviewed testing, adjusting and balancing report.

1.7 MANUFACTURERS AND EQUALS

- A. The manufacturer's products scheduled on the Drawings have been carefully reviewed and specified to satisfy the intent of the design. If there is a discrepancy between the scheduled product and the specification, the requirements listed in the specification have priority and must be complied with.
- B. Division 15 specification sections may list comparable manufacturers as indicated for product requirements, subject to compliance with the requirements of the Drawings and specifications. Products by these listed alternate manufactures are not considered to be substitutions but must be of similar physical size, capacity, construction, quality, features, and performance characteristics as that of the scheduled manufacturers. It is the Contractor's responsibility to coordinate any connection or other changes if the Contractor elects to install one of the alternate manufacturers.

- C. Products by a manufacturer other than scheduled or specified as an alternative, shall meet the “or equal” requirements of the General Conditions and Division 1 Section “MATERIALS AND EQUIPMENT”. If a scheduled, specified or “or equal” item is not available, the Contractor may propose a substitution in accordance with the requirements of the General Conditions and Division 1 Section “MATERIALS AND EQUIPMENT”. The Contractor is responsible for the rearrangement of any work of his trade or any other trade to accommodate the proposed substitution. Substitution submittals for proposed item which are of less than equal performance and or quality to the scheduled or specified item shall clearly identify these differences.

PART 2 PRODUCTS

2.1 GENERAL

- A. All materials and equipment shall be new and of the best quality and shall conform to standards and carry labels in every case where standards have been established.
- B. To the maximum extent possible, all mechanical equipment for any one system shall be the product of a single manufacturer. Engineer reserves the right to disapprove and reject equipment from various manufacturers when acceptable components can be secured from fewer manufacturers and to require that source of materials be unified to the maximum extent possible.
- C. Following submittal approval, the Contractor shall not make equipment substitutions during the project for any reason without the approval of the Engineer. Any work requiring removal and re-installation due to the Contractor’s failure to comply with this requirement shall be the responsibility of the Contractor with no additional cost to the Owner.

PART 3 EXECUTION

3.1 SAFETY

- A. Contractor shall be responsible for proper protective and safety measures when working under the provisions of the Contract.

3.2 CODE CONFORMANCE

- A. General: Install all systems of Division 15 sections in conformance with all applicable State of Vermont and Town of Montgomery codes in addition to all the specific codes and standards listed in the various Division 15 sections.

- B. Codes include but are not limited to:
 - 1. Vermont Fire & Building Safety Code – 2015, effective October 10, 2016.
 - 2. Fire Prevention Code NFPA 1 – 2015; Life Safety Code NFPA 101 – 2015; International Building Code – 2015, and National Board Inspection Code – 2015 as adopted and amended by the Vermont Fire & Building Safety Code.
 - 3. 2018 International Plumbing Code as adopted and amended by the 2018 State of Vermont Plumbing Rules, effective July 15, 2019.
 - 4. 2020 Vermont Commercial Building Energy Standards (CBES).

3.3 PERFORMANCE

- A. Perform all work which is requisite and essential in completing the intended installation in the proper manner.
- B. The Drawings indicate the general arrangement of equipment, fixtures, piping, ductwork and other mechanical work. Field verification of all dimensions is required. Specifications and Drawings are for assistance and guidance, but exact locations, distances and levels shall be governed by actual field conditions. Piping runs and ductwork are shown diagrammatically only. Furnish, install and place in satisfactory condition, ready for operation, all mechanical items and all other materials needed for complete mechanical systems as indicated on the Drawings.
- C. If any departures from the Construction Documents are deemed necessary by Contractor due to obstruction encountered or otherwise required in order to furnish an efficient, complete and satisfactory installation, details of such departures and the reasons therefore shall be brought to the attention of Engineer. Do not make departures without prior approval of Engineer. Departures from the Construction Documents without the approval of the Engineer will be at the Contractor's risk. Any corrections to the installation as a result of these departures will be by the Contractor with no additional cost to the Owner.

3.4 PREPARATION

- A. The Mechanical Contractor is advised that equipment supplied by other Divisions is subject to change and may require different mechanical connections than is indicated on the Drawings. The Contractor shall review the installation requirements supplied by the equipment manufacturer prior to performing rough in and mechanical connections. Discrepancies shall be brought to the attention of the Engineer. Any work requiring removal and re-installation due to the Contractor's failure to review these documents shall be the responsibility of the Contractor with no additional cost to the Owner.

3.5 COORDINATION

- A. Layout all work at the site by consultation with other trades before installing work to eliminate any conflict between this work and work of other trades.
- B. It is the responsibility of the Mechanical Contractor to coordinate the work of his trade with all other trades prior to the commencement of construction. The Drawings are schematic in nature, not all fittings and offsets are shown. It is the responsibility of the Contractor to provide, in his original bid, all necessary offsets, fittings, and transformations to provide a complete project. Any conflicts must be brought to the attention of the Engineer. Any work requiring removal and re-installation due to the lack of coordination shall be the responsibility of the Contractor with no additional cost to the Owner. Do not locate any piping over electrical equipment.

3.6 GUARANTEE

- A. Contractor shall guarantee all work and equipment installed under this Section of the Specifications against any defects for the time period described in Contract Conditions and Division 1 Sections. Guarantee all other work and damage as a result of such defects. Coordinate with the General Contractor for requirements of guarantee.
- B. Replace any material and equipment prior to final acceptance, which is corroded or otherwise damaged through the failure to properly operate and maintain the installation during construction or testing.
- C. Keep the work in repair and replace any defective materials, equipment or workmanship upon notice from the Engineer or Owner's representative for a period of one year from date of acceptance.
- D. Materials or equipment requiring excessive service during the first year of operation shall be considered defective.
- E. Post on the equipment and give to the Owner, a list of phone numbers to call for servicing during emergency and guarantee periods.

END OF SECTION 15010

SECTION 15030

ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.
- B. Division 16

1.2 SUMMARY

- A. This Section specifies the basic requirements for electrical components which are an integral part of packaged mechanical equipment. These components include, but are not limited to factory installed motors, starters, and disconnect switches furnished as an integral part of packaged mechanical equipment.
- B. Specific electrical requirements (i.e. horsepower and electrical characteristics) for mechanical equipment are specified within the individual equipment specification sections and/or on the Drawings.

1.3 REFERENCES

- A. NEMA Standards MG 1: Motors and Generators
- B. NEMA Standards ICS 2: Industrial Control Devices, Controllers, and Assemblies.
- C. NEMA Standard 250: Enclosures for Electrical Equipment
- D. NEMA Standard KS 1: Enclosed Switches
- E. National Electrical Code (NFPA 70).

1.4 SUBMITTALS

- A. No separate submittal is required. Submit product data for motors, starters, and other electrical components with submittal data required for the equipment for which it serves, as required by the individual equipment specification sections.

1.5 QUALITY ASSURANCE

- A. Electrical components and materials shall be UL labeled.

PART 2 PRODUCTS

2.1 MOTORS

- A. The following are basic requirements for simple or common motors. For special motors, more detailed and specific requirements are specified in the individual equipment specifications.
 - 1. Torque characteristics shall be sufficient to satisfactorily accelerate the driven loads.
 - 2. Motor sizes shall be large enough so that the driven load will not require the motor to operate in the service factor range.
 - 3. Two speed motors shall have two separate windings on poly phase motors.
 - 4. Temperature Rating:
 - a. Motors without variable frequency speed drives: Rated for 40° C environment with maximum 90° C temperature rise for continuous duty at full load (Class B Insulation).
 - b. Motors with variable frequency speed drives: Rated for 40° C environment with maximum 115° C temperature rise for continuous duty at full load (Class F Insulation).
 - 5. Starting capability: Frequency of starts as indicated by automatic control system, and not less than five evenly time spaced starts per hour for manually controlled motors.
 - 6. Service Factor: 1.15 for poly-phase motors. For single phase motors, 1.4 for 1/20 to 1/8 HP, 1.35 for 1/6 to 1/3 HP, 1.25 for 1/2 to 1 HP.
- B. Explosion proof motor requirements are indicated on Drawings. Explosion proof motors shall meet requirements of NEC, Class I, Division 1 or NEC, Class I, Division 2, as noted on the drawings.
- C. Motor construction: NEMA Standard MG 1, general purpose, continuous duty, Design "B", except "C" where required for high starting torque.
 - 1. Frames: NEMA Standard No. 48 or 54; use driven equipment

manufacturer's standards to suit specific application.

2. Bearings:
 - a. Ball or roller bearings with inner and outer shaft seals.
 - b. Re-greasable, except permanently sealed where motor is normally inaccessible for regular maintenance.
 - c. Designed to resist thrust loading where belt drives or other drives produce lateral or axial thrust in motor.
 - d. For fractional horsepower, light duty motors, sleeve type bearings are permitted.

3. Enclosure Type:
 - a. Open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation;
 - b. Guarded drip-proof motors where exposed to contact by employees or building occupants;
 - c. Weather protected Type I for outdoor use, Type II where not housed;

4. Overload protection: Built-in thermal overload protection and, where indicated, internal sensing device suitable for signaling and stopping motor at starter.

5. Efficiency:
 - a. Each Subtype I (per EISA of 2007) general purpose electric motor shall meet efficiency ratings as defined by NEMA MG 1-2006, Table 12-12. Motors shall be NEMA Premium® type and minimum efficiencies shall comply with the following tables:

OPEN DRIP PROOF MOTORS (ODP)			
HP	1200 RPM	1800 RPM	3600 RPM
1	82.5%	85.5%	77.0%
1.5	86.5%	86.5%	84.0%
2	87.5%	86.5%	85.5%
3	88.5%	89.5%	85.5%
5	89.5%	89.5%	86.5%
7.5	90.2%	91.0%	88.5%
10	91.7%	91.7%	89.5%
15	91.7%	93.0%	90.2%

TOTALLY ENCLOSED FAN COOLED MOTORS (TEFC) AND EXPLOSION PROOF (XP) MOTORS			
HP	1200 RPM	1800 RPM	3600 RPM
1	82.5%	85.5%	77.0%
1.5	87.5%	86.5%	84.0%
2	88.5%	86.5%	85.5%
3	89.5%	89.5%	86.5%
5	89.5%	89.5%	88.5%
7.5	91.0%	91.7%	89.5%
10	91.0%	91.7%	90.2%
15	91.7%	92.4%	91.0%

6. Each Subtype II (per EISA of 2007) general purpose electric motor shall meet efficiency ratings as defined by NEMA MG 1-2006, Table 12-11. Minimum efficiencies shall comply with the following tables:

OPEN DRIP PROOF MOTORS (ODP)			
HP	1200 RPM	1800 RPM	3600 RPM
1	80%	82.5%	-
1.5	84%	84%	82.5%
2	85.5%	84%	84%
3	86.5%	86.5%	84%
5	87.5%	87.5%	85.5%
7.5	88.5%	88.5%	87.5%
10	90.2%	89.5%	88.5%
15	90.2%	91%	89.5%

TOTALLY ENCLOSED FAN COOLED MOTORS (TEFC) AND EXPLOSION PROOF (XP) MOTORS			
HP	1200 RPM	1800 RPM	3600 RPM
1	80%	82.5%	75.5%
1.5	85.5%	84%	82.5%
2	86.5%	84%	84%
3	87.5%	87.5%	85.5%
5	87.5%	87.5%	87.5%
7.5	89.5%	89.5%	88.5%
10	89.5%	89.5%	89.5%
15	90.2%	91%	90.2%

7. Power Factor: All motors 1 horsepower and larger shall have a minimum 90% power factor rating or shall be provided with capacitors as specified in this section to correct the power factor if the uncorrected power factor is

less than 90%.

8. Nameplate: Indicate the full identification of manufacturer, ratings, characteristics, construction, special features, nominal full load motor efficiency and similar information.

2.2 STARTERS, ELECTRICAL DEVICES, AND WIRING

- A. General: Except as otherwise indicated, provide motor controllers and ancillary components which comply with the manufacturer's standard materials, design, and construction in accordance with published product information, and as required for a complete installation.
- B. Combination Magnetic Starters: Full voltage non-reversing type with circuit protective device. Circuit protective devices shall be molded case motor circuit protector breakers for motors sized up to 10 horsepower, and fusible disconnect switches for motors sized larger than 10 horsepower. Circuit protective devices shall be rated for approximately 175% of the motor full load amperage. Fuses shall be dual element time delay type. Molded case circuit breakers shall have symmetrical interrupting capacity, rating to accommodate available short circuit current of the electrical system. Starters shall be 60 Hertz, be mounted in a NEMA rated enclosure suitable for the environment in which it is located, sized properly for the motor horsepower, voltage, and phasing. Minimum size shall be NEMA size 1. All starters shall be sized in accordance with the National Electric Code.
- C. Magnetic Starters: Starters shall be 60 Hertz, be mounted in a NEMA rated enclosure suitable for the environment in which it is located, sized properly for the motor horsepower, voltage, and phasing. Minimum size shall be NEMA size 1. All starters shall be sized in accordance with the National Electric Code.
- D. Provide magnetic starters with fused 120 volt control circuits and auxiliary contacts. Minimum size control transformers shall be 100VA. Provide each magnetic starter with auxiliary contacts, two normally open (NO) and two normally closed (NC). Furnish all combination starters with Hand-Off-Auto (HOA) switches and red pilot 'ON' lights. Bimetallic, isothermic type ambient compensated overload and relay shall be provided in each leg of the starters. Overload relays shall be NEMA Class 20 and sized so that their thermal characteristics closely parallel the motor thermal characteristics as determined from the motor nameplate. Overload relays shall be hand reset from the outside of the starter enclosure by an insulated reset button.
- E. Motor connections: Flexible conduit, except where plug-in electrical cords are specifically indicated.

2.3 CAPACITORS:

- A. Features:
 - 1. Individual unit cells
 - 2. All welded steel housing
 - 3. Each capacitor internally fused
 - 4. Non-flammable synthetic liquid impregnant
 - 5. Craft tissue insulation
 - 6. Aluminum foil electrodes
 - 7. KVAR size shall be as required to correct motor power factor to 90 percent or better and shall be installed on all motors 1 horsepower and larger, that have an uncorrected power factor of less than 85 percent at rated load.

2.4 DISCONNECT SWITCHES

- A. Fusible switches: Fused, each phase; general duty; horsepower rated; quick-make / quick-break mechanism; dead front line side shield; solderless lugs suitable for copper or aluminum conductors; spring reinforced fuse clips; electro silver plated current carrying parts; hinged doors; operating lever arranged for locking in the "OPEN" position; arc quenchers; capacity and characteristics as required.
- B. Non-fusible switches: For equipment 2 horsepower and smaller, shall be horsepower rated; toggle switch type; quantity of poles and voltage rating as required. For equipment larger than 2 horsepower, switches shall be the same as fusible type.

PART 3 EXECUTION (Not Applicable)

END OF SECTION 15030

SECTION 15050

BASIC MECHANICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes limited scope general construction materials and methods for application with mechanical installations as follows:
 - 1. Wall and floor sleeves.
 - 2. Mechanical equipment nameplate data.
 - 3. Miscellaneous metals for support of mechanical materials and equipment.
 - 4. Miscellaneous lumber, nailers, blocking, fasteners, and anchorage for support of mechanical materials and equipment.
 - 5. Joint sealers for sealing around mechanical materials and equipment.
 - 6. Firestopping materials for sealing mechanical penetrations in fire and smoke barriers, floors, and walls.
 - 7. Access doors.
- B. This Section covers the general execution requirements which are applicable to all mechanical work.
 - 1. Examination.
 - 2. Rough-ins.
 - 3. Mechanical Installations.
 - 4. Installation of Equipment.
 - 5. Cutting and Patching.
 - 6. Painting.
 - 7. Cleaning.

- C. Architectural items, structural items, electrical items and other related work are specified in other Sections which are not a part of Division 15. The mechanical connections to these items or devices are specified in the appropriate Sections of Division 15. Certain mechanical equipment is specified in other Divisions and is required to be furnished by equipment manufacturers.
- D. Division 15 covers, in broad detail, the extent of the mechanical work and the equipment to be provided and shall not be construed as a complete description of all the details of design and construction required.
- E. Provide all labor, materials, equipment, articles, and tools and perform all work necessary for the complete execution of the mechanical work, as shown on the Drawings, required by the Specifications and work not specifically shown or specified, yet required to insure the design intent inherent in the work and to comply with all applicable codes and regulations.
- F. The Drawings are generally diagrammatic, intended to convey the scope of the work and indicate the general arrangement of equipment, ductwork and piping and approximate sizes and locations of equipment. Do not scale Drawings. Consult Architectural and Structural Drawings for space conditions.

1.3 SUBMITTALS

- A. Refer to Division 1 and Division 15 Section "BASIC MECHANICAL REQUIREMENTS" for administrative and procedural requirements for submittals.
- B. Submit product data on the following products:
 - 1. Firestopping materials.
- C. Submit shop drawings detailing fabrication and installation for metal fabrications, and wood supports and anchorage for mechanical materials and equipment.
- D. Submit welder certificates, signed by Contractor, certifying that welders comply with requirements specified under "QUALITY ASSURANCE" article of this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer for the installation and application of firestopping.
- B. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel."

- C. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- D. Equipment and appurtenances shall be designed in conformity with ANSI, ASME, IEEE, NEMA, OSHA, AGMA and other generally accepted applicable standards. They shall be of rugged construction and of sufficient strength to withstand all stresses which may occur during fabrication, testing, transportation, installation and all other conditions or operations. All bearings and moving parts shall be adequately protected against wear by bushings or other approved means. Provisions shall be made for adequate lubrication with readily accessible devices.
- E. Ample clearance shall be provided for repairs, inspection and adjustment. Protruding members such as joints, corners and gear covers shall be finished in appearance. All exposed welds shall be ground smooth and the corners of structural shapes shall be rounded or chamfered.
- F. All machinery and equipment shall be safeguarded in accordance with the safety codes of the ANSI, OSHA, and local industrial codes, including but not limited to, shaft guards on all rotating shafts.
- G. All mechanical work shall be performed by mechanics who are qualified to do such work and who are normally engaged in this type of work. Because of the complexity of the mechanical work, unskilled labor is not permitted.
- H. Firestopping Materials: Firestopping materials must bear the UL label and UL test number. A copy of the test as well as the installation instructions must be included in the submittal.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.
- B. Properly store all materials and equipment in accordance with the manufacturers' recommendations and as required to protect them from damage, deterioration and corrosion.
- C. Temporarily close all openings to prevent obstruction, damage or the intrusion of foreign materials.
- D. Deliver firestopping materials in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.

1.6 PROJECT CONDITIONS

- A. Environmental Conditions: Apply firestopping under temperature and humidity conditions within the limits permitted by the manufacturer. Do not apply firestopping to wet substrates.

PART 2 PRODUCTS**2.1 WALL AND FLOOR SLEEVES**

- A. Sheet Metal Sleeves (heavy): 16 gage galvanized sheet metal with pipe or Pittsburgh lock longitudinal joint.
- B. Steel Sleeves: Schedule 10, steel pipe, ASTM A53, Grade A.

2.2 MECHANICAL EQUIPMENT NAMEPLATE DATA

- A. Nameplate: For each piece of power operated mechanical equipment provide a permanent operational data nameplate indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data. Locate nameplates in an accessible location.

2.3 MISCELLANEOUS METALS

- A. Steel plates, shapes, bars, and bar grating: ASTM A 36.
- B. Cold-Formed Steel Tubing: ASTM A 500.
- C. Hot-Rolled Steel Tubing: ASTM A 501.
- D. Non-shrink, Nonmetallic Grout: Premixed, factory-packaged, non-staining, noncorrosive, nongaseous grout, recommended for interior and exterior applications.
- E. Fasteners: Materials as specified for "Miscellaneous Materials" in Division 15 Section "MECHANICAL HANGERS AND SUPPORTS", type, grade and class as required.

2.4 MISCELLANEOUS LUMBER

- A. Framing Materials: Standard Grade, light-framing-size lumber of any species. Number 2 Common boards complying with WCLIB or AWPA rules, or Number 2 boards complying with SPIB rules. Lumber shall be preservative treated in accordance with AWPB LP-2, and kiln dried to a moisture content of not more

than 19 percent.

- B. Construction Panels: Plywood panels; APA C-D PLUGGED EXT, with exterior glue; thickness not less than 23/32 inches.

2.5 FIRESTOPPING

- A. General: Firestopping caulk, joint fillers, and other related materials compatible with each other and with joint substrates under conditions of service and application. All products shall be installed in the manner determined by the manufacturer as tested by an independent testing laboratory.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. 3M Fire Protection Products.
 - 2. Spec Seal (Specified Technologies Inc.).
 - 3. Rectorseal Corporation.
 - 4. Or equal.

2.6 ELASTOMERIC JOINT SEALERS

- A. Refer to Division 7 specification Section “JOINT SEALERS” and coordinate work with appropriate trades for all joint sealant requirements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Prior to performing work required under Division 15, carefully inspect all existing conditions and the installed work of all other trades and verify that all conditions and all such work is complete to the point where the mechanical work may properly commence.
- B. Verify that mechanical work may be done in complete accordance with all pertinent laws, codes, regulations and the design.
- C. In the event of discrepancy, immediately notify Engineer.
- D. Do not proceed with the work in areas of discrepancy until all such discrepancies have been fully resolved.
- E. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting installation and application of firestopping. Do not proceed with installation until

unsatisfactory conditions have been corrected.

3.2 ROUGH-IN

- A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected. Refer to approved equipment submittals for rough in requirements.
- B. Coordinate rough in with the work of all other trades.
- C. Protect the work and close all openings until equipment and fixtures can be installed.

3.3 MECHANICAL INSTALLATIONS

- A. Layout all work at the site by consultation with other trades before installing work to eliminate any conflict between this work and work of other trades.
- B. Coordinate mechanical work, in advance, with other work. The installation of chases, openings, etc., required for mechanical equipment, shall be done at such time as to minimize the need for any subsequent cutting and patching. Prior to the ordering of any equipment, verify the location, type and characteristics of connections to be furnished.
 - 1. Verify all dimensions by field measurements.
 - 2. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for mechanical installations.
 - 3. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
 - 4. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
 - 5. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
 - 6. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
 - 7. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent

possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form.

8. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components.
9. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.
10. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

3.4 INSTALLATION OF EQUIPMENT

- A. All equipment shall be installed true, level and in the location shown on the Drawings. Precision gauges and levels shall be used in setting all equipment.
- B. Equipment shall be erected in a neat and workmanlike manner on the foundations and supports at the locations and elevations shown on the Drawings, unless otherwise directed by the Engineer during installation.
- C. Furnish, install and protect all necessary guides, bearing plates, anchor and attachment bolts, and all other appurtenances required for the installation of equipment. These shall be of ample size and strength for the purpose intended.
- D. Anchor bolts shall be furnished and built into the concrete foundations.
- E. All equipment shall be installed in such a manner as to provide access for routine maintenance, including lubrication.
- F. Structural steel supports and miscellaneous steel required for supporting and/or hanging equipment and piping furnished under this Division, shall be provided and installed.
- G. All foundations, anchor pads, piers, thrust block, inertia blocks and structural steel supports shall be built to template and reinforced as required for loads imposed on them.
- H. Assume all responsibility for sizes, locations, and design of all foundations, anchor pads, piers, thrust blocks, inertia blocks, curbs and structural steel

supports.

3.5 CUTTING AND PATCHING

- A. General: Perform cutting and patching in accordance with Division 1 Section "EXECUTION REQUIREMENTS." In addition to the requirements specified in Division 1, the following requirements apply:
 - 1. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.
- B. Perform cutting, fitting, and patching of mechanical equipment and materials required to:
 - 1. Uncover Work to provide for installation of ill-timed Work.
 - 2. Remove and replace defective Work.
 - 3. Remove and replace Work not conforming to requirements of the Contract Documents.
 - 4. Remove samples of installed Work as specified for testing.
 - 5. Upon written instructions from the Engineer, uncover and restore Work to provide for Engineer observation of concealed Work.
- C. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
- D. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
- E. Patch finished surfaces and building components using new materials specified for the original installation and experienced Installers.

3.6 PAINTING

- A. Any equipment or device that receives a factory coat of paint and is damaged during installation, must receive touch painting. Clean and paint to match original finish, all items scratched or otherwise damaged.
- B. Field painting requirements, other than as needed to repair damaged paint on anything with a factory coat of paint, is covered in Division 9 section "PAINTING".

3.7 INSTALLATION OF SLEEVES

- A. Applications:
1. Install sheet metal sleeves for all pipes passing through non-fire rated dry wall partitions and walls.
 2. Install sheet metal sleeves for all ducts passing through floors and smoke rated walls and in walls constructed of concrete or masonry.
 3. Install steel pipe sleeves for all pipes passing through fire and/or smoke rated walls, and in walls constructed of masonry or concrete.
 4. Sleeves may be eliminated in walls when holes are cleanly cored or saw cut through solid concrete or masonry.
 5. Penetrations through exterior walls shall be sleeved with steel pipe.
- B. Sleeves poured in place shall have anchors welded to the outside of the sleeve to insure embedment in the concrete. All steel shall be painted one coat of a rust inhibitive paint.
- C. Sleeves shall be installed flush with the face of finished walls and ceilings; extend one inch above the level of finished floors.
- D. Where insulated piping and insulated, non fire dampered ductwork passes through fire rated floors and walls, stop insulation at barriers and fire seal sleeved hole fully to bare piping or duct with firestopping and, if necessary, filler material as specified in the firestopping manufacturer's tested assembly.

3.8 ERECTION OF METAL SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place miscellaneous metal fabrications accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- B. Field Welding: Comply with AWS "Structural Welding Code."

3.9 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- B. Select fastener sizes that will not penetrate members where opposite side will be

exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood members.

- C. Attach to substrates as required to support applied loads.

3.10 APPLICATION OF FIRESTOPPING

- A. Installation of Fire-Stopping Sealant: The Contractor must determine the penetration is of suitable size and is properly prepared for installation of the fire caulk. Install sealant, including forming, packing, and other accessory materials, to fill openings around mechanical services penetrating floors and walls, to provide fire-stops with fire-resistance ratings indicated for floor or wall assembly in which penetration occurs. Comply with installation requirements established by testing and inspecting agency. The Contractor must have, for reference on site, the testing laboratory written installation instructions specific to the installation being performed.

3.11 COORDINATION OF ACCESS DOORS PROVIDED BY OTHER SECTIONS

- A. General: The Mechanical Contractor must coordinate the installation of mechanical work with the installation of access doors. This will require that the Mechanical Contractor become familiar with architectural details in the Architectural Drawings. Mechanical equipment must be laid out so that the access panels as designed can serve their purpose.
- B. Coordinate installation of access doors at all locations and with adequate door size to provide the required access to mechanical system components including but not limited to, fire dampers, smoke dampers, volume dampers, valves, steam traps, controls devices and components, and equipment filters.
- C. Fire-rated access doors and frames shall be furnished for all locations where the doors are to be installed in a rated assembly. Refer to Architectural Drawings for locations of rated assemblies.
- D. All required access doors may not be indicated on the Architectural Drawings. Responsibility for access to all mechanical items is with the Mechanical Contractor and shall be coordinated with the General Contractor. Obtain approval from Architect before installation of access doors not shown on the Drawings or doors that are to be relocated from locations shown on Architectural Drawings due to relocation of equipment to be serviced. Failure to obtain this approval may necessitate rework at the installing Contractors expense.

3.12 CLEANING

- A. Protect equipment against mortar, dust, weather, etc., during construction and leave all equipment clean. Remove from the premises, all debris and unused material and leave premises in a clean and neat condition.
- B. Inspect all items of equipment thoroughly. Repair any items dented, scratched, or otherwise damaged in any manner and paint to match original finish. All items so repaired and refinished shall be brought to the attention of the Engineer for inspection and approval.

END OF SECTION 15050

SECTION 15140

HANGERS AND SUPPORTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawing and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This section includes the following:
 1. Horizontal piping hangers and supports.
 2. Vertical piping clamps.
 3. Hanger rod attachments.
 4. Building attachments.
 5. Saddles and shields.
 6. Miscellaneous materials.
 7. Equipment supports.

1.3 SUBMITTALS

- A. Product data, including installation instructions for each type of hangers and supports. Submit pipe hanger and support schedule showing Manufacturer's figure number, size, piping system, and features for each required.
- B. Welder certificates signed by Contractor certifying that welders comply with requirements specified under "Quality Assurance" Article.

1.4 QUALITY ASSURANCE

- A. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code – Steel."
- B. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- C. Regulatory Requirements: Comply with applicable codes pertaining to product materials and installation of supports and anchors.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

- A. Hangers and support components shall be factory fabricated of materials, design, and manufacturer complying with MSS SP-58, current edition.
- B. Pipe attachments shall have nonmetallic coating for electrolytic protection or shall be of copper construction where attachments are in direct contact with copper tubing.

2.2 MISCELLANEOUS MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36.
- B. Threaded support rods and fasteners shall be zinc plated or galvanized steel for dry areas (Operations Room), galvanized steel or Type 316 stainless steel for semi-wet process areas (UV Room), Type 316 stainless steel for wet process areas (Headworks), galvanized steel for exterior locations.

2.3 FINISHES

- A. All hangers and support components must be factory painted with manufacturer's standard primer.
 - 1. Exception: Any component that has a galvanized or epoxy finish or is constructed of stainless steel does not need the factory standard primer.
- B. All hangers and components that are to be installed exposed to the weather must be provided with hot dipped galvanized finish per ASTM A123.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions under which supports and anchors are to be installed. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Review with the Engineer substrates of questionable integrity prior to installation.

3.2 INSTALLATION OF HANGERS AND SUPPORTS

- A. General: Install hangers, supports, clamps and attachments to support piping properly from building structure; comply with MSS SP-69 and SP-89. Install supports with maximum spacings complying with the most stringent of:
 - 1. MSS SP 69, latest edition.

2. Applicable Mechanical and Plumbing Codes.
3. The following schedule:

	Pipe Size	Steel Pipe	Copper Pipe	Polypropylene	PVC Pipe
Horizontal	≤ ³ / ₄ "	7'	5'	4'	4'
	1" – 1 ¼"	7'	6'	4'	4'
	1½"	9'	8'	4'	4'
	2"	10'	8'	4.6'	4'
	2½"	11'	9'	4.9'	4'
	≥3"	12'	10'	5.2'	4'
Vertical	All sizes: at every floor or as scheduled	12'	12'	4'	4'

- a. The above chart reflects PVC pipe spacing with 100°F fluid temperature. Higher temperatures may require closer spacings, refer to manufacturer’s printed recommended spacings.
 - b. Follow polypropylene piping manufacturer’s printed guidelines based on operating and ambient temperatures. Higher temperatures may require closer spacings.
- B. Arrange for grouping of parallel runs of horizontal piping supported together on field fabricated, heavy duty trapeze supports where possible. Where piping of various sizes are supported together by trapeze supports, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe as specified above for individual pipe hangers. Where piping is supported with trapeze supports, install clamps or clips to keep lines in their relative lateral positions. Lines subject to thermal expansion shall be free to roll axially or slide on the piping support.
- C. Install building attachments within concrete or to structural steel. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert to forms
- D. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- E. Steel ‘C’ clamps (MSS type 23) are permitted for use with hangers supporting single pipes ≤2". Use malleable iron beam clamps (MSS type 19) or center beam hangers (MSS types 21, 22, 27, 28, 29, or 30) for single pipe hangers >2" and multiple pipe hangers

- F. Trapezes: Provide field fabricated or pre-manufactured.
 - 1. Field Fabricated, Heavy Duty Steel Trapezes: Fabricate from steel shapes selected for loads required; weld steel in accordance with AWS D-1.1.
 - 2. Manufactured Steel Trapezes: Manufactured steel channel shapes of dimensions and gauge as required for loads carried per ASTM A570 GR 33 and A366 as manufactured by Unistrut or approved equal.
 - 3. Trapeze hangers shall be sized for all loads imposed on the trapeze and in accordance with all applicable codes.
 - 4. Trapezes for exterior locations must be provided with a galvanized finish.
- G. Install hangers and supports to allow controlled movement of piping systems, to permit freedom of movement.
- H. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
- I. Pipe Slopes: Install hangers and supports to provide indicated and specified pipe slopes, and so that maximum pipe deflections allowed by ASME B31.9 Building Services Piping Code is not exceeded.
- J. Uninsulated Piping: Provide adjustable clevis hangers, MSS Type-1. Provide steel for use with steel piping and copper for use with copper piping. For any other piping system, provide hangers of a compatible material.

3.3 INSULATED PIPING REQUIREMENTS

- A. Supports for piping lines 1-½” and larger and shall be provided with a non-compressible insulation insert and shield:
 - 1. Hangers: Provide adjustable steel clevis hangers MSS Type 1 for insulated piping, sized for insulation outside diameter.
 - 2. Shields: Install G-90 galvanized steel protective insulation shields MSS type 40.
 - 3. Shields shall span an arc of 180°, minimum sizes as follows:

Pipe Size	Length	Thickness
¼" → 3 ½"	12"	18 ga

- 4. Inserts: Install high compressive strength calcium silicate insert at hangers. Insert material shall be at least as long as the protective shield.

Insert shall encompass at least the bottom 180° of the piping.

- a. Where piping insulation includes a vapor barrier, the vapor barrier must be continuous over the non-compressible insert insulation.
- B. Supports for all insulated piping that does not require a non-compressive insert shall be provided with a protective shield that complies with above requirements for shields.

3.4 EQUIPMENT SUPPORTS

- A. Fabricate structural steel stands to suspend equipment from structure above or support equipment above floor.
- B. Grouting: Place grout under supports for equipment.

3.5 METAL FABRICATION

- A. Cut, drill, and fit miscellaneous metal fabrications for equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding work, and the following:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. Grind smooth welds at exposed connections so that no roughness shows after finishing, and so that contours of welded surfaces match adjacent contours.

3.6 ADJUSTING

- A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Touch Up Painting: Immediately after erection of anchors and supports, clean field welds and abraded areas of shop paint and paint exposed areas with same material as used for shop painting to comply with SSPC-PA-1 requirements for touch-up of field-painted surfaces.

- C. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- D. For galvanized surfaces clean welds, bolted connections and abraded areas and apply galvanizing repair finish to comply with ASTM A 780.

END OF SECTION 15140

SECTION 15411

DOMESTIC WATER DISTRIBUTION PIPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this Section.

1.2 SUMMARY

- A. This Section includes potable cold water, hot water, and circulation hot water piping, fittings, and specialties within the building to a point 10 feet outside the building.

1.3 DEFINITIONS

- A. Water Distribution Pipe: A pipe within the building or on the premises that conveys water from the water service pipe or meter to the points of usage.
- B. Water Service Pipe: The pipe from the water main or other source of potable water supply to the water distributing system of the building served.
- C. Pipe sizes used in this Specification are nominal pipe size (NPS).

1.4 REFERENCES:

- A. General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to the extent indicated.
 1. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings
 2. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
 3. ICC LC1002 - PMG Listing Criteria For Press Connection Fittings For Potable Water Tube And Radiant Heating Systems
 4. IAPMO PS117 - Copper And Copper Alloy Tubing System Incorporating Press-Type or Nail-Type Connections.
 5. NSF/ANSI 61 - Drinking Water System Components - Health Effects

6. NSF/ANSI 61-G Annex G – Weighted Average Lead Content Evaluation Procedure to a 0.25% Lead Requirement
7. NSF/ANSI 372 - Drinking Water System Components – Lead Content

1.5 SUBMITTALS

- A. Refer to Division 1 and Division 15 Section “BASIC MECHANICAL REQUIREMENTS” for administrative and procedural requirements for submittals.
- B. Submit the following:
 1. Product data for each piping specialty and special duty valve specified.
 2. Product data for trap primers, thermostatic mixing valves and thermal expansion tanks.
 3. Piping pressure test and backflow preventer test reports specified in Part 3 of this Section.
 4. Reports for cleaning and disinfecting procedures completed and satisfactory bacteriological sample test results.
 5. Inspection reports of the Authority Having Jurisdiction.
 6. Maintenance data for each piping specialty and valve specified for inclusion in Maintenance Manual specified in Division 1 and Division 15 Section - "BASIC MECHANICAL REQUIREMENTS."

1.6 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with the provisions of the following codes:
 1. ASME B31.9 "Building Services Piping" for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label.
 2. "Lead Free" Compliance: All plumbing valves used to convey or dispense water for human consumption shall meet the low lead requirements of NSF/ANSI 61 Annex G and NSF/ANSI 372 for <0.25% weighted average lead content in relation to the wetted surface area in accordance with the Federal "Reduction of Lead in Drinking Water Act" of 2011.
 3. All pipe, fittings and valves installed in potable domestic water systems shall comply with NSF 61 "Drinking Water System Components – Health Effects."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store pipe in a manner to prevent sagging and bending.

1.8 SEQUENCING AND SCHEDULING

- A. Coordinate the installation of pipe sleeves for foundation wall penetrations.

1.9 EXTRA MATERIALS

- A. Maintenance Stock: Furnish one valve key for each key operated wall hydrant, hose bibb, fixture supply, or faucet installed.

PART 2 PRODUCTS

2.1 PIPE, FITTINGS, AND JOINT MATERIALS

- A. Pipe and Tube: Refer to Part 3, Article, "PIPE APPLICATIONS," for identification of systems where the below materials are to be used.
- B. Annealed Temper Copper Tubing:

ITEM	SIZE	ASTM SPEC NO.	MATERIAL WEIGHT & TYPE
Pipe	≤3"	B88 copper	Type L or K, drawn
Solder Fittings	≤3"	Wrought copper or cast bronze	ANSI B16.22 & B16.18
Press Fittings	≤2"	Wrought copper or bronze	ANSI B16.22 and B16.18, EPDM sealing element
Press Fittings	2 1/2", 3"	Wrought copper or bronze	ANSI B16.22 and B16.18, EPDM sealing element, 420 stainless steel grip ring, PBT separator ring
Bolts	Per flange standard	A193, grade B7 carbon steel	Hex head (ANSI B18.2.1), B1.1, class 2A course thread
Nuts	Per flange standard	A194, Grade 2H, Carbon steel	Heavy hex (ANSI B18.2.2), B1.1, class 2B course thread
Gaskets	Per flange standard	1/16" Compound fiber	

- C. Polypropylene Piping:

ITEM	SIZE	ASTM SPEC NO.	MATERIAL WEIGHT & TYPE
Pipe	1/2" & 3/4"	F-2389	SDR 7.4, Aquatherm Greenpipe® Faser Composite, Nupi Nyron Clima PP-RCT or equal.

Pipe	1”	F-2389	SDR 9, Aquatherm Greenpipe® Faser Composite, Nupi Nyron Clima PP-RCT or equal.
Pipe	≥1-1/4”	F-2389	SDR 11, Aquatherm Greenpipe® Faser Composite, Nupi Nyron Clima PP-RCT or equal.
Fittings	≤3”	F-2389	SDR 7.4, Aquatherm Greenpipe®, Nupi Nyron Clima PP-RCT or equal.

D. CPVC Piping:

ITEM	SIZE	ASTM SPEC NO.	MATERIAL WEIGHT & TYPE
Pipe	≤3”	D-1784, D-2846 & F-441CPVC	Schedule 80
Fittings	≤3”	D2846 & F441CPVC	Schedule 80

2.2 SPECIAL DUTY VALVES

- A. Interior Wall Hydrant for Utility Spaces: Metal handwheel operated, bronze or brass construction, chrome or rough bronze finish with ASSE 1011 approved vacuum breaker, 3/4” inlet connection, 3/4” hose connection.
 - 1. Watts Regulator Co. - #SC8
 - 2. Woodford Mfg. Co. – Model 24
 - 3. Or equal

- B. Exterior Wall Hydrant, Exposed Type: Exposed, key operated, bronze or brass construction, chrome finish or stainless steel face, non-freeze, anti-siphon, automatic draining, with ASSE 1011 approved vacuum breaker, 3/4” inlet, 3/4" hose connection.
 - 1. Josam Co. - #71050 series
 - 2. Woodford Mfg. Co. - #65 series
 - 3. Zurn Industries Inc., Hydromechanics Div. - #Z-1310
 - 4. Or equal

- C. Hose Stations: Hose stations shall be of size, materials of construction and accessories as indicated on Drawings. Units shall be of stainless steel or bronze and stainless steel construction as indicated. Hose stations shall be furnished with inlet stop and check valves and color coded heat resistant valve handles on inlets. Hose stations shall be furnished with stainless steel hose racks, stainless steel mounting plate, vacuum breaker, hose connection, hose and spray nozzle.

1. Leonard
2. Straham
3. Approved Equal

2.3 PIPING SPECIALTIES

- A. Water Hammer Arresters: Bellows type, with stainless steel casing and bellows, pressure rated for 125 psi, tested and certified in accordance with PDI Standard WH-201 and shall conform to ASSE 1010.
1. Josam Co. - #75000 series
 2. J. R. Smith Mfg. Co. – Hydrotrol, #5005-5050
 3. Watts Regulator Co. - #15 series
 4. Zurn Industries, Inc.; Hydromechanics Div. - #Z-1700 Shoktrol series
 5. Or equal
- B. Vacuum Breakers: Atmospheric type shall conform to ASSE Standard 1001, silicone disc, rough brass finish, for use in low hazard connections where not subject to continuous pressure. Vacuum breakers shall comply with requirements of the maximum lead content regulation per Part 1 – Quality Assurance, when applicable.
1. Conbraco - #AVB1LF (38LF-100) series
 2. Watts Regulator Co. - #LF288A series
 3. Zurn Industries, Inc., Wilkins Regulator Div. - #35XL
 4. Or equal
- C. Backflow Preventers (equipment isolation for line sizes 2” and smaller): Reduced pressure principle assembly consisting of shutoff valves on inlet and outlet and strainer on inlet. Assemblies shall include four test cocks and pressure differential relief valve located between 2 positive seating check valves. Backflow preventers shall comply with requirements of ASSE 1013, AWWA/ANSI 511-97 and the maximum lead content regulation per Part 1 – Quality Assurance, when applicable. Provide an air gap drain funnel at the pressure differential relief valve.
1. Conbraco - #40LF-200 series
 2. Watts Regulator Co. – #LF-909 series
 3. Zurn Industries Inc. Wilkins #975XL2
 4. Or equal
- D. Hydronic System Makeup Water Pressure Reducing Valves: Diaphragm operated, cast iron or brass body valve, with low inlet pressure check valve, inlet strainer removable without system shut down, and non-corrosive valve seat and stem. Select valve size, capacity, and operating pressure to suit system. Valve shall be factory- set at operating pressure and have the capability for field adjustment.
1. Armstrong Pumps, Inc. - RD-40

2. Bell and Gossett - FB-38
 3. Taco, Inc. - #335
 4. Or equal
- E. Water Service Line Pressure-Reducing Valves: Single-seated, direct-operated type, having bronze body with integral strainer and complying with requirements of ASSE Standard 1003 and the maximum lead content regulation per Part 1 – Quality Assurance, when applicable.
1. Conbraco - #PRH-LF series
 2. Watts Regulator Co. - #LF223 series
 3. Zurn Industries Inc., Wilkins Regulator Div. - #500XL series
 4. Or equal
- F. Combined Pressure-Temperature Relief Valves: Bronze body, test lever, thermostat, self-closing complying with ANSI Z21.22 listing requirements for temperature and discharge capacity of the appliance for which installed. Temperature relief valves shall be factory set at not more than 210°F, and pressure relief at 150 psi or the pressure vessel manufacturer's rated working pressure, whichever is less.
1. Watts Regulator Co. - #40XL
 2. Zurn Industries, Inc., Wilkins Regulator Div., #TP series
 3. Or equal

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine rough-in requirements for plumbing fixtures and other equipment with water connections to verify actual locations of piping connections prior to installation.

3.2 PIPE APPLICATIONS

- A. Above grade, non-corrosive environment: At Contractor's option install Type L, drawn copper tube with wrought copper fittings and solder joints or proprietary Viega ProPress copper press fittings and joints or polypropylene pipe with socket-fusion type fittings.
- B. Above grade, corrosive environment (Headworks): Install polypropylene pipe with socket-fusion type fittings.
- C. Below Grade, $\leq 2"$: Install Type K, annealed temper copper tube for pipe sizes 2" and smaller, with minimum number of joints, below ground. Minimum

contiguous pipe section requirement is 45'. Joint connections shall be brazed.

3.3 PIPING INSTALLATION

- A. Refer to Division 15 Section "BASIC PIPING MATERIALS AND METHODS" for general piping installation requirements.
- B. Install piping with 1/32"/foot (¼%) downward slope towards drain point.

3.4 HANGERS AND SUPPORTS

- A. Refer to Division 15 Section "HANGERS AND SUPPORTS" for hanger, support, and anchor devices.

3.5 JOINTS

- A. Refer to Division 15 Section "BASIC PIPING MATERIALS AND METHODS" for joint construction.

3.6 SERVICE ENTRANCE

- A. Extend water distribution piping to connect to water service piping, of size and in location indicated for service entrance to building. Maintain a minimum 10' horizontal separation to sanitary building sewer lines.
- B. Install sleeve and mechanical sleeve seal at penetrations through foundation wall for watertight installation.
- C. Unless otherwise indicated, at each service entrance install shutoff valves, a strainer, pressure reducing valve, backflow preventer and a pressure gauge with an isolation valve downstream of the entrance shutoff valve and downstream of the pressure reducing valve.

3.7 VALVE APPLICATIONS

- A. Refer to Division 15 Section "PLUMBING VALVES" for general duty valve applications.
- B. General: The Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Shut-off duty and throttling duty: Use ball valves.

3.8 INSTALLATION OF PIPING SPECIALTIES

- A. Install backflow preventers at each connection to mechanical equipment and systems and in compliance with the plumbing code and the authority having

jurisdiction. Install air gap fitting and pipe relief outlet drain without valves to nearest floor drain.

- B. Install pressure-reducing valves with inlet and outlet shutoff valves. Install pressure gage on pressure reducing valve inlet and outlet.
- C. Install shutoff valves where indicated and as required by the plumbing code.
- D. Install trap primers where indicated on the Drawings serving traps indicated. Trap primers shall be installed a minimum of 36" above the inlet of the trap, shall be located in accessible locations and shall incorporate an air gap fitting.
- E. Install water hammer arresters for each bathroom group and at each location with equipment furnished with fast acting solenoid valves. Arresters shall be located in accessible locations.
- F. Install mixing valves where indicated and required by plumbing code and in compliance with manufacturer's requirements.

3.9 EQUIPMENT CONNECTIONS

- A. Piping Runouts to Fixtures: Provide hot and cold water piping runouts to fixtures of sizes indicated, but in no case smaller than required by plumbing code.
- B. Mechanical Equipment Connections: Connect hot and cold water piping system to mechanical equipment as indicated. Provide shutoff valve and union for each connection; provide drain valve with hose end connection, cap and chain on drain connection.

3.10 FIELD QUALITY CONTROL

- A. Inspections: Inspect water distribution piping as follows:
 - 1. Do not enclose, cover, or put into operation the water distribution piping system until it has been inspected and approved by the authority having jurisdiction.
 - 2. During the progress of the installation, notify the authority having jurisdiction at least 5 days prior to the time such inspection must be made. Perform tests specified below in the presence of the authority unless the inspection requirement is waived by the authority
 - 3. Rough-in Inspection: Arrange for inspection of the piping system by the authority after system is roughed in and before concealed or closed in and prior to setting fixtures.
 - 4. Final Inspection: Arrange for a final inspection by the authority to

observe the tests specified below if requested by the authority and to ensure compliance with the requirements of the plumbing code.

5. Other Inspections: Arrange for other inspections in addition to the above if requested by the authority.
 6. Reinspections: Whenever the authority finds that the piping system will not pass the test or inspection, make the required corrections and arrange for reinspection by the authority.
 7. Reports: Submit inspection reports signed by the authority having jurisdiction
- B. Test water distribution piping as follows:
1. Test for leaks and defects all new water distribution piping systems and parts of existing systems that have been altered, extended or repaired. If testing is performed in segments, submit a separate report for each test, complete with a diagram of the portion of the system tested.
 2. Leave uncovered and unconcealed all new, altered, extended, or replaced water distribution piping until it has been tested and approved. Expose all such work for testing that has been covered or concealed before it has been tested and approved.
 3. After press fittings have been installed a stepped pressure test shall be followed. Utilizing air, water, or dry nitrogen, pressurize the system not to exceed 85 psig. Walk the system and check for leaks. If no leaks are identified, proceed to pressurize the system to the specified pressure. If a leaking joint that has not been pressed is identified, relieve the pressure from the system, ensure the tube is fully inserted into the fitting and press the fitting. Resume test procedure, after the necessary repairs have been made.
 4. Cap and subject the piping system to a static water pressure of 50 psig above the operating pressure without exceeding the pressure rating of the piping system materials. Isolate the test source and allow to stand for 4 hours. Leaks and loss in test pressure constitute defects that must be repaired.
 5. Repair all leaks and defects with new materials and retest system or portion thereof until satisfactory results are obtained.
- C. Testing for polypropylene-random (PP-R) piping:
1. Test polypropylene piping systems in accordance with printed recommendations of piping system manufacturer.

- D. Prepare and submit reports for all tests and required corrective action and make reports available to the plumbing authority when so requested by the authority.

3.11 CLEANING AND DISINFECTING

- A. Clean and disinfect water distribution piping as follows:
 1. Purge all new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired prior to use.
 2. Use the purging and disinfecting procedure prescribed by the authority having jurisdiction or, in case a method is not prescribed by that authority, the procedure described in either AWWA C651, or AWWA C652, or as described below:
 3. Flush the piping system with clean, potable water until dirty water does not appear at the points of outlet.
 4. Fill the system or part thereof with a water/chlorine solution containing at least 50 parts per million of chlorine and isolate (valve off) the system or part thereof and allow to stand for 24 hours or fill the system or part thereof with a water/chlorine solution containing at least 200 parts per million of chlorine and isolate (valve off) and allow to stand for 3 hours.
 5. Following the allowed standing time, flush the system with clean, potable water until chlorine does not remain in the water coming from the system.
 6. Submit water samples in sterile bottles to the health authority having jurisdiction. Repeat the procedure if the biological examination made by the authority shows evidence of contamination. Consecutive bacteriological samples must be taken 24 hours apart before the water system is put into service.
- B. Prepare reports for all cleaning and disinfecting activities.

3.12 COMMISSIONING

- A. Fill the system. Check tanks to determine that they are not air bound and that the system is completely full of water.
- B. Before operating the system, perform these steps:
 1. Close drain valve, hydrants, and hose bibbs.
 2. Open valves to full open position.
 3. Remove and clean strainers.

4. Test operation of backflow preventers in accordance with applicable American Society of Sanitary Engineering (ASSE) standards and utility company standards for service line installations

END OF SECTION 15411

SECTION 15430

PLUMBING VALVES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes general duty valves common to most plumbing piping systems.
- B. Special duty valves are specified in individual plumbing piping system specifications.

1.3 SUBMITTALS

- A. Refer to Division 1 and Division 15 Section “BASIC MECHANICAL REQUIREMENTS” for administrative and procedural requirements for submittals.
- B. Submit product data, including manufacturer, model number, body material, valve design, pressure and temperature classification, end connection details, seating materials, trim material and arrangement, dimensions and required clearances, and installation instructions.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements: Where required, comply with the requirements of the latest edition of the following Standards:
 - 1. NSF/ANSI 61 – Drinking Water System Components – Health Effects.
 - 2. NSF/ANSI 61 Annex G – Weighted Average Lead Content Evaluation Procedure to a 0.25% Lead Requirement.
 - 3. NSF/ANSI 372 – Drinking Water System Components - Lead Content.
- B. American Society of Mechanical Engineers (ASME) Compliance: Comply with ASME B31.9 for building services piping.

- C. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) Compliance: Comply with the various MSS Standard Practices referenced.
- D. "Lead Free" Compliance: All plumbing valves used to convey or dispense water for human consumption shall meet the low lead requirements of NSF/ANSI 61 Annex G and NSF/ANSI 372 for <0.25% weighted average lead content in relation to the wetted surface area in accordance with the Federal "Reduction of Lead in Drinking Water Act" of 2011.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Preparation For Transport: Prepare valves for shipping as follows:
 - 1. Ensure valves are dry and internally protected against rust and corrosion.
 - 2. Protect valve ends against damage.
 - 3. Set valves in best position for handling. Set ball valves open to minimize exposure of functional surfaces; and block swing check valves in either closed or open position.
- B. Storage: Use the following precautions during storage:
 - 1. Do not remove valve end protectors unless necessary for inspection; then reinstall for storage.
 - 2. Protect valves from weather. Store valves indoors.

PART 2 PRODUCTS

2.1 VALVE FEATURES, GENERAL

- A. Pressure and Temperature Ratings: As specified and required to suit system pressures and temperatures.
- B. Sizes: Same size as upstream pipe, unless otherwise indicated.
- C. Operators: Provide the following special operator features:
 - 1. Hand wheels, fastened to valve stem, for valves other than quarter turn. Operating force not to exceed 80 pounds.
 - 2. Lever handles on quarter turn valves 6" and smaller.
- D. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation.
- E. End Connections: As indicated in the valve specifications.

1. Threads: Comply with ANSI B1.20.1.
2. Flanges: Comply with ANSI B16.24 for cast copper alloy.
3. Solder Joint: Comply with ANSI B16.18.

2.2 BALL VALVES

- A. Ball Valves, 2" and Smaller, Bronze Body: Rated for 150 psi SWP and 400 psi WOG non-shock; two piece construction; with bronze body, standard (or regular) port, 316 stainless steel ball and stem, replaceable ‘Teflon’ or "TFE" seats and seals, blowout-proof stem, vinyl covered steel handle, threaded or solder ends and extended stem for insulated piping.

Non-Potable Water Service		
	Threaded	Solder
Apollo	70-14x series	70-24x series
Stockham	T-285-BR-R-66	S-285-BR-R-66
Milwaukee Valve	BA-100S	BA-150S
Watts	LF-B-6080-G2	LF-B-6081-G2
Or Equal		

“Lead Free” Potable Water Service		
	Threaded	Solder
Apollo	70LF-14x series	70LF-24x series
Stockham	LFT-285-BR-R-66	LFS-285-BR-R-66
Milwaukee Valve	UPBA100S	UPBA150S
Watts	LF-B-6080-G2	LF-B-6081-G2
Or Equal		

- B. Low Point Drain Valves: Bronze body rated for 150 psi saturated steam pressure, 400 psi WOG pressure; two piece construction; with bronze body, standard (or regular) port, B-16 chrome plated ball and stem, replaceable ‘Teflon’ or ‘TFE’ seats and seals, blowout-proof stem, vinyl covered steel handle. System end shall be thread or solder, opposite end shall be 3/4" hose connection with brass cap. Provide 1/2" inlet for pipe line sizes ≤1", 3/4" inlet for line pipe sizes >1".

Non-Potable Water Service		
	Threaded	Solder
Apollo	70-10x-HC series	N/A
Milwaukee Valve	BA-100H	BA-150H
Watts	FBV-3C-CC	FBVS-3C-CC
Or Equal		

“Lead Free” Potable Water Service		
	Threaded	Solder
Apollo	70LF-100HC series	70LF-200HC series
Watts	LF-FBV-3C-CC	LF-FBVS-3C-CC
Or Equal		

2.3 CHECK VALVES

- A. Swing Check Valves, 2" and Smaller Bronze Body: MSS SP-80; rated for 125 psi SWP and 200 psi WOG non-shock, cast bronze body and cap conforming to ASTM B-62 or ASTM B-584; with horizontal swing, Y-pattern, brass or bronze disc; and having threaded or solder ends. Provide valves capable of being reground while the valve remains in the line. Provide Class 150 valves meeting the above specifications, with threaded end connections, where system pressure requires or where Class 125 valves are not available.

Non-Potable Water Service		
	Threaded	Solder
Crane	137	1342
Milwaukee Valve	509	1509
Watts	CVY	CVYS
Or Equal		
“Lead Free” Potable Water Service		
	Threaded	Solder
Crane	LF37	LF1340
Milwaukee Valve	UP509	UP1509
Watts	LFCV	LFCVS
Or Equal		

PART 3 EXECUTION**3.1 EXAMINATION**

- A. Examine valve interior through the end ports for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks used to prevent disc movement during shipping and handling.
- B. Actuate valve through an open close and close open cycle. Examine functionally significant features, such as guides and seats made accessible by such actuation. Following examination, return the valve closure member to the shipping position.
- C. Examine threads on both the valve and the mating pipe for form (i.e., out of round or local indentation) and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Check gasket material for proper size, material composition suitable for service, and freedom from defects and damage.
- E. Prior to valve installation, examine the piping for cleanliness, freedom from foreign materials, and proper alignment.
- F. Replace defective valves with new valves.

3.2 VALVE ENDS SELECTION

- A. Select valves with the following ends or types of pipe/tube connections:
 - 1. Copper Tube Size, 2" and Smaller: Solder or threaded ends.

3.3 VALVE APPLICATIONS

- A. Domestic Hot and Cold Water, ($\leq 2"$): Bronze bodied ball and check valves.
- B. Install "lead free" valves on all potable water systems used to convey or dispense water for human consumption.

3.4 VALVE INSTALLATIONS

- A. General Application: Use ball valves for shut off duty and for throttling duty. Refer to piping system specification sections for specific valve applications and arrangements.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves for each fixture and item of equipment arranged to allow fixture or

equipment isolation without system shutdown.

- D. Install valves in horizontal piping with stem at or above the center of the pipe.
- E. Install valves in a position to allow full handle movement.
- F. Provide valve stem extensions when valves are installed in insulated piping systems.
- G. Installation of Check Valves: Install for proper direction of flow as follows:
 - 1. Swing Check Valves: Horizontal position with hinge pin level.
- H. Install drain valves at the low points of all plumbing piping.

3.5 CONNECTIONS

- A. Refer to Division 15 specification, "BASIC PIPING MATERIALS AND METHODS".
- B. Solder Connections:
 - 1. Close ball valves to the full closed position.
 - 2. Remove the cap and disc holder of swing check valves having composition discs.

3.6 FIELD QUALITY CONTROL

- A. Tests: After piping systems have been tested and put into service, but before final adjusting and balancing, inspect valves for leaks. Adjust or replace packing to stop leaks; replace valves if leak persists.

3.7 ADJUSTING AND CLEANING

- A. Cleaning: Clean mill scale, grease, and protective coatings from exterior of valves and prepare valves to receive finish painting or insulation.

END OF SECTION 15430

SECTION 15830

HEATING TERMINAL UNITS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.2 SUMMARY

- A. Extent of terminal unit work is indicated by Drawings and schedules, and by requirements of this Section.
- B. Types of terminal units required for project include the following:
 - 1. Electric Resistance Unit Heaters.
- C. Refer to other Division-15 sections for piping; ductwork; and testing, adjusting and balancing of terminal units; not work of this Section.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications for terminal units showing dimensions, capacities, ratings, performance characteristics, gages and finishes of materials, and installation instructions.
- B. Electrical Requirements: Submit manufacturer's electrical requirements for power supply wiring to terminal units.
- C. Maintenance Data: Submit maintenance instructions, including lubrication instructions, motor and drive replacement, and spare parts lists. Include this data, product data, shop drawings in maintenance manuals; in accordance with requirements of Division 1.

1.4 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of terminal units, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Codes and Standards:

1. UL Compliance: Provide electrical components for terminal units which have been listed and labeled by UL.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Handle terminal units and components carefully to prevent damage, breaking, denting and scoring. Do not install damaged terminal units or components; replace with new.
- B. Store terminal units and components in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.
- C. Comply with Manufacturer's installation instructions for unloading terminal units and moving them to final location.

PART 2 PRODUCTS

2.1 UNIT HEATERS

- A. General: Provide unit heaters in locations as indicated, and of capacities, style, and having accessories as scheduled.
- B. Horizontal Unit Heaters:
 1. Casings: Construct of steel, phosphatized inside and out, and finished with baked enamel. Provide motor-mounted panel, minimum of 18 gauge steel. Fabricate casing to enclose coil, louvers, and fan blades.
 2. Fans: Construct of aluminum, and factory balance. Provide fan inlet orifice, smooth, and drawn into casing back panel.
- C. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and 60-Hz hum, embedded in magnesium oxide refractory and sealed in steel or corrosion-resistant metallic sheath with fins no closer than 0.16 inch (4 mm). Element ends shall be enclosed in terminal box. Fin surface temperature shall not exceed 550 deg F (288 deg C) at any point during normal operation.
 1. Circuit Protection: One-time fuses in terminal box for overcurrent protection and limit controls for high-temperature protection of heaters.
 2. Wiring Terminations: Stainless-steel or corrosion-resistant material.
- D. Motors: Provide totally enclosed motors, with built in overload protection,

having electrical characteristics as scheduled. Where scheduled provide explosion proof motors rated for Class I, Division 1, Group D environment.

- E. Manufacturer: Subject to compliance with requirements, provide unit heaters of one of the following:
 - 1. Modine Mfg. Co
 - 2. Qmark
 - 3. Reznor
 - 4. Or equal

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine areas and conditions under which terminal units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF UNIT HEATERS

- A. General: Install unit heaters as indicated, and in accordance with manufacturer's installation instructions.
- B. Uncrate units and inspect for damage. Verify that nameplate data corresponds with unit designation.
- C. Hang units from building substrate, not from piping. Mount as high as possible to maintain greatest headroom possible unless otherwise indicated.
- D. Support units with rod-type hangers anchored to building substrate with vibration isolators.
- E. Protect units with protective covers during balance of construction.

3.3 ADJUSTING AND CLEANING

- A. General: After construction is completed, including painting, clean unit exposed surfaces, vacuum clean terminal coils and inside of cabinets.
- B. Retouch any marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

END OF SECTION 15830

SECTION 15850

FANS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following types of fans:
 - 1. Power Wall or Roof Exhauster (PWE)

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections:
 - 1. Product data for selected models, including specialties, accessories, dimensions, weights, required clearances, components, location and size of field connections and the following:
 - a. Certified fan performance curves with system operating conditions indicated.
 - 2. Certified fan sound power ratings in all octave bands (including 63 Hz) for the following:
 - a. Fan inlet.
 - b. Fan discharge.
 - c. Radiated casing.
 - 3. Motor ratings and electrical characteristics plus motor and fan accessories.
 - 4. Materials gages and finishes, including color charts.
- B. Maintenance data for fans, for inclusion in Operating and Maintenance Manual.

1.4 QUALITY ASSURANCE

- A. UL Compliance: Fans shall be designed, manufactured, and tested in accordance with UL 705 "Power Ventilators".

- B. UL Compliance: Fans and components shall be UL listed and labeled.
- C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.
- D. Electrical Component Standard: Components and installation shall comply with NFPA 70, "National Electrical Code", and the requirements of Division 15, "ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT".
- E. Sound Power Level Ratings: Comply with AMCA Standard 301 "Method for Calculating Fan Sound Ratings From Laboratory Test Data". Test fans in accordance with AMCA Standard 300 "Test Code for Sound Rating". Fans shall be licensed to bear the AMCA Certified Sound Ratings Seal.
- F. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings in accordance with AMCA Standard 210/ASHRAE Standard 51 - Laboratory Methods of Testing Fans for Rating.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Lift and support units with the manufacturer's designated lifting or supporting points.
- B. Disassemble and reassemble units as required for movement into the final location following manufacturer's written instructions.

1.6 EXTRA MATERIALS

- A. Furnish one additional complete set of belts for each belt driven fan.

PART 2 PRODUCTS

2.1 GENERAL

- A. General: Provide fans that are factory fabricated and assembled, factory tested, and factory finished, with indicated capacities and characteristics.
- B. Fans and Shafts: Statically and dynamically balanced and designed for continuous operation at the maximum rated fan speed and motor horsepower.
- C. Fan Shaft: Turned, ground, and polished steel designed to operate at no more than 70% of the first critical speed at the top of the speed range of the fan's class.

- D. Belt Drives: Factory mounted, with final alignment and belt adjustment made after installation.
- E. Service Factor: 1.4.
- F. Belts: Oil-resistant, non-sparking, and non-static.
- G. Motors and Fan Wheel Pulleys: Adjustable pitch for use with motors through 15 HP. Select pulley so that pitch adjustment is at the middle of the adjustment range at fan design conditions.
- H. Belt Guards: Provide belt guards for motors mounted on the outside of the fan cabinet.

2.2 POWER ROOF OR WALL EXHAUSTERS (PWE)

- A. General Description: Belt or direct drive (as scheduled on the Drawings) fans for wall mounting with integral domed housing. Motor assembly shall be mounted on vibration isolators.
- B. Materials: Housing shall be seamless spun aluminum, fan shall be aluminum.
- C. Fan Wheel: Backward inclined (BI).
- D. Bearings: Pillow block type with minimum (L50) life of 200,000 hours.
- E. Finish: None required.
- F. Accessories:
 - 1. Disconnect Switch: NEMA 1 enclosure within motor compartment.
 - 2. Provide motorized or gravity backdraft damper as indicated on the Drawings.
- G. Manufacturers:
 - 1. Cook ACW.
 - 2. Greenheck Model CUE and CUBE series.
 - 3. Or equal

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting

performance of fans.

- B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install fans level and plumb, in accordance with manufacturer's written instructions. Support units as described below, using the vibration control devices indicated.
- B. Suspended Units: Suspend units from structural steel support frame using threaded steel rods and vibration isolation springs. Refer to Division 15 Section "HANGERS AND SUPPORTS" for support rod construction material requirements.
- C. Arrange installation of units to provide access space around fans for service and maintenance.

3.3 CONNECTIONS

- A. Duct installations and connections are specified in other Division 15 sections. Make final duct connections with flexible connections.
- B. Electrical Connections: The following requirements apply:
 - 1. Electrical power wiring is specified in Division 16.
 - 2. Temperature control wiring and interlock wiring are specified in Division 15 Section "FACILITY MANAGEMENT SYSTEM".
- C. Grounding: Connect unit components to ground in accordance with the National Electrical Code.

3.4 ADJUSTING, CLEANING, AND PROTECTING

- A. Clean unit cabinet interiors to remove foreign material and construction dirt and dust. Vacuum clean fan wheel and cabinet.

3.5 COMMISSIONING

- A. Final Checks Before Start-Up: Perform the following operations and checks before start-up:
 - 1. Remove shipping blocking and bracing.
 - 2. Verify unit is secure on mountings and supporting devices and that connections for piping, ductwork, and electrical are complete. Verify proper thermal overload protection is installed in motors, starters, and

disconnects.

3. Perform cleaning and adjusting specified in this Section.
 4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearings operations. Reconnect fan drive system, align belts, and install belt guards.
 5. Lubricate bearings, pulleys, belts, and other moving parts with factory recommend lubricants.
 6. Verify manual and automatic volume control in connected ductwork systems are in the full open position.
- B. Refer to Division 15 Section “TESTING, ADJUSTING, AND BALANCING” for procedures for air handling system testing, adjusting, and balancing.

END OF SECTION 15850

SECTION 15891

METAL DUCTWORK & ACCESSORIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.

1.2 SUMMARY

- A. This Section includes metal ductwork and accessories. The scope of metal ductwork and accessories requirements is indicated on Drawings and schedules, and by requirements of this Section.
- B. Drawings: The intent of the Specifications and Drawings is to have a “complete” system which operates as described and required. The Drawings should not be considered as complete with every detail, coordination and method of installation. Provide all work and coordination with all other building services as required for a complete project.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instructions for the following:
 - 1. Manual dampers.
 - 2. Relief dampers.
 - 3. Turning vanes.
 - 4. Duct hardware.
 - 5. Duct access doors.
 - 6. Flexible connections.
 - 7. Registers, grilles and diffusers.
 - 8. Louvers.
 - 9. Duct sealant.
- B. Sheet Metal Shop Standards: Submit ductwork Fabrication Shop Standards Manual indicating materials, gauges, reinforcing, and similar information for ductwork, fittings, accessories, etc., for the required sizes and static pressure classes to fully demonstrate compliance with SMACNA “HVAC Duct Construction Standards, Metal and Flexible, Third Edition (2005)”. The Manual shall be shop specific.

1.4 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of metal ductwork, products and accessories of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with metal ductwork systems similar to that required for the project.
- C. Codes and Standards:
 - 1. SMACNA Standards:
 - a. Comply with SMACNA "HVAC Duct Construction Standards, Metal and Flexible, Third Edition (2005)" for fabrication and installation of metal ductwork.
 - b. Comply with SMACNA "HVAC Air Duct Leakage Test Manual" for sealing requirements of metal ductwork.
 - c. Comply with SMACNA "Duct Cleanliness for New Construction Guidelines" (latest edition).
 - d. Comply with SMACNA "Guideline on Through-Penetration Fire-stopping (latest edition).
 - e. Comply with SMACNA "Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems" (latest edition).
 - 2. ASHRAE Standards: Comply with ASHRAE Handbook, "Systems and Equipment", Latest Edition, "Duct Construction", for fabrication and installation of metal ductwork and accessories.
 - 3. NFPA Standards:
 - a. Comply with NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems".
 - 4. ARI Compliance: Test and rate air outlets and inlets in accordance with ARI 650, "Standard for Air Outlets and Inlets".
 - 5. ASHRAE Compliance: Test and rate air outlets and inlets in accordance with ASHRAE 70, "Method of Testing the Performance of Air Outlets and Inlets".
 - 6. AMCA Compliance: Test and rate louvers in accordance with AMCA 500-L-12, "Laboratory Methods of Testing Louvers for Rating".

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protection: Protect shop-fabricated and factory-fabricated ductwork, air devices, accessories and purchased products from damage during shipping, storage and handling. Prevent end damage and prevent dirt and moisture from entering ductwork and accessories.
- B. Storage: Store ductwork and accessories inside and protect from weather. Where necessary to store outside, store above grade and enclose with waterproof and dustproof wrapping.
- C. All ductwork shall be fabricated, transported, stored, handled, installed, and protected in accordance with the recommendations and requirements set forth in the SMACNA Duct Cleanliness for New Construction Guidelines. The Mechanical and Sheet-metal Contractors shall be responsible to ensure that every effort is made to maintain cleanliness throughout the ductwork systems.

1.6 DESIGN CRITERIA

- A. Static Pressure Classifications: Except where otherwise indicated, construct duct systems to the following pressure classifications:
 - 1. Supply ducts and other ducts at discharge side of fans: 3" water gauge, positive pressure.
 - 2. Return ducts at inlet side of fans: 3" water gauge, negative pressure.
 - 3. Exhaust ducts at inlet side of fans: 3" water gauge, negative pressure.
- B. Seal Class – New Ducts: Seal all new sheet metal ducts to SMACNA Seal Class ‘A’.

PART 2 PRODUCTS

2.1 DUCTWORK MATERIALS

- A. Exposed Ductwork Materials: Where ductwork is indicated to be exposed to view in occupied spaces, provide materials that are free from visual imperfections including pitting, seam marks, roller marks, oils, stains and discolorations, and other imperfections, including those that would impair painting.
- B. Sheet Metal: Except as otherwise indicated, or specified fabricate ductwork from galvanized sheet steel complying with ASTM A 924 and A 653, lock-forming quality, with G 90 zinc coating in accordance with ASTM A 90.
 - 1. Ductwork to be installed in exposed locations shall be phosphatized per ASTM D2092 or otherwise prepared and treated as necessary to ensure proper paint adhesion.

- C. Stainless Steel Sheet: Where indicated, ductwork to be stainless steel complying with ASTM A 167; Type 304, with No. 4 finish where exposed to view in occupied spaces, No. 1 finish elsewhere. Protect finished surfaces with mill-applied adhesive protective paper, maintained through fabrication and installation.
- D. Aluminum Sheet: Where indicated, ductwork to be aluminum sheet complying with ASTM B 209, Alloy 3003, Temper H14.

2.2 MISCELLANEOUS DUCTWORK MATERIALS

- A. General: Provide miscellaneous materials and products of types and sizes indicated and, where not otherwise indicated, provide type and size required to comply with ductwork system requirements including proper connection of ductwork and equipment.
- B. Duct Sealant - General: ANSI/UL 181A or ANSI/UL 181B listed, low V.O.C, non-hardening, non-migrating water based mastic or liquid elastic sealant, type applicable for fabrication/installation detail, as compounded and recommended by manufacturer specifically for sealing joints and seams in ductwork.
 - 1. Hardcast: Flex Grip
 - 2. United McGill: United Duct Sealer
 - 3. Or equal
- C. Duct Sealant, Flange Type: Continuous butyl rubber extrusion specifically designed for use in flanged duct joints. Product shall be listed by ANSI/UL to have a flame spread rating of less than 25 and smoke developed rating of less than 50.
 - 1. Hardcast: Flange Grip #1902-FR
 - 2. Or equal
- D. Ductwork Support Materials: Provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork in dry non-corrosive areas.
 - 1. For aluminum provide corrosion resistant support materials compatible with the materials being supported.

2.3 RECTANGULAR DUCT FABRICATION

- A. General: Except as otherwise indicated, fabricate rectangular ducts with galvanized sheet steel, in accordance with SMACNA "HVAC Duct Construction Standards" Tables 2-1 through 2-49, including associated details. Fabricate rectangular ducts with aluminum sheet, in accordance with SMACNA "HVAC Duct Construction Standards", Tables 2-1 through 2-52, including associated details. Conform to the requirements in the referenced standard for metal thickness, reinforcing types and intervals, tie rod applications, and joint types and intervals.

- B. Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification.
- C. Provide materials that are free from visual imperfections such as pitting, seam marks, roller marks, oils, stains, and discoloration.
- D. Cross Breaking or Cross Beading: Cross break or bead duct sides that are 11" and larger and are 20 gauge or less, with more than 4 sq. ft. of unbraced panel area, as indicated in SMACNA "HVAC Duct Construction Standard," Figure 2-9, regardless of insulation.
- E. Fittings: Provide long radius type fittings, radius to centerline of duct is 1 ½ times duct width.
- F. Fabricate elbows, transitions, offsets, branch connections, and other duct construction in accordance with SMACNA "HVAC Metal Duct Construction Standard," Figures 4-1 through 4-9, with the following modifications:
 - 1. Figure 4-2
 - a. Type RE1 – Square throat is not permitted.
 - b. Types RE4, 6, 7, 8, 9, & 10 are not permitted.
 - 2. Figure 4-3
 - a. Use single thickness vanes with trailing ends, SP=1½”.
 - 3. Figure 4-7
 - a. Offset types 1 & 2 are not allowed.
 - b. Minimum bell mouth radius shall be 1½”.
 - 4. Figure 4-8
 - a. Figures A & C are not allowed.
- G. Fabricate duct fittings to match adjoining ducts, and to comply with duct requirements as applicable to fittings. Limit angular tapers to 30° for contracting tapers and 20° for expanding tapers.
- H. Fabricate ductwork with accessories installed during fabrication to the greatest extent possible.
- I. Duct joining system shall be Ductmate, Ward Industries, Carlisle, MEZ Industries or equal Transverse Duct Connection (TDC) for all ducts with longest side over 24". Above systems are optional for smaller duct systems. Above systems are to be used with galvanized sheet steel and aluminum sheet. Ducts fabricated of stainless steel shall have welded joints.

- J. Button punch snap lock (figure 2-2, type L-2) and internal standing seam joints (figure 2-7) are not allowed.
- K. Duct sizes indicated on the Drawings are the net free area. Where duct liner and/or double wall ductwork is installed, increase the duct size accordingly.

2.4 ROUND AND SPIRAL DUCT FABRICATION

- A. General: Except as otherwise indicated, fabricate round ducts with galvanized sheet steel, in accordance with SMACNA "HVAC Duct Construction Standards," Tables 3-1 through 3-14 and figures 3-1 through 3-6. Conform to the requirements in the referenced standard for metal thickness and joint types. Modify the above tables and figures as follows:
 - 1. Table 3-1
 - a. All elbows, regardless of duct velocity, shall be 1½ radius to duct diameter.
 - 2. Figure 3-2
 - a. Seam types RL-3, 6A, 6B and 7 are not allowed.
 - 3. Figure 3-4
 - a. Adjustable elbows are not allowed.
 - 4. Figure 3-5
 - a. Non lateral taps may be used only where spatial conditions do not allow lateral taps.
 - 5. Figure 3-6
 - a. Replace the transition length formula listed ($L_2=A-B$) with the following: Limit angular tapers to 30° for contracting tapers and 20° for expanding tapers.
- B. Provide materials that are free from visual imperfections such as pitting, seam marks, roller marks, oils, stains, and discoloration.
- C. Fabricate ductwork with accessories installed during fabrication to the greatest extent possible.
- D. Diverging-Flow Fittings: Fabricate with a reduced entrance to branch taps with no excess material projecting from the body onto branch tap entrance.
- E. Fitting Gauges: One gauge heavier than the duct size requirement, 22 gauge minimum.
- F. Manufacturers: Subject to compliance with requirements, provide spiral

ductwork of one of the following:

1. Semco Mfg., Inc.
2. United Sheet Metal Div., United McGill Corp.
3. Spirosafe, division of Lindlab
4. Spiro Metal, Inc.
5. Or equal

2.5 DAMPERS

- A. Manual Dampers: Provide dampers of single blade type or multi blade type, constructed in accordance with SMACNA “HVAC Duct Construction Standards”, Figures 7-4 and 7-5, amended as follows:
 1. Figure 7-4
 - a. Figure A is not allowed, use only figure B regardless of duct size.
- B. Provide end bearings for all systems requiring Seal Class A regardless of pressure class.
- C. Backdraft Dampers:
 1. Unless otherwise noted on Drawings, provide aluminum construction counterbalanced backdraft dampers with 0.09” thick extruded aluminum frame, 0.025” thick formed aluminum blades extruded vinyl edge seals, synthetic bearings, linkage concealed in frame and mill finish. Dampers shall be Ruskin CBD2 series or equal.
 2. Where noted on Drawings, provide 304 stainless steel construction backdraft dampers with 16 gauge stainless steel channel frame, 26 gauge formed stainless steel blades, full length stainless steel axles, nylon bearings, stainless steel linkage and mill finish. Dampers shall be Ruskin S2SS series or equal.
 3. Manufacturers: Subject to compliance with requirements, provide backdraft dampers of one of the following:
 - a. Air Balance, Inc.
 - b. American Warming & Ventilating, Inc.
 - c. Arrow Louver and Damper; Div. of Arrow United Industries, Inc.
 - d. Greenheck Fan Corp.
 - e. Louvers & Dampers, Inc.
 - f. Ruskin Mfg. Co.
 - g. Or equal

2.6 DUCT HARDWARE

- A. General: Provide duct hardware, manufactured by one manufacturer for all items on project, for the following:
- B. Quadrant Locks: Provide for each manually controlled damper, quadrant lock device on one end of shaft; and end bearing plate on other end. Provide extended quadrant locks and extended end bearing plates for externally insulated ductwork.
- C. Manufacturers: Subject to compliance with requirements, provide duct hardware of one of the following:
 - 1. Duro Dyne National Corp.
 - 2. Ventfabrics, Inc.
 - 3. Young Regulator Co.
 - 4. Or equal

2.7 DUCT ACCESS DOORS

- A. General: Provide where indicated, duct access doors per the following schedule (adjust as required to suit specific equipment needs):

Access Door Schedule	
duct size (exposed width)	door size
<10"	2" less than duct size
10" - 18"	8" x 8"
19" - 30"	12" x 12"
>30"	18" x 18"

- B. Construction: Construct per the requirements of SMACNA HVAC Duct Construction Standards, Figures 7-2 & 7-3. Provide insulated doors for insulated ductwork. Provide flush frames for uninsulated ductwork, extended frames for externally insulated duct. Provide one side hinged, other side with latching devices per the SMACNA schedule.
- C. Manufacturers: Subject to compliance with requirements, provide duct access doors of one of the following:
 - 1. Air Balance Inc.
 - 2. Buckley Associates
 - 3. Duro Dyne Corp.
 - 4. Register & Grille Mfg. Co., Inc.
 - 5. Ruskin Mfg. Co.
 - 6. Ventfabrics, Inc.
 - 7. Or equal

2.8 FLEXIBLE CONNECTIONS

- A. General: Provide flexible duct connections wherever ductwork connects to vibration isolated equipment. Construct flexible connections of Durolon base, Hypalon coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make airtight joint. The fabric shall remain serviceable from -40°F to 250°F, and shall be resistant to mildew and ultraviolet rays. Minimum fabric weight is 24 ounces per square yard. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibration of connected equipment. The connector width shall be 3" of 24 gauge (min) sheet metal, 3" of fabric, and 3" of 24 gauge (min) sheet metal.
- B. Manufacturers: Subject to compliance with requirements, provide flexible connections of one of the following:
 - 1. Duro Dyne National Corp.
 - 2. Ventfabrics, Inc.
 - 3. Young Regulator Co.
 - 4. Or equal

2.9 REGISTERS, GRILLES, AND DIFFUSERS

- A. General: Except as otherwise indicated, provide manufacturer's standard diffusers, registers and grilles where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.
- B. Performance: Provide diffusers, registers and grilles that have, as minimum, throw, pressure drop, and noise criteria ratings for each size device as listed in manufacturer's current data. The products specified on the Drawings are the basis of the design for this project, products of alternate manufacturers must meet the basis of design. All performance data must be per requirements of ARI 650 and ASHRAE Standard 70.
- C. Compatibility: Provide diffusers, registers and grilles with border styles that are compatible with adjacent wall and ceiling systems, and that are specifically manufactured to fit into wall and ceiling construction with accurate fit and adequate support. Refer to general construction drawings and specifications for types of wall and ceiling construction that will contain each type of register, grille, and diffuser. It is the Contractor's responsibility to fully coordinate installation requirements for various surfaces.
- D. Types: Provide diffusers, registers and grilles of type, capacity, and with accessories and finishes as listed on the Drawing schedule and as described here.
- E. Fabric Ductwork and Diffuser: Round profile, washable woven fire-retardant high

density polyethylene and non-permeable fabric, 5.9 oz. square yard per ASTM D3776, rated for temperatures from -40 deg F to 175 deg F, meeting the requirements of ULC-S102.2 for fire retardancy, suspension cable and hardware shall be of stainless steel or aluminum for corrosion resistance. Diameter, length, air distribution orifice placements, air flow rating and terminal velocities as scheduled. White color.

1. FabricAire
 2. DuctSox ChemSox
 3. Or equal
- F. Cube Core Ceiling Return/Exhaust: Square face, all aluminum construction with ½" x ½" x ½" grid design, 80% minimum free area. Provide with opposed blade damper (where scheduled) with operator accessible through face. Where round connection to ductwork are indicated, provide with field or factory applied round neck transition. Provide off white finish unless otherwise scheduled.
1. Metalaire Series CC5D
 2. Titus Series Model 50
 3. Anemostat Series GC
 4. Price Series 80FF
 5. Nailor Model 51C
 6. Tuttle & Bailey Series CRE 500
 7. Or equal
- G. Double Deflection Sidewall Return/Exhaust: Extruded aluminum with front blades vertical. Blades at 0° angle, spaced at approximately 0.666" o/c. Provide with opposed blade damper (where scheduled) with operator accessible through face. Where round connections to ductwork are indicated, provide with field or factory applied round neck transition. Finish shall be off white unless otherwise scheduled.
1. Metalaire Series V4004
 2. Titus Series 300
 3. Anemostat Series X
 4. Price Series 620
 5. Nailor Model 51
 6. Tuttle & Bailey Series A60
 7. Or equal

2.10 LOUVERS

- A. General: Except as otherwise indicated, provide manufacturer's standard louvers where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.

- B. Performance: Provide louvers that have minimum free area, and maximum pressure drop of each type as listed in manufacturer's current data, complying with louver schedule.
- C. Substrate Compatibility: Provide louvers with frame and sill styles that are compatible with adjacent substrate, and that are specifically manufactured to fit into construction openings with accurate fit and adequate support, for weatherproof installation. Refer to general construction drawings and specifications for types of substrate which will contain each type of louver.
- D. Materials: Construct of aluminum extrusions, ASTM B 221, Alloy 6063-T52. Weld units or use stainless steel fasteners. Louver finish shall be as scheduled on the Drawings.
- E. Louver Screens: On inside face of exterior louvers, provide 1/2" square mesh anodized aluminum wire bird screens mounted in removable extruded aluminum frames.
- F. Manufacturers: Subject to compliance with requirements, provide louvers of one of the following:
 - 1. American Warming & Ventilating Inc.
 - 2. Arrow United Industries, Inc.
 - 3. Construction Specialties, Inc.
 - 4. Louvers & Dampers, Inc.
 - 5. Greenheck Fan Corp.
 - 6. Ruskin Mfg. Co.
 - 7. Or equal

PART 3 EXECUTION

3.1 GENERAL

- A. Inspection: Examine areas and conditions under which metal ductwork, air inlets and outlets and accessories are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.
- B. Coordination: It is the responsibility of the sheet metal contractor to coordinate the work of his trade with all other trades prior to the commencement of construction. Any conflicts must be brought to the attention of the Architect/Engineer. Any work requiring removal and reinstallation due to the lack of coordination shall be the responsibility of the Contractors with no additional cost to the Owner.
- C. Offsets: The HVAC duct drawings are schematic in nature and do not indicate all

fittings. It is the responsibility of the Contractor to provide all necessary offsets, fittings, and transformations to provide a complete project at no additional cost to the Owner.

- D. Ductwork which is dented, deformed, skewed, elongated or out-of-round, buckled, deflected, heavily marred, corroded or otherwise damaged, will be considered unacceptable. Such ductwork will be removed from the project site and replaced at no additional cost or delay to the project.
- E. Ductwork which has been exposed to weather or water and exhibits “white rust”, rust, corrosion, oxidization, or other damage or deterioration shall be considered unacceptable, and shall be removed and replaced at no additional cost to the Owner.

3.2 INSTALLATION OF METAL DUCTWORK

- A. General: Assemble and install ductwork in accordance with recognized industry practices which will achieve air-tight and noiseless (no objectionable noise) systems, capable of performing each indicated service. Install each run with minimum number of joints. Align ductwork accurately at connections, within 1/8" misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers and anchors of type which will hold ducts true-to-shape and to prevent buckling. Ductwork shall be supported independently of others system components and other systems. Support vertical ducts at every floor.
- B. Routing: Locate ductwork runs, except as otherwise indicated, vertically and horizontally and avoid diagonal runs wherever possible. Locate runs as indicated by drawings, details and notations or, if not otherwise indicated, run ductwork in shortest route which does not obstruct useable space or block access for servicing building and its equipment. Hold ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building. Limit clearance to 1/2" where furring is shown for enclosure or concealment of ducts, but allow for insulation thickness, if any. Where possible, locate insulated ductwork for 1" clearance outside of insulation. Wherever possible in finished and occupied spaces, conceal ductwork from view, by locating in mechanical shafts or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown. Coordinate layout with suspended ceiling and lighting layouts and similar finished work.
- C. Branch takeoffs shall be flange-mounted 45-degree lateral wye, conical tee, or bell-mouth, “mini” bell-mouth, or square-to-round dovetail type. Other takeoff types shall not be used except by written permission from the Architect/Engineer.
 - 1. Spin-in take-offs are not acceptable.

2. “Cut-and-tabbed over” connections are not acceptable.
 3. “Straight-taps” are not acceptable.
 4. All branch take-offs shall be sealed with appropriate gasket and/or sealant for an air-tight connection.
- D. As a minimum, seal all transverse and longitudinal joints, seams and ductwall penetrations (except continuously welded joints, and gasketed jointing system) in all ductwork in accordance with the Seal Class indicated in Part 1 and as defined in the SMACNA HVAC Duct Construction Standards.
- E. Clearance to Combustible Materials: Maintain a minimum ½” clearance from metal air ducts used for heating to assemblies constructed of combustible materials in accordance with NFPA 90A.
- F. Electrical Equipment Spaces: Do not route ductwork through transformer vaults and electrical equipment spaces and enclosures. Do not locate ductwork above electrical equipment within clear spaces as required by the electrical code.
- G. Penetrations: Where ducts pass through non-fire rated interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gauge as duct. Overlap opening on 4 sides by at least 1½". Fasten to duct or substrate.
- H. Coordination: Coordinate duct installations with installation of accessories, dampers, coil frames, equipment, controls and other associated work of ductwork system.
- I. Installation: Install metal ductwork in accordance with SMACNA HVAC Duct Construction Standards. Provide all auxiliary steel for attachment of duct supports to the building structure.
- J. Volume Dampers: Prior to the installation of the sheet metal ducts, the sheet metal contractor shall coordinate with the balancing contractor to ensure volume dampers are located in locations where the balancing contractor can effectively perform his trade.
- K. Temporary Closure: At ends of ducts which are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering which will prevent entrance of dust and debris until time connections are to be completed.
- L. Test Holes: Drill test holes in ducts as required for testing and balancing and adjacent to control system sensors and probes in order to facilitate testing and calibration of the sensors and probes. Plug with red plastic plugs to permit easy

locating.

3.3 EQUIPMENT CONNECTIONS

- A. General: Connect metal ductwork to equipment as indicated. Provide flexible connection for each ductwork connection to equipment mounted on vibration isolators and/or equipment containing rotating machinery. Provide access doors as indicated.

3.4 INSTALLATION OF DUCTWORK ACCESSORIES

- A. Install ductwork accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and in accordance with recognized industry practices to ensure that products serve intended function.
- B. Install turning vanes in square or rectangular 90° elbows in supply and exhaust air systems, and elsewhere as indicated.
- C. Install access doors with latches operable from either side, except outside only where duct is too small for person to enter. Install access doors at all fire dampers, smoke dampers, motor operated dampers, humidifiers, duct mounted coils, smoke detectors and similar devices requiring access. Install access doors every 20' on return and exhaust air systems. Label access doors in accordance with Division 15 Section "MECHANICAL IDENTIFICATION."
- D. Provide access doors at all plenums and connections to louvers and exterior vents. Suitably size access doors to facilitate thorough inspection and cleaning of the plenums and/or louvers and vents.
- E. Access doors should be located as close as practicable to the devices being accessed. Access doors shall be located at the underside of the duct rather than the side of the duct if the device being accessed can be more easily and readily accessed in this manner.
- F. Generally duct access doors are not shown on the Drawings, but they shall be provided in accordance with the above requirements, and as necessary to properly service, clean, maintain and operate systems and equipment.
- G. Install all components provided by other trades for installation in metal ducts (temperature sensors, pressure sensors, smoke detectors, etc.) in accordance with the component manufacturer's requirements.
- H. Where drain fittings are indicated or provided at the bottom of intake, exhaust and/or relief air plenums, install ¾" drain fittings and trapped drain piping, routed

to the nearest floor drain. Pitch the bottom of the plenums for proper drainage. Reinforce the plenums as required for a rigid installation.

3.5 INSTALLATION OF AIR INLETS AND OUTLETS

- A. General: Install air outlets and inlets in accordance with manufacturer's written instructions and in accordance with recognized industry practices to insure that products serve intended function.
- B. Coordinate with other work, as necessary to interface installation of air outlets and inlets with other work.
- C. Locate diffusers, registers, and grilles, as indicated. Unless otherwise indicated, locate units in center of acoustical ceiling module.
- D. Where required by Drawing details, provide sheet metal elbows when connecting ceiling diffusers with flexible ducts.

3.6 FIELD QUALITY CONTROL

- A. Operate installed ductwork and accessories to demonstrate compliance with requirements. Check for air leakage while system is operating. Repair or replace faulty accessories, as required to obtain proper operation and quiet performance.

3.7 ADJUSTING AND CLEANING

- A. Clean ductwork internally, section by section as it is installed, of dust and debris. Clean external surfaces of foreign substances which might cause corrosive deterioration of metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration.
- B. Verify all temporary closures have been removed.
- C. Adjust ductwork and accessories for proper settings.
- D. Final positioning of manual dampers is specified in Division-15 Section "TESTING, ADJUSTING, AND BALANCING".
- E. Balancing: Provide sufficient on site manpower to assist the balancing contractor during balancing of air systems. Provide the necessary temporary caps and install dampers as required.

END OF SECTION 15891

**SECTION 16010
BASIC ELECTRICAL REQUIREMENTS**

1. GENERAL

1.1 Summary

- A. This section covers the basic contract and procedural requirements which are applicable to all electrical work and the testing of completed systems. The provisions of this section apply to each and every section in this division.
- B. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this and the other sections of Division 26.
- C. Process, plumbing, and mechanical equipment are specified under other divisions. The wiring and connections to this equipment which shall comply with the requirements of the applicable Division 26 sections. Certain electrical equipment is specified in other Sections and is required to be furnished by equipment manufacturers. Where specific electrical requirements are not described in other sections, the requirements of Division 26 shall apply.
- D. Division 26 covers, in broad detail, the extent of the electrical work and the equipment to be provided and shall not be construed as a complete description of all the details of design and construction required.
- E. The Contractor shall be responsible for reviewing all Contract Drawings and Specifications relating to the project to ensure that all electrical work associated with other trades will be coordinated. No extra compensation will be allowed for his lack of compliance herewith.
- F. Provide all materials, equipment, and tools and provide all labor necessary for the complete execution of the electrical work as shown on the Drawings and required by the Specifications. In addition, the Contractor shall provide all work not specifically shown or specified yet required to insure proper and complete operation of all systems to satisfy the design intent of the Project, and to comply with all applicable codes and regulations.
- G. The Drawings are generally diagrammatic, intended to convey the scope of the work and indicate the general arrangement, approximate sizes, and locations of equipment. Do not scale Drawings. Consult Architectural and Structural Drawings for space conditions.

1.2 Codes and Standards

- A. All materials, equipment, and installation shall be in accordance with the requirements of the currently adopted Federal, State, and Local codes and standards.
 - 1. All manufactured products and assemblies shall conform to nationally recognized standards referenced in other sections of the Division 26 specifications that are applicable to the product being supplied.

1.3 Quality Assurance

- A. All electrical work shall be performed by licensed electricians who are qualified to do such work, and who are normally engaged in this type of work. Registered apprentices shall perform electrical work only under the direct supervision of a licensed electrician. Because of the complexity of the electrical work, unskilled labor is not permitted.
- B. Installation of electrical work shall conform to the latest requirements of the National Electrical Code, National Electrical Safety Code, OSHA, NFPA 70E, and all adopted State and Local Electrical Codes. All materials, equipment, sizes, capacities shall conform to the latest NEMA, ANSI, UL, IEEE, and EIA/TIA standards.
- C. Not all requirements of the applicable codes have been shown or included in the drawings and specifications. The licensed electricians installing the work are expected to understand all applicable codes that are relevant to the work being installed. Questions and interpretations on the drawings and specifications shall be directed to the Engineer.
- D. All electrical work shall be completed in a professional manner with a high degree of workmanship.
 - 1. Installation methods and materials shall be consistent throughout the project and shall only use products that have been approved or specified. The installation of equipment or materials that have not been approved shall be at the Contractor's risk.
 - 2. Work that is sloppy, inconsistent, or incomplete will be rejected.

1.4 Permits and Inspections

- A. Secure and pay for all permits and inspections required by the jurisdiction governing the project location.
- B. The Contractor shall work closely with the local electrical inspector throughout the project and shall accommodate all requests for interim and final inspections. Failure to communicate with the inspector at the early stages of the project shall be at the Contractor's risk

1.5 Guarantee

- A. Contractor shall guarantee all equipment and workmanship to be free from mechanical and electrical defects for a period of one year from the date of final acceptance unless stated otherwise in the specifications. Any replacement of parts or adjustments, including labor made necessary by such defects or adjustments, shall be rectified without cost to the Owner, to the satisfaction of the Engineer.

1.6 Submittals for Approval

- A. Prepare submittals in accordance with requirements of Division 1 requirements.
- B. Provide all submittals for each product type being supplied as identified in the relative section of the specifications.
- C. Submittals shall be provided in electronic, searchable, PDF format unless otherwise permitted.
- D. All submittals shall bear a stamp which indicates the Contractor has reviewed the submittals for compliance with the specifications. Stamp shall include contractor name, project title and date.
- E. Where submitted product information consists of manufacturer's standard catalog data sheets or brochures, the specific product and related features and options being supplied shall be clearly marked with arrows, boxes, circles, or notes that are reproducible with non-color printing. Highlighted text does not reproduce well, and the contractor is cautioned against using it. The inclusion of a separate bill of material list, does not relieve the Contractor from identifying the proposed products on each catalog data sheet. Failure to clearly identify the specific product being supplied will be cause for rejection.
- F. Where the submittal consists of products that are specifically fabricated or assembled for the Project, the submittal shall include the suppliers name, the name of the project, a unique document number, and the first issue date with place for subsequent revisions.
- G. Submit list of nameplate designations for acceptance prior to engraving.
- H. Submit copies of all electrical permits prior to commencing the work.

1.7 Submittals for Record and Project Closeout

- A. Record drawings and project closeout documents shall comply with all “Submittal for Approval” requirements, and the requirements of Division 1.
- B. Provide installation instructions and operation and maintenance manuals for all equipment as required by the specifications. Manuals shall include the following as it applies to the equipment:
 - 1. Functional description of the equipment and all installed options including all modes of operation, operator adjustable settings, safety devices, alarm, and shut down features.
 - 2. Description of the normal operating characteristics of the equipment, including performance expectations, minimum and maximum limits, and electrical specifications.
 - 3. Operating instructions that include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
 - 4. Operating instructions that clearly describe all user interface including navigation through HMI screens, operation of switches, purpose of indicators, etc.
 - 5. Programming instructions that clearly describe available user configuration changes including equipment operation, and modifications to set points, alarm values, messages, etc. shall be included.
 - 6. Default settings and “As Left” settings of all programmable functions.
 - 7. Information necessary for maintenance including complete nomenclature and commercial numbers of replacement parts, labeled assembly and layout diagrams, procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions
 - 8. Servicing instructions and lubrication charts and schedules shall be included.
 - 9. All instructions, charts, and diagrams shall be properly indexed, identified, and titled to form a complete manual that is specific to the type of equipment being supplied. Provide separate manuals for unrelated equipment.
- C. Provide as-built drawings in accordance with Division 1 requirements. Drawings shall include the following information:
 - 1. The routing of concealed feeder and other major conduit runs below grade, below slab, and above ceilings. Show all locations of major junction boxes, pull boxes, and vaults. Include dimensions from prominent building features.
 - 2. Important circuit information such as circuit breaker assignments.
 - 3. “As Left” settings of programmed and adjustable equipment including transformer taps, circuit breakers, variable frequency drives, automatic transfer switches, lighting controllers, timers and timing relays.

4. All field changes where deviations from the drawings have been made, such that if not corrected would result in erroneous information.
 - D. Provide copies of all test reports for review and approval immediately after the test is completed. Proceeding with work prior to receiving the Engineer's acceptance of the test results shall be at the Contractor's risk.
 - E. Provide copies of electrical and fire inspection certificates.
 - F. Submit all manufacturer field start up reports. The report shall include the representatives name and contact information, the date of the visit, observations, corrections and final adjustments made, and his/her signature indicating acceptance of the installation.
 - G. Submit all manufacturer warranty information including terms and conditions, and service center contact information.
 - H. Submit all offers for manufacturer's extended warranties or service plans for Owner to review prior to their expiration.
 - I. During the progress of the work, the Contractor shall furnish and keep on file at all times a complete and separate set of black or blue line print record documents. Each shall be clearly, neatly and accurately noted, promptly, as the work progresses, all electrical changes, revisions, additions, deletions and deviations from the work. Wherever the work was installed, other than as shown on the Contract Drawings, the changes shall be so noted.

1.8 Manufacturers and Equals

- A. The manufacturer's products scheduled on the drawings have been carefully reviewed and specified to satisfy the intent of the design. If there is a discrepancy between the scheduled product and the specification, the requirements listed in the specification have priority and must be complied with.
- B. Division 26 specification sections may list acceptable alternate manufacturers, subject to compliance with the requirements of the drawings and specifications. Products by these listed alternate manufactures are not considered to be substitutions but must be of similar physical size, capacity, construction, quality, features, and performance characteristics as that of the scheduled manufacturers. It is the contractor's responsibility to coordinate any connection or other changes if the contractor elects to install one of the alternate manufacturers.

- C. Products by a manufacturer other than scheduled or specified as an alternative, will be considered substitutions. As a minimum, any proposed substitution must be of similar physical size, capacity, construction, quality, features, and performance characteristics as that of the scheduled manufacturers. Additionally, the requirements of "SUBSTITUTIONS" in the General Conditions must be satisfied. The contractor is responsible for the rearrangement of any work of his trade or any other trade to accommodate the proposed substitution. In general, substitutions will only be accepted if there is a demonstrated benefit to the owner such as cost savings, energy savings, reduced maintenance, etc. The contractor must clearly identify these benefits when submitting for a substitution in accordance with Division 1.

1.9 Ordering of Equipment

- A. Contractor is cautioned that the power requirements and sizes of various equipment and machinery provided by other Divisions are subject to change and will be based on the approved product. The actual equipment and machinery that is supplied could result in the need to provide different sized wires, cables, conduits, boxes, starter, overload protection, fuses, and other electrical equipment, controls and materials. As such, the ordering of equipment and the installation of work is not recommended until all shop drawings and other submissions have been made and have been reviewed by the Engineer. Any such work ordered or installed by the Contractor shall be his responsibility and any modifications necessary shall be made to provide electrical systems in complete compliance with the Contract Documents.

1.10 Site Visitation

- A. The Contractor shall visit the site and shall examine all existing conditions which may affect his work under this Contract. No claims for extra compensation will be allowed because of his failure to do so.

1.11 Temporary Power

- A. The Contractor shall furnish and install all labor, materials and equipment necessary to provide a complete temporary power system as may be needed to install the work. Refer to Section 260100 for requirements.

2. PRODUCTS

2.1 General

- A. All materials and equipment shall be new and of the best quality and shall conform to standards and carry labels in every case where standards have been established.

- B. To the maximum extent possible, all electrical equipment for any one system shall be the product of a single manufacturer. Engineer reserves the right to disapprove and reject equipment from various manufacturers when acceptable components can be secured from fewer manufacturers and to require that source of materials be unified to the maximum extent possible.
- C. Following submittal approval, the Contractor shall not make equipment substitutions during the project for any reason without the approval of the Engineer. Any work requiring removal and re-installation due to the Contractor's failure to comply with this requirement shall be the responsibility of the Contractor with no additional cost to the Owner.

3. EXECUTION

3.1 Safety

- A. The Contractor shall be responsible for complying with all Code and Project required safety measures.
- B. The Contractor shall be responsible for maintaining a clean and safe work environment. All work areas shall be cleaned daily, and materials, tools, and equipment shall be stored in designated areas.

3.2 Code Compliance

- A. The Contractor shall install all systems of Division 26 sections in conformance with all applicable State and local codes in addition to all the specific codes and standards listed in the various Division 26 sections.

3.3 Performance

- A. Perform all work which is required and essential in completing the intended installation in the proper manner.
- B. The Drawings indicate the general arrangement of circuits and outlets, locations of switches, panelboards, conduits and other work. Field verification of all dimensions is required. Specifications and Drawings are for assistance and guidance, but exact locations, distances and levels shall be governed by actual field conditions. Conduit runs and grounding are shown diagrammatic only, and the layout does not necessarily show the total number of conduits for the circuit required, nor is the location of indicated runs intended to show the actual routing of conduits.

- C. If any departures from the Construction Documents are deemed necessary by Contractor to furnish an efficient, complete and satisfactory installation, details of such departures and the reasons therefore shall be brought to the attention of Engineer. Do not make departures without prior approval of Engineer. Departures from the Construction Documents without the approval of the Engineer will be at the Contractors risk. Any corrections to the installation because of these departures will be by the Contractor with no cost to the Owner or Design Professionals.

3.4 Preparation

- A. The Contractor is cautioned that the power requirements and sizes of various equipment and machinery are subject to change and will be based on the product or substitution that is provided. The actual equipment and machinery installed could result in the need to provide different sized wires, cables, conduits, boxes, starter, overload protection, fuses, and other electrical equipment, controls and materials. As such, the ordering and installation of work is not recommended until all shop drawings and other submissions have been made and have been reviewed by the Engineer. Any such work ordered or installed by the Contractor shall be his responsibility and any modifications necessary shall be made to provide electrical systems in complete compliance with the Contract Documents.

3.5 Coordination

- A. Layout all work at the site by consultation with other trades before installing work to eliminate any conflict between this work and work of other trades.
- B. The Drawings are schematic in nature, not all conduit, fittings, boxes, and routing are shown. It is the responsibility of the Contractor to provide, in his original bid, all necessary equipment to provide a complete project. Any conflicts must be brought to the attention of the Engineer. Any work requiring removal and re-installation due to the lack of coordination shall be the responsibility of the Contractor with no additional cost to the Owner.

3.6 Existing Conditions

- A. Existing conditions indicated on the plans are based on the best information available and may not be 100% accurate or complete. The Contractor shall be responsible for protecting existing systems to remain.

3.7 Guarantee

- A. Contractor shall guarantee all equipment and workmanship free from mechanical and electrical defects for the time period described in Division 1 of the specifications. Any replacement of parts or adjustments, including labor made necessary by such defects or adjustments, shall be rectified without cost to the Owner, and to the satisfaction of the Engineer.
- B. In the absence of specific guarantee requirements in Division 1, the period shall be one year from the date of final acceptance.
- C. The duration of manufacturer warranties of equipment shall be not less than that required by the specification section associated with the equipment. The warranty period shall begin at the time of final acceptance.
- D. Replace any material and equipment prior to final acceptance, which is corroded or otherwise damaged through the failure to properly operate, protect, and maintain the installation during construction or testing.
- E. Keep the work in repair and replace any defective materials, equipment or workmanship upon notice from the Architect/Engineer or Owner's representative for a period of one year from date of acceptance.
- F. Materials or equipment requiring excessive service during the first year of operation shall be considered defective.
- G. Post on the equipment and give to the Owner, a list of phone numbers to call for servicing during emergency and guarantee periods.

3.8 Instruction Services

- A. Provide a competent instructor to instruct the Owner and his representatives in the proper operation and maintenance of the electrical systems.
- B. Include in the Contract Price, the cost of the instructor's on-site time, which may be broken down into several days during the period commencing near the date of final installations and extending through the guarantee period.
- C. The instructor's time is totally independent of any time necessarily required of Contractor to return to the project during the guarantee period for repairs, corrective work or for any other reasons.

END OF SECTION

SECTION 16050**BASIC ELECTRICAL MATERIALS AND METHODS****1. GENERAL****1.1 Description**

- A. This Section includes general construction materials and methods for application with electrical installations as follows:
 - 1. Wall and floor sleeves.
 - 2. Miscellaneous metals for support of electrical materials and equipment.
 - 3. Wood materials and structures for support of electrical equipment.
 - 4. Joint sealers for sealing around electrical materials and equipment.

- B. This Section covers the general execution requirements which are applicable to all electrical work.
 - 1. Examination
 - 2. Rough-ins
 - 3. Installation of Equipment
 - 4. Temporary Power
 - 5. Selective Demolition
 - 6. Cutting and Patching
 - 7. Painting
 - 8. Installation of Sleeves
 - 9. Erection of Metal Supports and Anchorage
 - 10. Erection of Wood Supports and Anchorage
 - 11. Application of Firestopping and Joint Sealers
 - 12. Installation of Access Doors
 - 13. Coordination of Access Doors Provided by Other Sections
 - 14. Field Quality Control and Testing
 - 15. Adjust and Clean

- C. Architectural items, structural items, process items, mechanical items and other related work are specified in other Sections which are not a part of Division 26. The electrical connections to these items or devices are specified in the appropriate Sections of Division 26. Certain electrical equipment is specified in other Divisions and is required to be furnished by equipment manufacturers.

- D. Division 26 covers, in broad detail, the extent of the electrical work and the equipment to be provided and shall not be construed as a complete description of all the details of design and construction required.
- E. Provide all labor, materials, equipment, articles, and tools and perform all work necessary for the complete execution of the electrical work, as shown on the Drawings, required by the Specifications and work not specifically shown or specified, yet required to insure the design intent inherent in the work and to comply with all applicable codes and regulations.
- F. The Drawings are generally diagrammatic, intended to convey the scope of the work and indicate the general arrangement of equipment, major raceway systems, and approximate sizes and locations of equipment. Do not scale Drawings. Consult Architectural and Structural Drawings for space conditions.

1.2 SUBMITTALS

- A. Refer to Division 1 and Division 26 Section “BASIC ELECTRICAL REQUIREMENTS” for administrative and procedural requirements for submittals.
 - 1. Submit product data on the following products:
 - a. Joint sealers.

1.3 QUALITY ASSURANCE

- A. All electrical work shall be performed by licensed electricians who are qualified to do such work, and who are normally engaged in this type of work. Registered apprentices shall perform electrical work only under the direct supervision of a licensed electrician. Because of the complexity of the electrical work, unskilled labor is not permitted.
- B. Installation of electrical work shall conform to the latest requirements of the National Electrical Code, National Electrical Safety Code, OSHA, NFPA 70E, and all adopted State and Local Electrical Codes. All materials, equipment, sizes, capacities shall conform to the latest NEMA, ANSI, UL, IEEE, and EIA/TIA standards.
- C. Not all requirements of the applicable codes have been shown or included in the drawings and specifications. The licensed electricians installing the work are expected to understand all applicable codes that are relevant to the work being installed. Questions and interpretations on the drawings and specifications shall be directed to the Engineer.
- D. All electrical work shall be completed in a professional manner with a high degree of workmanship.
- E. Installation methods and materials shall be consistent throughout the project and shall only use products that been approved or specified. The installation of equipment or materials that have not been approved shall be at the Contractor’s risk.

- F. Work that is sloppy, inconsistent, or incomplete will be rejected.
- G. Installer Qualifications: Engage an experienced Installer for the installation and application of joint sealers, firestopping and access doors.
- H. All electrical equipment shall be NRTL listed, and shall be suitable for the purpose and location which it is installed. All equipment shall be installed in accordance with its listing and the instructions provided by the manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. The Contractor shall be responsible for receiving and off-loading all equipment delivered to the site.
- B. Products delivered to the project shall be properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.
- C. Properly store all materials and equipment in accordance with the manufacturers' recommendations and as required to protect them from damage and corrosion.
- D. Products shall be delivered in original containers, boxes, packages, or on the skids provided by the manufacturer. The packaging should be in good condition as indicative of proper handling and storage. Equipment with damaged packaging will be considered as possibly unacceptable for installation. The Contractor or manufacturer may be required to demonstrate to the Owner/Engineer that it's in new condition. Any equipment deemed unsatisfactory will be replaced at no cost to the Owner.
- E. Temporarily close all openings of raceways to prevent obstruction, damage or the intrusion of foreign materials.
- F. Protect all enclosed electrical equipment from damage due to water, dirt, dust, and accidental contact with tools and equipment. Keep factory doors and covers on as much as possible, or provide temporary barriers, tarps, etc.
- G. Protect all finished surfaces from damage.

1.5 PROJECT CONDITIONS

- A. The contractor shall maintain any process equipment, utility, etc., necessary to maintain continuous treatment. Any such equipment that must be relocated, either temporarily or permanently, or any process equipment, utilities, etc., that must be installed, either temporarily or permanently, to maintain wastewater treatment shall be the responsibility of the Contractor. The Contractor shall include the cost of all temporary facilities required to maintain treatment, meeting secondary standards, during the construction period in his bid prices. The cost shall include the cost of all labor, tools, equipment and materials necessary.

1.6 SEQUENCE AND SCHEDULING

- A. The Contractor shall plan the work to minimize the interruption of power to existing systems. Where interruptions of electrical power to equipment is necessary, as in the case of transferring loads to new distribution systems, the Contractor shall submit a detailed work plan that describes the methods and durations of the work for approval.
- B. Coordinate the shut-off and disconnection of utility services with the Owner and the utility company.
- C. Perform demolition in phases as specified, indicated or required.
- D. Notify Engineer at least one (1) week in advance of all testing so that he may witness the tests and testing procedures.
- E. It is expected that the Contractor will request the Engineer to make a site visit to perform a final inspection of the work for substantial completion or contract closeout, only if the work is essentially complete, and following the final approval of the local inspector. The Contractor shall identify areas where the work is incomplete, and provide an explanation for the delay with an expected timeframe to complete the work.

1.7 CONTINUITY OF SERVICE

- A. The Contractor shall guarantee continuance of electrical service to all areas of the project presently receiving electrical service which are not designated as construction areas. The Contractor shall schedule, with the Owner, power shutdowns one (1) week in advance.
- B. It is the responsibility of the Contractor to maintain and protect existing building services which pass through areas affected by demolition and excavation. Contractor shall include in his bid price all costs (material, labor, etc.) associated to maintain these services and/or temporarily refeed.

1.8 TEMPORARY POWER

- A. The Contractor shall furnish and install all labor, materials and equipment necessary to provide a complete temporary power system as may be needed to install the work.
- B. The Contractor shall furnish and install a system of enclosed circuit breakers, fused safety switches, electrical panels, ground fault interrupting type outlets, generators, and wiring as required to complete the work. Provide temporary power to all job trailers. Furnish and install all temporary lighting.
- C. The Contractor shall install all temporary power in accordance with Article 590 of the National Electrical Code.

- D. The work installed shall be coordinated with the Utility Company. All Utility Company charges, and permit fees associated with temporary services to the site shall be paid for by the Contractor. The Contractor shall pay for all temporary power consumed during construction unless stated otherwise in the Specifications.

2. PRODUCTS

2.1 WALL AND FLOOR SLEEVES

- A. Sheet Metal Sleeves (heavy): 26 gage galvanized sheet metal with pipe or Pittsburgh lock longitudinal joint.
- B. Steel Sleeves: Schedule 10, steel pipe, ASTM A53, Grade A.

2.2 MISCELLANEOUS METALS

- A. Steel plates, shapes, bars, and bar grating: ASTM A 36.
- B. Cold-Formed Steel Tubing: ASTM A 500.
- C. Hot-Rolled Steel Tubing: ASTM A 501.
- D. Steel Pipe: ASTM A 53, Schedule 40, welded.
- E. Fasteners: Zinc-coated, type, grade, and class as required.

2.3 MISCELLANEOUS LUMBER

- A. Framing Materials: Standard Grade, light-framing-size lumber of any species. Number 2 Common boards complying with WCLIB or AWPB rules, or Number 2 boards complying with SPIB rules. Lumber shall be preservative treated in accordance with AWPB LP-2, and kiln dried to a moisture content of not more than 19 percent.
- B. Construction Panels: Plywood panels; APA C-D PLUGGED EXT, with exterior glue; thickness as indicated, or if not indicated, not less than 23/32 inches.

2.4 ELASTOMERIC JOINT SEALERS

- A. General: Joint sealers, joint fillers, and other related materials compatible with each other and with joint substrates under conditions of service and application.

1. Colors: As selected by the Architect from manufacturer's standard colors.
2. General Duty: One-part, neutral core silicone sealant of formulation indicated that is recommended for exposed applications on exterior and interior joints in vertical and horizontal surface of concrete, masonry, glass, aluminum, and steel.
3. Wet Locations: Provide manufacturer's standard one part, mildew resistant, paintable silicone sealant that is recommended for exposed locations on interior ceramic tile, masonry, and metals in bathroom and shower room locations.
4. Manufacturers:
 - a) Dow Corning.
 - b) General Electric.
 - c) Ohio Sealants, Inc.
 - d) Pecora Corp.
 - e) Sonneborn.
 - f) Tremco, Inc.

3. EXECUTION

3.1 EXAMINATION

- A. Prior to performing work required under Division 26, carefully inspect all conditions and the work of other trades and verify that all conditions and all such work is complete to the point where the electrical work may properly commence.
- B. In the event of a discrepancy, immediately notify the Engineer. Do not proceed with the work in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 ROUGH-IN

- A. Verify final locations of conduits and boxes with field measurements and with the requirements of the actual equipment to be connected. Refer to approved equipment submittals for rough in requirements.
- B. Refer to rough in requirements related to specific equipment in specification Divisions 2 through 26.
- C. Coordinate rough in with the work of all other trades.

- D. Protect the work and close all openings until equipment and conductors can be installed.

3.3 ELECTRICAL INSTALLATIONS

- A. General: The materials described in the Project plans and specifications may exceed the requirements of the National Electrical Code and other regulatory requirements. Compliance with the codes, does not relieve the Contractor from providing and installing the materials specified.
- B. Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment with the work of other trades.
- C. Comply with the following requirements:
 - 1. Coordinate the installation of electrical systems, equipment, and related materials with other systems and building features.
 - 2. All dimensions shall be verified by field measurements.
 - 3. Coordinate the locations of supports, chases, sleeves, and openings for electrical installations with other trades and the building features. Schedule the placement of these with the progress of the construction work.
 - 4. Coordinate and schedule the installation of below slab and in-slab conduits, and poured in place boxes, sleeves, and supports, with the forming and pouring of concrete.
 - 5. Sequence equipment delivery and placement with the progress of the construction work. Set large equipment prior to closing in the building.
 - 6. Where mounting heights of equipment are not detailed or dimensioned, the Contractor shall:
 - a. Comply with all applicable Code requirements.
 - b. Follow industry standard dimensions.
 - c. Use dimensions that are practical for the equipment or location.
 - d. Request dimensions from Engineer where there is uncertainty.
 - 7. Install conduits, boxes, and supports to provide the maximum headroom possible.

8. Coordinate the connection of electrical systems utility company services. Comply with all applicable codes, and the specific requirements of each utility company for the installation. The Contractor shall contact the Utility Company to confirm the requirements prior to proceeding with the work.
9. Refer to approved equipment submittals and installation instructions for the electrical requirements of equipment specified under other divisions. Plan, rough in, and install electrical materials and equipment to conform with these requirements. Conform to the general arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form.
10. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed or in accessible ceilings.
11. Conceal the conduits within walls, floors, ceilings, or underground where required, possible, or practical.
12. Switches, receptacles, control stations, and similar wall mounted devices shall be flush mounted in all new walls.
13. Conceal conduits and provide flush mounted boxes for wiring devices and lighting in all newly constructed poured concrete, concrete block, and stud framed walls.
14. Surface mounted conduit is acceptable in process equipment rooms, electrical rooms, and similar unfinished utility type spaces.
15. Conduit for exterior wiring devices and lighting fixtures shall be concealed such that they are not visible on the outside of the building. Wiring to the device shall be concealed in the wall or run in the interior of the building and poke through the wall to the device box or fixture.
16. Install access doors where units are concealed behind finished surfaces.
17. Install electrical equipment to facilitate servicing, maintenance, repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations.
18. The installation of electrical materials and equipment shall give right-of-way priority to large equipment, ducts, and piping, and to systems that are required to be installed at a specified slope.

3.4 SELECTIVE DEMOLITION

- A. General: Demolish, remove, demount, and disconnect abandoned electrical materials and equipment indicated to be removed and not indicated to be salvaged or saved.
- B. In general, portions of the existing electrical system shown on the plans to be removed, shall be removed in phases to prevent system shutdown, unless noted otherwise on the drawings, in areas of remodeling and renovation.
- C. Protect adjacent materials indicated to remain. Install and maintain dust and noise barriers to keep dirt, dust, and noise from being transmitted to adjacent areas. Remove protection and barriers after demolition operations are complete.
- D. Locate, identify, and protect electrical services passing through demolition area and serving other areas outside the demolition limits. Maintain services to areas outside demolition limits. When services must be interrupted, install temporary services for affected areas.
- E. All existing electrical work that is not specifically indicated on the plans to be removed, but conflicts with proposed alterations and modifications to the buildings, mechanical, or electrical systems, shall be relocated as required.
- F. Any device which is to remain but becomes de-energized by removal of existing work shall be rewired and/or reconnected as required to maintain service to the device in question.
- G. Abandoned raceways embedded in floors, walls, and inaccessible ceilings may remain if such materials do not interfere with new installations. Remove all conductors and retain as spare conduits if practical to do so. Remove materials above accessible ceilings.
- H. Abandoned raceways below grade may remain if such materials do not interfere with new installations. Remove conductors and retain as spare conduits if practical to do so.
- I. Materials and Equipment To Be Salvaged: Remove, demount, and disconnect existing electrical materials and equipment indicated to be removed and salvaged. The Owner reserves the right to retain any and all existing materials and equipment including all items not identified for salvage within the Contract Documents. Existing materials and equipment identified by the Owner to be retained shall remain the property of the Owner. The Contractor shall deliver all salvaged materials and equipment to a storage site as directed by the Owner.
- J. Disposal and Cleanup: Remove from the site and legally dispose of demolished materials and equipment not indicated or identified by the Owner to be salvaged.

3.5 CUTTING AND PATCHING

- A. General: Perform cutting and patching in accordance with Division 1 Section "EXECUTION REQUIREMENTS." In addition to the requirements specified in Division 1, the following requirements apply:
 - 1. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.
- B. Perform cutting, fitting, and patching of electrical equipment and materials required to:
 - 1. Uncover Work to provide for installation of ill-timed Work.
 - 2. Remove and replace defective Work.
 - 3. Remove and replace Work not conforming to requirements of the Contract Documents.
 - 4. Remove samples of installed Work as specified for testing.
 - 5. Install equipment and materials in existing structures.
 - 1. Upon written instructions from the Architect/Engineer, uncover and restore Work to provide for Architect/Engineer observation of concealed Work.
- C. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
- D. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
- E. Patch finished surfaces and building components using new materials specified for the original installation and experienced Installers.

3.6 PAINTING

- A. Any equipment or device that receives a factory coat of paint and is damaged during installation, must receive touch painting. Clean and paint to match original finish, all items scratched or otherwise damaged.
- B. Field painting requirements, other than as needed to repair damaged paint on anything with a factory coat of paint, will be covered in Division 9 section "PAINTING".

3.7 PENETRATIONS

- A. Except where absolutely necessary, do not penetrate roofs and waterproof surfaces. Where required, make penetrations prior to the application of roofing and waterproofing materials and provide all sleeves, pitch-pockets and other acceptable items. Advise Architect in advance before making such penetrations, even where such penetrations are shown on the Drawings.
- B. All penetrations through rated assemblies shall maintain the requirements of the assembly rating.

3.8 INSTALLATION OF SLEEVES

- A. Applications:
 - 1. Install steel pipe sleeves for all conduits passing through poured concrete walls and foundations.
 - 2. Install steel pipe sleeves for all conduits passing through poured concrete floors between accessible building levels.
 - 3. Install Link-Seal fittings at all below grade conduit penetrations into basement spaces.
 - 4. Sleeves poured in place shall have anchors welded to the outside of the sleeve to insure embedment in the concrete. All steel shall be painted one coat of a rust inhibitive paint.
 - 5. Sleeves shall be installed flush with the face of finished walls and ceilings; extend one inch above the level of finished floors.

3.9 ERECTION OF METAL SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place miscellaneous metal fabrications accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- B. Field Welding: Comply with AWS "Structural Welding Code."

3.10 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- B. Select fastener sizes that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

3.11 APPLICATION OF FIRESTOPPING AND JOINT SEALERS

- A. General: Comply with joint sealer manufacturers' printed application instructions applicable to products and applications indicated, except where more stringent requirements apply. Comply with recommendations of ASTM C 1193 for use of elastomeric joint sealants.
- B. Surface Cleaning for Joint Sealers: Clean surfaces of joints immediately before applying joint sealers to comply with recommendations of joint sealer manufacturer.
- C. Apply joint sealer primer to substrates as recommended by joint sealer manufacturer. Protect adjacent areas from spillage and migration of primers, using masking tape. Remove tape immediately after tooling without disturbing joint seal.
- D. Apply joint sealers and firestopping under temperature and humidity conditions within the limits permitted by the manufacturer. Do not apply joint sealers and firestopping to wet substrates.
- E. Tooling: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.12 INSTALLATION OF ACCESS DOORS

- A. Set frames accurately in position and securely attached to supports, with face panels plumb and level in relation to adjacent finish surfaces.
- B. Adjust hardware and panels after installation for proper operation.

3.13 COORDINATION OF ACCESS DOORS PROVIDED BY OTHER SECTIONS

- A. General: The electrical contractor must coordinate the installation of electrical work with the installation of access doors. This will require that the electrical contractor become familiar with architectural details in the architectural drawings. Electrical equipment must be arranged so that the access panels as designed can serve their purpose.
- B. Coordinate installation of access doors at all locations and with adequate door size to provide the required access to electrical system components including but not limited to, junction boxes, electrical connections at equipment, switches, and control devices.

- C. Fire-rated access doors and frames shall be furnished for all locations where the doors are to be installed in a rated assembly. Refer to Architectural Drawings for locations of rated assemblies.
- D. All required access doors may not be indicated on the Architectural drawings. Responsibility for access to all electrical items is with the Electrical Contractor and shall be coordinated with the General Contractor. Obtain approval from Architect before installation of access doors not shown on the drawings or doors that are to be relocated from locations shown on Architectural drawings due to relocation of equipment to be serviced. Failure to obtain this approval may necessitate rework at the installing Contractors expense.

3.14 FIELD QUALITY CONTROL AND TESTING

- A. Notify Engineer at least one (1) week in advance of all testing so that he may witness the tests and testing procedures.
- B. Provide all labor, materials, testing equipment, electricity, fuel, lights, lubricants, and all other materials required for conducting all tests.
- C. Test all parts of the electrical system before placing them in service.
- D. Test all devices related to life safety in the presence of the Engineer or Code Authority. Submit all test results with the Record Documents.
- E. All systems shall test free from short circuits and grounds, shall be free from mechanical and electrical defects, and shall show insulation resistance between phase conductors and ground of not less than that required by NEC, or as specified herein.
- F. All equipment shall have proper neutral and grounding connections.
- G. Balance loading on each phase of lighting and receptacle panels to within a twenty percent range.
- H. Check all motors for proper rotation and all starters for proper overload protective elements or settings.
- I. Test all control devices for proper operation of motors and equipment.
- J. Adjust circuit breakers to settings recommended by the Engineer, or as determined by approved coordination study.
- K. Demonstrate the proper operation of any equipment item, or system to Owner, Architect, Engineer, or Code Authority upon request.

- L. Conduct all other tests required to secure approval of the work from all agencies having jurisdiction.
- M. Replace any portion of the work which does not conform to established standards and requirements.
- N. Make all adjustments and changes during tests necessary to achieve optimum operation of the equipment.
- O. Should any defects be suspected or found after the tests have been completed, make all required adjustments, repairs, and replacements, and retest to the satisfaction of the Engineer.

3.15 ADJUST AND CLEAN

- A. Protect equipment against mortar, dust, water, weather, etc. during construction and leave all equipment clean. Remove all debris and unused material from the premises and leave the project site in a neat and clean condition.
- B. Clean all exposed electrical work and remove all unnecessary labels, soil, markings, and foreign materials. Do not remove labels required by the specifications, laws, regulations and codes (e.g.: UL Labels) or special labels warning of hazards, denoting special operating and maintenance procedures or labels with important or meaningful messages, directions or warnings.
- C. Thoroughly clean the interior of panelboards and the like and remove all dust, dirt, and other foreign materials, which may adversely affect the operation of equipment, damage equipment, or which may create a potential hazard or unsafe condition.
- D. Thoroughly clean the tops of all electrical equipment enclosures free of dirt, construction debris, spare parts, tools, and other unnecessary items to reduce the risk of injury to personnel, damage to the equipment inside.
- E. Replace all electrical appliances or equipment which have been damaged by water.
- F. Replace all three phase motors that were operated on single phase voltage during the project.
- G. Inspect all items thoroughly. Install all screws and fasteners supplied or intended by the manufacturer of the equipment to secure covers and such. Repair any items that are scratched, dented or otherwise damaged to like new condition. Touch up paint shall match the color of the original finish. All repaired items shall be brought to the attention of the Engineer for inspection and approval.

END OF SECTION

SECTION 16110
RACEWAYS

1. GENERAL

1.1 Summary

- A. This Section includes raceways for electrical wiring. Types of raceways in this section include the following:
1. Electrical metallic tubing.
 2. Intermediate metal conduit.
 3. Rigid metal conduit.
 4. PVC externally coated rigid steel conduit.
 5. Flexible metal conduit.
 6. Liquidtight flexible conduit.
 7. Rigid nonmetallic conduit.
 8. Wireway.

1.2 Related Documents

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Requirements of the following Division 26 Sections apply to this Section:
1. 260529 - Supporting Devices

1.3 Submittals

- A. Refer to Division 1 and Division 26 Section "BASIC ELECTRICAL REQUIREMENTS" for administrative and procedural requirements for submittals.
- B. Product Data: Submit product data for the following items:
1. Metal conduit and tubing products and fittings.
 2. Non-metallic conduit and tubing products and fittings.
 3. Flexible conduit products and fittings.
 4. Wireway and fittings.

1.4 Quality Assurance

- A. Code Compliance: Product use and installation methods shall comply with NFPA 70 "National Electrical Code."
- B. NEMA Compliance: Comply with applicable requirements of NEMA standards pertaining to raceways.
- C. UL Compliance and Labeling: Comply with applicable requirements of UL standards pertaining to electrical raceway systems. Provide raceway products and components listed and labeled by UL, ETL, or CSA.

1.5 Delivery, Storage, And Handling

- A. Store and handle all conduit and tubing in a manner to prevent entrance of dirt, debris, and moisture. Conduit and tubing stored outside shall be stored above grade on 4" x 4" wood blocks. Metal raceways shall be protected from the weather.
- B. Store and handle metal conduit and tubing in a manner to prevent damage to galvanized coating and subsequent corrosion.
- C. Store and handle PVC coated metal conduit and liquid tight flexible conduit in a manner to prevent damage to protective coating and subsequent corrosion.
- D. Store and handle painted wireway and surface raceway products in a manner to damage to the factory applied finish.
- E. Provide factory applied plastic end caps on each length of threaded conduit. Maintain end caps through shipping, storage and handling to prevent damage to ends of pipe and threads.

1.6 Sequencing And Scheduling

- A. Coordinate with other Work, including excavation, metal and concrete deck installation, and wall construction, as necessary to interface installation of electrical raceways and components with other Work.

2. PRODUCTS

2.1 Manufacturers

- A. Manufacturers: Provide UL listed products that satisfy the requirements of the Project.

2.2 Metal Conduit And Tubing

- A. General: Minimum conduit size shall be 3/4" unless otherwise indicated.
- B. Electrical Metallic Tubing (EMT): EMT shall conform to ANSI C80.3, UL 797, and federal specification WW-C-563.
 - 1. EMT shall be steel with hot galvanized coating on outside diameter with rust inhibiting and stain resistant clear coat. The internal diameter shall be sprayed with a coating for corrosion resistance and easy wire pulling.
 - 2. Factory produced elbows shall be from the same manufacturer as the conduit and shall match all conduit properties and standards.
 - 3. EMT connectors and couplings shall be steel-zinc plated compression type.
 - 4. EMT connectors shall be supplied with steel locknuts.
- C. Rigid Steel Conduit: All conduit shall conform to ANSI C80.1, UL 6, and federal specifications WW-C-581. Threading shall conform to ANSI/ASME B1.20.1
 - 1. Rigid metal conduit shall be heavy wall steel with hot galvanizing coating on both inside and outside diameters.
 - 2. Each conduit section shall be supplied with a tapered thread at each end. A coupling shall be installed at one end, and a factory applied color coded protective cap at the other.
 - 3. Factory produced conduit elbows, couplings, and nipples shall be from the same manufacturer as the conduit and shall match all conduit properties and standards.
 - 4. Terminations for rigid metal conduit shall be double locknut and bushings. Use watertight type locknut in all damp or wet locations. Bushings shall be plastic or insulated metal.
- D. Intermediate Steel Conduit: All conduit shall conform to ANSI C80.6, UL 1242, and federal specifications WW-C-581. Threading shall conform to ANSI/ASME B1.20.1.
 - 1. Intermediate metal conduit shall be steel with hot galvanized coating on outside diameter with rust inhibiting and stain resistant clear coat. The

internal diameter shall be sprayed with a coating for corrosion resistance and easy wire pulling.

2. Each conduit section shall be supplied with a tapered thread at each end. A coupling shall be installed at one end, and a factory applied color coded protective cap at the other.
 3. Factory produced conduit elbows, couplings, and nipples shall be from the same manufacturer as the conduit and shall match all conduit properties and standards.
 4. Terminations for intermediate metal conduit shall be double locknut and bushings. Use watertight type locknut in all damp or wet locations. Bushings shall be plastic or insulated metal.
- E. PVC Externally Coated Rigid Steel Conduit: All conduit prior to coating shall conform to ANSI C80.1, UL 6, and federal specification WW-C-581-E. All coated conduit shall conform to NEMA RN 1.
1. The conduit shall be hot dipped galvanized inside and out with hot dipped galvanized threads.
 2. The hot dipped galvanized threads and the interior of the conduit shall be coated with rust inhibiting urethane. The thickness of the interior coating shall be not less than .002" (2 mils).
 3. The exterior of the conduit shall have a PVC coating with a minimum thickness of .040" (40 mils) applied by dipping in liquid plastisol.
 4. The conduit shall be bendable without damage to either interior or exterior coating.
 5. All coated fittings, conduit bodies, boxes, and supporting devices shall be manufactured by the same processes and to the same standards as the conduit.
 6. All hubs on fittings and couplings shall have a PVC sleeve extending one pipe diameter or 2 inches, whichever is less. The I.D. of the sleeve to be equal to the O.D. of the uncoated pipe.
 7. Boxes, conduit bodies, and fittings used in hazardous locations shall be listed for the location.
 8. The interior and exterior of boxes and conduit bodies shall be coated with rust inhibiting urethane.

9. Where screws are provided, they shall be encapsulated stainless steel.
 10. PVC Externally Coated Rigid Steel Conduit shall be Thomas & Betts OCAL- BLUE or approved equal.
- F. Flexible Metal Conduit: Conduit shall conform to UL 1, UL 1479, and federal specification WW-C-566C.
1. Field installed flexible metal conduit shall be full wall, interlocked steel armor construction with corrosion resistant zinc galvanizing.
 2. Aluminum flexible metal conduit is only acceptable when factory installed on a listed manufactured product.
 3. The minimum size of field installed flexible metal conduit shall be 1/2" diameter. 3/8" diameter flexible conduit is only acceptable when factory installed on a listed manufactured product.
 4. Flexible metal conduit connectors shall be squeeze type corrosion resistant zinc plated steel or zinc plated malleable iron, with steel locknut. Provide straight and 90 degree fittings as required for the installation.
 5. Flexible metal conduit connectors shall have insulated throats.
- G. Liquidtight Flexible Metal Conduit: Conduit shall conform to ANSI/UL 360.
1. Liquidtight flexible metal conduit shall be constructed of spiral wound strip of heavy gauge, corrosion resistant, hot dipped galvanized steel. For 3/8" through 1-1/4" size, the core shall be constructed with a square locked steel strip with an integral copper bonding strip enclosed in the steel revolutions. For 1-1/2" through 4" trade sizes, the core shall be constructed with a fully interlocked steel strip.
 2. The jacket shall be flame retardant, flexible PVC that is extruded over the steel core. The jacket shall resist oils, mild acids and exposure to sunlight shall be temperature Rated -30°C to 80°C. Provide conduit with UL listed temperature rating of -40°C to 105°C in applications having extreme temperature requirements.
 3. The minimum size of field installed flexible metal conduit shall be 1/2" diameter. 3/8" diameter flexible conduit is only acceptable when factory installed on a listed manufactured product.

4. Liquidtight flexible metal conduit connectors shall be compression type corrosion resistant zinc plated steel or zinc plated malleable iron, with steel locknut. Provide straight and 90 degree fittings as required for the installation.
5. Liquidtight flexible metal conduit connectors shall have insulated throats.

2.3 Nonmetallic Conduit And Ducts

- A. General: Minimum conduit size shall be 3/4" unless otherwise indicated.
- B. Rigid Nonmetallic Conduit: Schedule 40 and 80 PVC conduit shall conform to NEMA TC 2, UL 651, and federal specification WC1094A. Fittings shall conform to NEMA TC-3, UL 514B, and federal specification WC1094A. Conduit and fittings shall carry respective UL or ETL listing or labels.
 1. All exposed rigid non-metallic conduit and fittings shall be of the same manufacturer to achieve a uniform appearance with regard to color, shape, and markings.
 2. Provide schedule 80 PVC conduit and bends in areas subject to physical damage, where required by local utility company, the National Electrical Code, or where specifically indicated on the drawings.
 3. Rigid nonmetallic conduit shall be supplied in 10 or 20 foot lengths. Each length shall include a molded deep belled end coupling at one end.
 4. Rigid nonmetallic conduit bends shall match the schedule of the conduit.
 5. All conduit bends used in below grade applications shall be provided with a molded deep belled end coupling at one end.
 6. Rigid nonmetallic conduit bends shall standard radius for above grade applications unless otherwise indicated. In below grade applications, conduits 2" and smaller shall be provided with minimum 24" radius bends. Conduits 2- 1/2" and larger shall be provided with 36" radius bends.
 7. All fittings shall be listed for use with rigid nonmetallic conduit.
 8. Locknuts used with nonmetallic conduit fittings shall be steel. Provide sealing type with gasket in wet locations. Provide stainless steel locknuts in corrosive locations.

9. PVC conduit cement and primer products shall be designed for use with rigid nonmetallic conduit and identified as low VOC.

2.4 Conduit Bodies

- A. General: Types, shapes, and sizes as required to suit individual applications, NEC requirements and NEC bending radius. Provide matching gasketed covers secured with corrosion-resistant screws.
- B. Metallic Conduit and Tubing: Use metallic conduit bodies. Use bodies with threaded hubs for threaded raceways. Conduit bodies used with rigid metal conduit shall have malleable iron bodies and stamped steel covers. Use gaskets in all damp and wet locations. Conduit bodies shall have threaded hubs. Conduit bodies shall be standard type for 2" size and under, long body type for sizes over 2 inches.
- C. Condulets used with rigid metal conduit shall have malleable iron bodies and stamped steel covers. Use gaskets in all damp and wet locations. Condulets shall have threaded hubs. Condulet bodies shall be standard type for 2" size and under, long body type for sizes over 2 inches.
- D. Nonmetallic Conduit and Tubing: Use nonmetallic conduit bodies conforming to UL 514 B.

2.5 Wireways

- A. General: Electrical wireways shall be of types, sizes, and number of channels as indicated. Fittings and accessories including but not limited to couplings, offsets, elbows, expansion joints, adapters, hold-down straps, and end caps shall match and mate with wireway as required for complete system. Where features are not indicated, select to fulfill wiring requirements and comply with applicable provisions of NEC.
- B. Wireway covers shall be hinged type, unless otherwise noted.

3. EXECUTION

3.1 Wiring Method

- A. Outdoors: Use the following wiring methods unless specifically noted:
 1. Exposed: Rigid or intermediate metal conduit. Fasteners for supports and fittings shall be stainless steel.

2. Exposed within 12" of Grade: Schedule 80 PVC (Except hazardous locations).
 3. Underground, Grouped: Schedule 80 PVC.
 4. Underground between hazardous locations and above grade conduit seal: Rigid metal conduit in accordance with NEC Article 501.
 5. Connection to Vibrating Equipment: Including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment: liquidtight flexible metal conduit.
- B. Indoor dry spaces (Operations Office, Bath, Process Equipment Rooms, Mechanical/Electrical Rooms): Use the following wiring methods unless specifically noted:
1. Exposed or Concealed: Electrical Metallic Tubing (EMT).
 2. Connection to Vibrating Equipment: Including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment: liquidtight flexible metal conduit.
- C. Class I Hazardous Locations (Headworks Room, Pump Station Wet Well, Valve Vault): Use the following methods unless specifically noted:
1. Exposed: PVC externally coated rigid steel conduit and fittings.
 2. Connection to Vibrating Equipment: Including transformers and hydraulic, pneumatic or electric solenoid or motor-operated equipment: Explosion proof, listed, flexible metal couplings of required length.
 3. All metal fasteners and supports shall be 316 stainless steel.
- D. Corrosive Non-Hazardous Locations (UV Room and above SBR and sludge tanks):
1. Exposed: Schedule 80 PVC.
 2. Connection to Vibrating Equipment: Including transformers and hydraulic, pneumatic or electric solenoid or motor-operated equipment: liquidtight flexible metal conduit.
 3. All metal fasteners and supports shall be 316 stainless steel.
- E. Encased in Concrete Slabs and Ductbanks:
1. Schedule 80 nonmetallic rigid conduit.
 2. Non-metallic rigid conduit shall transition to rigid metal conduit prior to exiting the concrete slabs or concrete encasements. Use only transition fittings listed for this specific use.

3.2 Installation

- A. General: Install electrical raceways in accordance with manufacturer's written installation instructions and applicable requirements of NEC.
- B. Conceal Conduit and EMT, unless indicated otherwise, within finished walls, ceilings, and floors where practical to do so. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot water pipes. Install raceways level and square and at proper elevations.
- C. Elevation of Raceway: Install horizontal raceway runs above water piping.
- D. Provide supports for raceways as specified elsewhere in Division 26.
- E. Prevent foreign matter from entering raceways by using temporary closure protection.
- F. Protect stub-ups from damage where conduits rise from floor slabs. Arrange so curved portion of bends is not visible above the finished slab.
- G. Make bends and offsets so the inside diameter is not effectively reduced. Unless otherwise indicated, keep the legs of a bend in the same plane and the straight legs of offsets parallel.
- H. Run concealed raceways with a minimum of bends in the shortest practical distance considering the type of building construction and obstructions except as otherwise indicated.
- I. Raceways embedded in slabs: Install in middle third of the slab thickness where practical and leave at least 1-inch concrete cover. Tie raceways to reinforcing rods or otherwise secure them to prevent sagging or shifting during concrete placement. Space raceways laterally to prevent voids in the concrete. Run conduit larger than 1-inch trade size, parallel with or at right angles to the main reinforcement; where at right angles to the reinforcement, the conduit shall be close to one of the supports of the slab. Where nonmetallic conduit is used, raceways must be converted to rigid steel conduit or electrical metallic tubing before rising above floor.
- J. Install exposed raceways parallel and perpendicular to nearby surfaces or structural members and follow the surface contours as much as practical. Run exposed, parallel, or banked raceways together. Make bends in parallel or banked runs from the same center line so that the bends are parallel. Factory elbows may be used in banked runs only where they can be installed parallel. This requires that there be a change in the plane of the run such as from wall to ceiling and that the raceways be of the same size. In other instances, provide field bends for parallel raceways.
- K. Join raceways with fittings designed and approved for the purpose and make joints tight. Where joints cannot be made tight, use bonding jumpers to provide electrical continuity of the raceway system. Make raceway terminations tight. Where

terminations are subject to vibration, use bonding bushings to assure electrical continuity. Where subject to vibration or dampness, use insulating bushings to protect conductors.

- L. Prior to locating and installing conduits, check the Contract Drawings and the work of other trades to be sure that the locations of all conduits and boxes will not interfere with the work of other trades and that conduit stubs for motors and equipment will be placed in proper locations.
- M. There shall be separate raceway systems for all voltages and system types. All wiring shall be in raceway systems.
- N. Holes through existing concrete walls, for conduit installation, shall be made with a core drill.
- O. Apply approved sealant around all conduits that penetrate finished walls and floors. Sealant shall match the fire rating of the wall or floor.
- P. Hanger rods for supporting raceway shall be all-thread galvanized rod. Minimum size rod shall be 1/4 inch, use larger rods where required for supporting loads heavier than recommended for 1/4 inch rods.
- Q. Raceways shall be fastened with malleable iron beam clamps or stamped steel or malleable iron one-hole straps, or “minerallac” type conduit hangers. Spring steel fasteners as manufactured by Cady or approved equal, may be used in stud walls and above ceilings.
- R. Perforated strap hangers are not permitted.
- S. Raceways fastened directly to concrete, brick or block walls or concrete ceiling shall be rigidly secured by means of proper size machine screws, or bolts, and lead expansion type shields. Plastic or fiber expansion shields are not permitted. Toggle bolts may be used with hollow concrete blocks.
- T. Terminations: Where raceways are terminated with locknuts and bushings, align the raceway to enter squarely and install the locknuts with dished part against the box. Where terminations cannot be made secure with one locknut, use two locknuts, one inside and one outside the box.
- U. Where terminating in threaded hubs, screw the raceway or fitting tight into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align the raceway so the coupling is square to the box, and tighten the chase nipple so no threads are exposed.
- V. Install pull line in empty raceways. Use continuous fiber, polypropylene plastic line having not less than 200-lb tensile strength. Leave not less than 12 inches of slack at each end of the pull line.

- W. Install raceway sealing fittings in accordance with the manufacturer's written instructions. Locate fittings at suitable, approved, accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points and elsewhere as indicated:
1. Where conduits enter or leave hazardous locations.
 2. Where conduits pass from warm locations to cold locations, such as the boundaries of refrigerated spaces and air-conditioned spaces.
 3. Where required by the NEC.
- X. Underground Raceway/Duct Sealing: Contractor is responsible for sealing all underground conduits entering buildings to prevent infiltration of water into the building. As a minimum, all underground conduits shall be sealed at the building entrance. In addition, conduits containing electrical conductors shall be sealed at all open ends including at manholes, junction boxes, transformers, and switches. Contractor shall provide sealing in other locations as required to prevent water infiltration into the building. Contractor shall use foam in place sealant for conduits with cables installed. Contractor shall use expanding blank plugs for spare conduits with pull rope installed.
- Y. Sleeves: Flange plates with mechanically compressed EDPM rubber shall be installed to seal around each underground conduit that penetrates below grade foundations into basements. Provide Link-Seal products by PSI or approved equal.
- Z. Compound: Foam in place two-part polyurethane material which rapidly expands to approximately 25 times in volume to form a strong, tough foam. Material shall be specifically designed for the purpose of sealing ducts and conduits of electrical and communications systems to prevent the infiltration of water and gases. Sealant shall be re-enterable; compatible with all cable jacket materials; shall be TDI, CFC and HCFC free; shall withstand up to 70 feet of water head pressure; and shall have a service temperature of -50F to 250F. Sealing product shall be ARNCO Hydra-Seal S-60 WTF or equal.
1. Plug: Plugs shall be corrosion proof plastic construction designed to seal ducts and conduits by compressing rubber seal between two plates by tightening a threaded hub. An eye for attaching pull rope shall be provided at each side. Plugs shall be sized for the conduit which it is installed. Provide Jackmoon series JM-BLA or equal.
- AA. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment with an adjustable top or coupling threaded inside for plugs and set flush with the finished floor. Extend conductors to equipment with steel conduit. Flexible metal conduit may be used 6 inches above the floor. Where equipment connections are not made under this contract, install removable flush plugs flush with floor.

BB. Flexible Connections: Use short length (maximum of 6 ft.) of flexible conduit for recessed and semi-recessed lighting fixtures, for equipment subject to vibration, noise transmission, or movement; and for all motors. Install separate ground conductor across flexible connections.

CC. PVC externally coated rigid steel conduit: Patch all nicks and scrapes in PVC coating after installing conduit.

3.3 Adjusting And Cleaning

A. Upon completion of installation of raceways, inspect interiors of raceways; clear all blockages and remove burrs, dirt, and construction debris.

END OF SECTION

SECTION 16120

WIRES AND CABLES

1. GENERAL

1.1 Summary

- A. This Section includes wires and cables, for power, lighting, and control wiring up to 600V. Types of wire and cables products in this section include the following:
 - 1. Single conductor, solid and stranded copper.
 - 2. Multi conductor cables, solid and stranded copper.
 - 3. Metal clad and armored cables.

1.2 Related Documents

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Refer to section 260101 Electrical Connections for Equipment for connectors and terminals used for wires and cables.
- C. Refer to Section 260526 Grounding for conductors specifically used as grounding electrode conductors.
- D. Refer to Section 283000 Security Alarm System for cables used for security system wiring.
- E. Refer to Section 273200 Telephone and Data Equipment and Conduit Systems for cables used for communication systems.
- F. Refer to Section 281200 Control Systems for cables used for controls and instrumentation circuits.

1.3 Submittals

- A. Refer to Division 1 and Division 26 Section “BASIC ELECTRICAL REQUIREMENTS” for administrative and procedural requirements for submittals.
- B. Submit product data for wires and cables.
- C. Submit cable megger tests.

1.4 Quality Assurance

- A. Code Compliance: Product use and installation methods shall comply with NFPA 70 "National Electrical Code."
- B. Product Listing: Provide only products that are listed and labeled by UL, ETL, or CSA.
- C. Standards Compliance: Comply with applicable requirements of the following standard organizations pertaining to wire and cables:
 - 1. ANSI – American Standards Institute
 - 2. ASTM – American Society for Testing and Materials
 - 3. IEEE – Institute of Electronic & Electrical Engineers
 - 4. NEMA – National Electrical Manufacturers Association
- D. All wire and cable shall conform to the requirements of the National Electrical Code and shall meet all A.S.T.M. Specifications. Wire and cable shall be new, manufactured within one year of date of installation, shall have size, grade of insulation, voltage rating and manufacturer's name permanently marked on the outer covering at intervals not exceeding 24 inches, and shall be delivered in complete coils or reels with identifying size and insulation tag.

1.5 Delivery, Storage, and Handling

- A. Store all wire and cable on spools until time of installation, and protect conductor insulation from damage. Conductors with damaged insulation should not be installed.
- B. Conductors stored outside shall be wrapped in plastic and shall have ends sealed to prevent entrance of moisture and dirt.
- C. Protect installed conductors from damage. Bundle and coil within the equipment enclosure or junction box until ready for termination.

1.6 Sequencing and Scheduling

- A. Coordinate the installation of wires and cables with other Work, including raceways and equipment.

2. PRODUCTS

2.1 Manufacturers

A. Manufacturers: Subject to compliance with the requirements, provide products by one of the following:

1. AFC Cable Systems
2. Allied Wire & Cable
3. Carol Cable
4. General Cable.
5. Houston wire & Cable
6. Southwire
7. Or Equal

2.2 Wires And Cables

A. General: Provide wire and cable that is suitable for the temperature, conditions, and location where installed.

B. Conductors: Provide solid conductors for power and lighting circuits #10AWG and smaller. Provide stranded conductors for sizes #8AWG and larger. Minimum size shall be #12 AWG for power and #14AWG for controls unless noted otherwise on the drawings.

C. Conductor Material: All conductors shall be copper unless specifically noted on the drawings. Provide copper conductors with conductivity of not less than 98% at 20 degrees C (68 degrees F). Aluminum conductors where permitted shall be stranded aluminum alloy (Southwire AA-8176 or equal).

D. Insulation Material:

1. All insulation shall be rated for 600V.
2. Provide THHN/THWN-2 rated at 90°C for all conductors that are installed in raceway in dry, interior locations.
3. Provide THHN/THWN-2 or XHHW-2 rated at 90°C for all conductors #10AWG or smaller that are installed in raceway in wet or exterior locations.
4. Provide XHHW-2 rated at 90°C for all conductors #8AWG and larger that are installed in raceway in wet or exterior locations.

E. Color coding of Conductors: The insulation of conductors size #6AWG and smaller shall have factory applied color coding for the entire length of the conductor. Identification shall be as follows:

208/120 Volts

Phase

480/277 Volts

Black	A	Brown
Red	B	Orange
Blue	C	Yellow
White	Neutral	White or Gray
Green or Bare	Ground	Green or Bare

- F. Cable Jackets for Multi-conductor Cable: Provide black, flame retardant Polyvinyl Chloride (PVC) jacket meeting the requirements of UL Standard 1227.
- G. Conductor and Cable Marking: Size, type, insulation rating, and manufacturer shall be marked at intervals of not less than four feet along the entire length.
- H. Metal Clad Cable:
 - 1. Metal-clad cable shall be UL listed and marked in accordance with NEC Article 310.11. Manufacturer’s standard color-coding on the exterior sheath may be used.
 - 2. Conductors #10 and #12AWG: Provide UL listed galvanized interlocking steel armor with copper conductors of required size and quantity. Cables for multi- wire branch circuits 120V and greater shall include (1) full size neutral per phase, and a green equipment grounding conductor. Phase conductors shall match color coding description included in this specification.
 - 3. Interlocked Armor Cables (IAC) for power feeders to 600V shall consist of three or four conductors of stranded copper, XLP insulated approved as Type XHHW- 2, phase identified, and shall include a stranded copper ground wire. Provide with aluminum interlocked armor and black PVC overall jacket.
 - 4. MC cable used for fire alarm circuits shall be supplied with a red armor.
 - 5. MC cables used for specialty applications shall have armor color indicated on the drawings.
 - 6. Connectors for MC and IAC cables shall be steel set screw.

3. EXECUTION

3.1 Wiring Method

- A. Install all conductors in raceway unless otherwise permitted by these specifications or indicated on the drawings.
- B. Metal clad cables with conductors #10AWG and smaller are permitted for single and multi-circuit branch wiring to outlet and switch boxes in interior finished non-process spaces such as offices, labs, restrooms, corridors, and closets, where concealed behind stud and gypsum board constructed walls, or above suspended accessible ceilings.
- C. Metal clad cables shall be permitted above suspended ceilings as a whip from outlet boxes to recessed lighting fixtures.
- D. Metal clad cables and interlocked armor cables with conductors #8AWG and larger are permitted where indicated on the drawings or with the Engineer's approval.

3.2 Size, Ratings, And Quantities Of Wires And Cables

- A. Conductors shall be sized as indicated on the drawings.
- B. Where the conductor size is not indicated, its current carrying capacity shall be equal to or greater than the rating of its overcurrent protective device. The rated ampacity of conductors shall be determined using the 75°C column of NEC Table 310.16, or other NEC tables that specifically apply to the installation..
- C. The routing of raceways, and the quantity of branch circuit conductors within those raceways are not specifically detailed on the drawings. The Contractor is responsible for selecting the best route for raceways, placement of junction boxes, and the assembly of branch circuit wiring. The Contractor shall apply NEC ampacity adjustment factors described in NEC Article 310 for the following:
 - 1. More than three current carrying conductors
 - 2. Spacing of raceways and cables
 - 3. Raceways and cables exposed to sunlight on roofs
- D. The neutral conductor is not required to be counted as a current carrying conductor for derating of ampacity when it only carries the unbalanced current of from other conductors of the same circuit. The neutral shall be counted as a current carrying conductor when part of a single wire or 3 wire branch circuit, and on a 3 phase, 4 wire wye circuit where the majority of the load is non-linear.
- E. The Contractor shall adjust the conductor size based on expected maximum ambient temperature of the installation location. Raceways that are routed on roof tops in direct sunlight, and in boiler rooms or similar heating plants are areas of special concern. Adjustments shall be made in accordance with NEC requirements.

- F. Voltage Drop: Multi-phase feeders for power distribution to panels and major equipment requiring that the conductor size be increased for voltage drop is indicated on the drawings. The Contractor shall be responsible for increasing the conductor size of branch circuit wiring based on the voltage and amperage rating of the circuit at 80% loading, and the circuit length. The following shall be used as a guideline:
1. Homeruns longer than seventy five (75) feet from a 120/208 Volt panelboard or one hundred seventy five (175) feet from a 277/480 Volt panelboard shall be not less than No. 10 AWG, copper.
 2. Where conductor sizes are increased for voltage drop or other reasons, the equipment grounding conductor (when provided) shall be increased in size proportionately.
 3. Where conductor sizes are increased for voltage drop they may be reduced in size within ten feet of the termination in order to fit under the lugs available on the overcurrent protective device but not less than the ampacity of the frame size of the overcurrent protective device.
 4. All conductors making up parallel feeders shall be the same size, same type, same insulation and all cut the same length. Bond each group of conductors making up a phase or neutral at both ends in an approved manner. Parallel conductors shall not be run in the same raceway.
 5. Provide a separate neutral and grounding conductor (or conduit ground) for all GFI circuits or GFI devices to ensure an adequate ground-fault path.
 6. Branch circuits requiring a neutral conductor shall have one neutral conductor per phase conductor when installed in a common raceway, unless specifically shown otherwise on the Drawings.

3.3 Installation Of Wire And Cables

- A. General: Install electrical cables, wires, and connectors in accordance with the applicable requirements of NEC.
- B. Coordinate the installation of wire and cable with other work.
- C. Conduit/raceway system shall be complete prior to pulling in wires.
- D. Any raceway that is damaged or otherwise unsuitable for the installation of conductors shall be abandoned and made unusable.
- E. Pull all required conductors into the raceway simultaneously. Use only UL approved cable lubricant where necessary.

- F. Conductors shall be continuous between outlets or junction boxes and no splices shall be made except in outlet boxes, junction boxes, and handholes.
- G. Keep conductor splices to a minimum. The Contractor shall obtain approval from the Engineer for installing splices in feeders rated 100A and larger, due to length of the run.
- H. Train conductors neatly in panelboards, cabinets, and other electrical equipment. Installed conductors shall allow for a minimum of one (1) future re-termination.
- I. Bundle the conductors of each multi-wire branch circuit together with cable ties in all pull boxes, junction boxes, outlet boxes, wireways, and hand holes to identify the conductors associated with each circuit. In panelboards, motor control centers, control panels, and similar equipment, bundle related circuit and control conductors with cable ties for the maximum practical length within the enclosure, but not less than one cable tie shall be installed at the conduit entrance.
- J. Cables shall be installed in cable trays neatly. Keep the cable in the same horizontal position of the tray for its entire length as much as possible and avoid crossing and twisting.
- K. Metal-clad cable shall be installed and supported in accordance with NEC Article
- L. 330.30. Supports shall be zinc-coated or equivalent corrosion protection with appropriate fastener or anchor. Staples are not permitted to be used for supports. Individual hangers, straps or similar fittings shall be used and installed at intervals so as not to damage the cable. Supports shall not terminate or be fastened directly to the roof decking. MC Cable under roof decking shall not be less than 1½ inches from the nearest surface of the roof decking.
- M. Metal-clad cable shall be installed parallel or perpendicular to walls. No diagonal runs shall be permitted.
- N. Bending radius for the metal-clad cable shall be in accordance with NEC Article 330.24.
- O. Metal-clad cable shall not interfere with accessible ceiling tiles. Access to electrical or other equipment shall not be denied by runs of MC cable that prevents removal of panels, including suspended ceiling panels.
- P. Metal-Clad cable shall not be installed exposed except in electrical rooms. Homeruns of MC cable shall be terminated in a wireway above the electrical panel. The conductors shall be grouped together without splicing and shall be routed to the panel through raceways not exceeding 24 inches in length. NEC ampacity derating factors shall be applied for raceways exceeding 24 inches having more than three current carrying conductors.
- Q. Horizontal wall penetrations of Metal-Clad cable through new or existing walls shall be sleeved. No other type of wiring systems shall occupy the same penetration sleeve with the MC cable. Sleeve penetrations through fire-rated walls, after installation of MC cables, shall be fire stopped with approved fire rated caulking or foam.

3.4 Field Quality Control

- A. After installing conductors and cables and before electrical circuitry has been energized, perform the following visual and mechanical inspections:
1. Verify the size and quantity of cables and conductors comply with the contract documents and equipment manufacturer's requirements.
 2. Verify conductors and cables are correctly identified at each termination, splice, and tap where applicable.
 3. Verify correct phase rotation has been maintained throughout the project.
 4. Verify color coding complies with the specifications and the National Electrical Code.
 5. Inspect all exposed section of cables and conductors for physical damage to the insulation. Cables and conductors with visible insulation damage shall be insulation tested (Megger) to demonstrate suitability for use, or replaced.
 6. Inspect all bolted and compression connections and check for tightness in accordance with manufacturer's specifications.
- B. Perform the following electrical tests prior to applying voltage:
1. Check all wiring for continuity, shorts, and grounds.
 2. Perform an insulation resistance test on all new 600V feeders with phase conductors #3AWG and larger (100A rating). The test shall be made with a calibrated 1000V DC Megger test unit. The test shall be performed between each pair of conductors, and between each conductor and ground. Each test shall be performed for 1 minute or until the value stabilizes. For acceptance, the insulation resistance shall be not less than 100 megohms. In addition, the lowest insulation resistance value shall not differ from the highest value by more than 20%. Submit cable test results to Engineer for review.
 3. Existing conductors that are to be reconnected to new sources shall be tested in accordance with the procedures outlined above. Failure of any conductor to satisfy these requirements shall be brought to the attention of the Engineer.
 4. Make any additional tests required by the Owner, Engineer, or any authorities having jurisdiction to determine that the installation is suitable for energizing.

5. The Contractor shall replace any faulty conductors that were supplied under this project at no cost to the Owner.
- C. Subsequent to energizing, demonstrate the proper functioning of all circuits including control device and system operation. Correct malfunctioning systems and retest to demonstrate compliance.

END OF SECTION

SECTION 16135

CABINETS, BOXES AND FITTINGS

1. GENERAL

1.1 Summary

- A. This Section describes the requirements of boxes and cabinets for electrical installations of the following types:
 - 1. Outlet, Device, and Junction Boxes for Branch Circuit Wiring
 - 2. Pull and Junction Boxes for Large Wiring
 - 3. Cabinets
 - 4. Enclosures for Electrical Components

1.2 Related Documents

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Where specific requirements of electrical boxes and enclosures supplied with equipment as part of a manufactured assembly are described in the related equipment sections, those requirements shall apply.
- C. Refer to Section 262726 Wiring Devices for plates and covers used with device boxes.
- D. Refer to Section 273200 Telephone and Data Equipment and Conduit Systems for enclosures and equipment racks used for communication systems.
- E. Refer to Section 181200 Control Systems for additional requirements related to enclosures used with shop fabricated control panels.

1.3 Submittals

- A. Refer to Division 1 and Division 26 Section “BASIC ELECTRICAL REQUIREMENTS” for administrative and procedural requirements for submittals.

- B. Submit product data for the following:
 - 1. Outlet, Device, and Junction Boxes
 - 2. Pull and Junction Boxes for Large Wiring
 - 3. Enclosures for Electrical Components

1.4 Quality Assurance

- A. Code Compliance: Product use, dimensions, and installation methods shall comply with NFPA 70 "National Electrical Code."
- B. Product Listing: Provide only products that are listed and labeled by UL, ETL, or CSA.
- C. Standards Compliance: Comply with applicable requirements of the following standard organizations pertaining to electrical enclosures:
 - 1. NEMA – National Electrical Manufacturers Association
 - 2. UL – Underwriters Laboratories

1.5 Delivery, Storage, And Handling

- A. Boxes and enclosures with painted finish shall be stored indoors, in the original packaging material or otherwise protected from moisture, dirt, and abrasions that cause damage to the finish.

1.6 Sequencing And Scheduling

- A. Coordinate the installation of boxes and enclosures with other Work, including building and structural components, raceways, and equipment.

2. PRODUCTS

2.1 General

- A. Furnish electrical boxes of materials, finish, type, NEMA class, and size indicated and required for location, kind of service, number of wires, and function.

- B. Boxes shall have appropriate means to secure covers. Provide boxes complete with accessible covers designed for quick removal and suitable for purpose used.
- C. Equip boxes with flat or raised blank covers where no devices are to be installed.
- D. Furnish necessary adapter plate for mounting devices on light fixtures, brackets, supports, hangers, fittings, bonding jumpers and other accessories required.
- E. Provide 1/8" thick neoprene gaskets for boxes subjected to weather.

2.2 Outlet, Device And Junction Boxes

- A. Definition: An electrical box 5" square or smaller that is used for device mounting, or splicing and pulling conductors.
- B. Manufacturers: Subject to compliance with the requirements, provide products by one of the following:
 - 1. Appleton
 - 2. Carlon
 - 3. Cantex
 - 4. Crouse Hinds
 - 5. Hubbell
 - 6. Legrand
 - 7. OZ Gedney
 - 8. Raco
 - 9. Steel City
 - 10. Thomas & Betts
 - 11. Or Equal
- C. Dimensions: The dimensions of outlet, device, and small wiring junction boxes shall satisfy the minimum volume requirements for the number of conductors and devices contained in accordance with NEC Article 314.16.
- D. Material and Finishes: Electrical boxes shall be made of materials that are suitable for the location where installed with consideration given to appearance, environmental factors, and potential for physical damage. Provide boxes that meet the following requirements:
 - 1. Conform to UL514A "Metallic Outlet Boxes".

2. Interior dry locations installed flush or concealed, or surface mounted in non-finished space: Galvanized sheet steel with pre-stamped knockouts for conduit connections. Junction box covers shall be flat galvanized steel with corrosion resistant plated screws.
3. Interior dry locations installed surface mounted in finished space: Two- piece assembly consisting of a galvanized or zinc plated steel wall mounting plate with factory painted steel cover. Specific color and shall be as indicated on the drawings. Provide boxes that are constructed of stainless steel, aluminum, or plastic where specifically noted on the drawings. Provide with corrosion resistant plated screws.
4. Wet, damp and exterior locations indicated as weatherproof: Die cast copper free aluminum with powder coat finish, and threaded conduit hubs of size and quantity required. Junction box covers shall be cast aluminum with stainless steel screws and neoprene gaskets. The color of boxes installed indoors shall be gray. The color of boxes installed outdoors on equipment or pedestals shall be gray. The color of boxes installed on the exterior of buildings shall be dark bronze. Confirm color with Architect/Engineer.
5. Corrosive locations: Outlet, device, and junction boxes used with PVC raceways in corrosive locations as defined on the drawings shall be gray PVC with molded conduit hubs of size and quantity required. Junction box covers shall be PVC, and supplied with the box with stainless steel screws and neoprene gaskets.
6. Corrosive locations: Outlet, device, and junction boxes used with PVC coated metal raceways in corrosive locations as defined on the drawings shall be cast class 30 iron alloy with 2 mil urethane coating on both interior and exterior, and a gray 40mil PVC coating bonded to the exterior. Boxes shall have threaded conduit hubs of size and quantity required. Covers shall be PVC coated and supplied with the box with stainless steel screws and neoprene gaskets.
7. Explosion proof locations: Die cast copper free aluminum style with threaded hubs as required. Boxes shall be listed for the electrical classification of the area to be installed. Device boxes shall be FS style and provided as a complete assembly with the device and cover. Junction boxes shall be round with matching threaded cast aluminum cover. Provide PVC coated junction boxes and covers in areas where PVC coated conduit and fittings are specified.

2.3 Pull And Junction Boxes For Large Wiring

- A. Definition: An electrical enclosure larger than 5" square that is used for pulling or splicing conductors.

- B. Manufacturers: Subject to compliance with the requirements, provide products by one of the following:
1. Appleton
 2. Cantex
 3. Crouse Hinds
 4. Eaton
 5. Hammond
 6. Hubbell-Wiegmann
 7. OZ Gedney
 8. Pentair-Hoffman
 9. Saginaw
 10. Steel City
 11. Thomas & Betts
 12. Or Equal
- C. The dimensions of pull and junction boxes shall satisfy the minimum length, width, and depth requirements for straight, angle, and U-pulls; and splices, as required by NEC Article 314.28.
- D. Material and Finishes: Electrical boxes shall be made of materials that are suitable for the location where installed with consideration given to appearance, environmental factors, and potential for physical damage. Provide boxes that meet the following requirements:
1. Comply with UL50 “Enclosures for Electrical Equipment” for boxes over 100 cubic inches in volume.
 2. Interior dry locations installed flush or concealed, or surface mounted in non-finished spaces: NEMA 1, galvanized code gauge steel with ANSI 61 gray acrylic electrocoat finish. Provide with or without pre-stamped knockouts for conduit connections. Junction box covers shall be painted galvanized steel with corrosion resistant plated slotted hex head screws.
 3. Wet, damp, or exterior locations indicated as weatherproof: NEMA 3R, galvanized code gauge steel with ANSI 61 gray acrylic electrocoat finish. Provide without pre-stamped knockouts for conduit connections. Box and cover shall be designed to provide protection against falling rain and sleet. Cover shall be held secure by sliding it under the top end flange and fastening it with plated corrosion resistant slotted hex head screws on the bottom end flange.

4. Wet, damp, or exterior locations indicated as corrosion resistant: NEMA 4X, type 304 stainless steel with seams continuously welded and ground smooth. Cover shall be hinged, removable, and provided with seamless foam gasket, and stainless steel clamps with padlocking provisions. Enclosure shall have external mounting provisions, and bonding provisions on the door and box.
5. Wet, damp, or exterior locations indicated as corrosion resistant and not subject to physical damage: UV stabilized PVC box and neoprene gasketed cover up to 12" square with NEMA ratings, 1, 3, 3S, 4, 4X, 12 and 13. Box and cover shall have a minimum thickness of .25". Box and cover shall be gray in color. Box shall have factory installed brass inserts for stainless steel cover screws. Box shall be provided with mounting feet and stainless steel mounting screws.
6. Explosion proof locations: Cast iron or copper free aluminum with threaded hubs of size and quantity required. Boxes shall be listed for the electrical classification of the area to be installed. Cover shall be constructed of the same material as the box. Cover shall join box at matching ground machined flanges for a flame-tight joint, and secured with stainless steel hex bolts. Box shall be provided with external mounting lugs.

2.4 Enclosures For Electrical Components

- A. Definition: An electrical enclosure that is used to house electrical components such as a control panel.
- B. Manufacturers: Subject to compliance with the requirements, provide products by one of the following:
 1. Hammond
 2. Hubbell-Wiegmann
 3. Pentair-Hoffman
 4. Rittal
 5. Saginaw
 6. Or Equal
- C. Dimensions: The dimensions of equipment enclosures shall be adequate to house the components they contain inside or installed on the door. Specific requirements for wire bending space at terminals as required by the National Electrical Code Article 312, and UL508A Standard for Industrial Control Panels shall be incorporated. Dimensions of enclosures shown on the plans shall be considered as a minimum requirement. The supplier shall increase the dimensions as needed to satisfy the minimum requirements of the listed standards based on the components housed within.

- D. Material and Finishes: Equipment enclosures shall be made of materials that are suitable for the installation location, with consideration given to appearance, environmental factors, and potential for physical damage. Provide boxes that meet the following requirements:
1. Provide enclosures with NEMA 4/12 rating except as indicated.
 2. Enclosures shall comply with the requirements of UL 50 “Cabinets and Boxes, and NEMA ICS 6 “enclosures for Industrial Controls and Systems”.
 3. Painted steel enclosures: NEMA 4/12 rated and constructed of sheet steel, 16-gauge minimum, with seams continuously welded and ground smooth. Cover shall be hinged, removable, and provided with seamless foam gasket, and stainless steel clamps with padlocking provisions. Enclosure shall have external mounting provisions, and bonding provisions on the door and box.
 4. Stainless steel enclosures: NEMA 4X rated and constructed of Type 304 stainless steel, 16-gauge minimum, with seams continuously welded and ground smooth. Cover shall be hinged, removable, and provided with seamless foam gasket, and stainless steel clamps with padlocking provisions. Enclosure shall have external mounting provisions, and bonding provisions on the door and box.
 5. Non-metallic enclosures: NEMA 4X rated and constructed of compression-molded fiberglass. The exterior surface shall be painted light gray acrylic enamel for enhanced UV protection. Cover shall be hinged, removable, and provided with seamless foam gasket, and stainless steel clamps with padlocking provisions. Enclosure shall have external mounting provisions.
- E. Features and Accessories (Applies to all enclosure types):
1. All enclosures shall be supplied with a white painted steel mounting panel that bolts to welded studs within the enclosure. Mounting panel shall have provisions for bonding.
 2. All doors shall open a full 180 degrees and shall be removable. Hinge pins shall be stainless steel.
 3. All enclosures shall be provided with stainless steel latches or clamps to secure cover tightly to the box. All enclosures shall have provisions for locking with a standard padlock to prevent public access.
 4. Doors shall not exceed 36” in width. Provide multiple doors as required.

5. Single and double door cabinets 30" or greater in width shall be provided with a keyed door handle and latching mechanism. All locks shall be keyed alike. Match Owner's standard keyed insert where indicated.
6. All enclosures shall be provided with an interior door pocket to hold control panel documents.
7. Provide doors with plexiglass view windows where indicated on the drawings.
8. Free standing enclosures shall be supplied with 12" high floor stands where indicated, or shall be designed with plinth base suitable for direct mounting on concrete.
9. Thermal Management: Provide thermostatically controlled heating and cooling equipment within enclosure where specified. All ventilation openings shall be provided with washable filters and shall be designed to prevent the entry of dripping water, rain, sleet, insects and rodents.

3. EXECUTION

3.1 Installation General

- A. Install electrical boxes and enclosures where indicated on the plans or where required by the Code. The electrical boxes and enclosures shall be listed and approved for the location where installed.
- B. Close unused knockouts, hubs, and openings with blanks that are specifically designed for the purpose and maintain the original NEMA rating of the enclosure.
- C. Support and mount items securely in accordance with Division 26 Supporting Devices.
- D. Sizes shall be adequate to meet NEC volume requirements, but in no case smaller than the sizes indicated. Where an extension is required to meet volume requirements, no more than one extension will be permitted. The box extension shall be of the same material as the box and with the cover, it shall form a complete assembly per the manufacturer's design.

- E. Grounding: All metal boxes shall be bonded to the electrical grounding system in accordance with NEC Article 250. Where wiring includes a grounding conductor, provide a listed grounding terminal inside the box, cabinet or enclosure.
- F. Remove sharp edges and burrs by filing or other means where they may come in contact with wiring or personnel.
- G. Where two or more wiring devices are indicated at a single location, they shall be ganged in a single box.
- H. Boxes set into concrete shall be cast type and listed for the purpose.
- I. All conduit penetrations into equipment enclosures in wet, damp, or below grade locations shall be made on the sides, back, or bottom. Do not make penetrations into the top of the enclosure without prior approval.
- J. Cleaning and Finish Repair: Remove all dirt and construction debris from the inside of all boxes prior to securing cover. The tops of all cabinets and enclosures shall be wiped clean. Repair damaged painted finishes with matching corrosion inhibiting touch up paint.

3.2 Installation Of Outlet Boxes:

- A. Before locating outlet boxes, check all of the Drawings for the type of construction and to make sure that there is no conflict with other equipment. The outlet boxes' location shall not interfere with other work or equipment and shall be accessible after completion.
- B. The plans show the approximate locations of locations of outlet boxes and are intended to indicate the quantity required and their general location. It is expected that the Contractor will use the plans as a reference, but will determine the final locations based on actual field conditions, good practice, and special requests from the Owner.
- C. Mount outlet boxes for switches and receptacles with long axis vertical or as indicated.
- D. Install multi-gang boxes where more than one device is shown in a single location on the plans.
- E. Install boxes for lighting switches on the strike side of the door. The rough in location of box shall be sufficiently far enough from the door jamb to allow a minimum of 1" clearance between the switch plate and the door trim.
- F. Where finish of wall changes material, rough in box such that device plate is not less than 1" from the transition.
- G. Thoroughly coordinate casework and backsplash heights with mounting heights of boxes.

- H. Outlet boxes for devices shown on the Drawings to be installed on opposite sides of the same wall shall be separated horizontally by not less than six (6) inches and if connected with each other, the ends of the raceway shall be filled with sound insulating material after wiring has been installed to fill the voids around the wire. For fire rated walls provide minimum 24" separation or use approved fire assembly.
- I. Outlet boxes installed in wood, stone masonry, tile, or glass shall be rectangular with square cut corners and straight sides. Saw cut all recesses for outlet boxes in exposed masonry and tile walls.
- J. Ceiling Outlets: For lighting fixtures or ceiling fans where wiring is concealed, use 4" square or octagonal boxes, minimum of 2" deep. Fixture or canopy shall completely conceal box. Provide mounting hardware specifically designed for attaching fixture to box.
- K. Boxes and hardware designed to support lighting, fans, and other ceiling mounted equipment shall be listed for the use, and shall meet the minimum weight ratings required by NEC Article 314.27. Install ceiling mounted outlet boxes in accordance with the manufacturer's requirements and the NEC.
- L. Concrete Boxes: Provide extra deep boxes to permit conduit entry without interference with reinforcing.

3.3 Installation Of Pull and Junction Boxes

- A. Pull and junction boxes shall be adequately supported from the building structure by direct means using beam clamps rated for the weight of the box and conductors contained within. Suspended boxes shall be supported by beam clamps and threaded rod with appropriate seismic bracing to minimize swaying.
- B. Boxes shall be installed such that they are fully accessible from the floor by ladders, lifts, or conventional means and are not blocked by conduits, piping, ducts, and equipment.
- C. Boxes shall be installed square with the lines of the building with the cover in a horizontal or vertical plane.
- D. Label pull and junction boxes with the voltage and circuit identification of the conductors they contain in accordance with Section 260553 "Electrical Identification".

3.4 Installation Of Cabinets And Electrical Enclosures

- A. Install cabinets and electrical enclosures flush or surface mounted as indicated on the plans, or as appropriate for the location installed.
- B. Flush mounted cabinets and enclosures shall be provided with a trim that completely covers the wall opening. Adjust trim such that edges are level and plumb.

- C. Free standing electrical enclosures shall be secured to the floor or pad with minimum 3/8” stainless steel anchors and hardware. All enclosures directly mounted to the floor in locations subject to water accumulation shall be installed on a 3-1/2” high concrete housekeeping pads.
- D. Label cabinets and enclosures with the system identification indicated on the plans, voltage, and power source location in accordance with Section 260553 “Electrical Enclosures”.
- E. Cabinets and enclosures shall be installed such that the hinged doors can fully open, but in no case less than 90 degrees.
- F. Provide working space clearance in front of all cabinets and enclosures in accordance with NEC Article 110.26.
- G. Install relevant circuit diagrams, schedules and other important information necessary for maintenance and troubleshooting inside the enclosure. Use plan pocket or provide plastic sleeve to contain documents.

END OF SECTION

SECTION 16136

CIRCUIT BREAKER PANELS AND ENCLOSURES

1. GENERAL

1.1 SUMMARY

- A. This Section describe the requirements of electrical panels and enclosures containing circuit breakers.
- B. The type of equipment described in this section include the following:
 - 1. Molded-case Circuit Breakers
 - 2. Panelboards
 - 3. Circuit Breaker Enclosures

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Refer to Division 26 section Electrical Identification for field labeling requirements.

1.3 SUBMITTALS

- A. Refer to Division 1 and Division 26 Section "BASIC ELECTRICAL REQUIREMENTS" for administrative and procedural requirements for submittals.
- B. Submit product data for each type of product specified.

1.4 QUALITY ASSURANCE

- A. Code Compliance: Products and installation shall comply with the requirements of NFPA 70 "National Electrical Code."
- B. Comply with UL 67 Standard for Panelboards

- C. Comply with UL 489 Standard for Molded-case Circuit Breakers
- D. Comply with NEMA Standard PB-1 Panelboards.
- E. Panels and circuit breaker assemblies used as service equipment shall be listed for “Service Entrance Use”.
- F. Comply with Product manufacturer’s installation requirements including torque values for securing conductors to terminals.
- G. Product Listing: Provide only products that are listed and labeled by UL or CSA.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store equipment in original packaging until ready for installation. Protect from damage due to construction activity, dirt, and moisture.

1.6 SEQUENCING AND SCHEDULING

- A. Coordinate equipment installation with the general progress of the work.

2. PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the requirements, provide products by the following:
 - 1. Cutler Hammer/Eaton Corp.
 - 2. General Electric
 - 3. Siemens
 - 4. Square D Company.
 - 5. Or equal.

2.2 GENERAL REQUIREMENTS

- A. General: Except as otherwise indicated, provide load centers, panelboards, enclosures and ancillary components, of types, sizes, and ratings indicated, which comply with manufacturer's standard materials; with the design and construction in accordance with published product information; equip with proper number of unit panelboard devices as required for complete installation. Where types, sizes, or ratings are not indicated, comply with NEC, UL and established industry standards for those applications indicated.
- B. Arrangement: Contractor shall be responsible for advising manufacturer of top or bottom feed requirements and location of main device based on the planned routing of conduits.
- C. Lugs: Provide tin plated, CU9AL aluminum mechanical lugs that are properly sized to accept the conductors specified on the drawings. Provide panels with sub-feed or feed thru lugs where indicated or required for multiple sections.
- D. Enclosures: Provide galvanized sheet steel cabinet type enclosures, in sizes and NEMA types as indicated, code-gage, minimum 16-gage thickness. NEMA 1 enclosures are permitted with or without pre-punched knockouts (Contractor's option). Provide baked gray enamel finish over a rust inhibitor coating. Enclosures specified for recessed mounting shall be provided with door assembly that is flush with the wall and conceals all gaps between the enclosure and wall material. Provide enclosures which are fabricated by same manufacturer as panelboards, which mate and match properly with panelboards to be enclosed.
- E. Series Rating: Series rating of equipment and circuit breakers is not acceptable. All equipment shall be fully rated to the amperage values indicated on the drawings.

2.3 MOLDED-CASE CIRCUIT BREAKERS

- A. Provide factory-assembled, molded-case circuit breakers of frame sizes, characteristics, and ratings including RMS symmetrical interrupting ratings indicated. Select breakers with permanent thermal and instantaneous magnetic trip, solid state adjustable trip, or fault-current limiting protection, of the ampere ratings as indicated. Construct with overcenter, trip-free, toggle-type operating mechanisms with quick-make, quick-break action and positive handle trip indication. Construct breakers for mounting and operating in any physical position, and operating in an ambient temperature of 40 deg C. Provide breakers with mechanical screw type removable connector lugs, AL/CU rated.

2.4 PANELBOARDS

- A. General: Equipment described as panelboards include electrical circuit breaker panels with a maximum rating of 400A at 480VAC, single or three phase, utilizing bolted circuit breakers, and provided with cover assembly consisting or separate trim and cover/door.
- B. Circuit Breakers: Provide bolted molded-case circuit breakers of the types and ratings indicated on the drawings.

- C. Bussing: Panelboard bussing shall be aluminum.
- D. Ground and Neutral Terminals: Provide each panelboard with manufacturer's standard ground and neutral terminal bars. Each bar shall have sufficient lugs to accommodate the number of circuits in the panel. Provide provisions to bond neutral bar to ground where required by the NEC for separately derived systems.
- E. Panelboard Enclosures: Panelboards shall be standard 20-inch-wide unless otherwise noted on the plans. Provide "door in door" fronts with adjustable trim clamps, concealed hinges, and doors with flush locks and keys. All panelboard enclosures shall be keyed alike. Equip with interior circuit-directory frame, and card with clear plastic covering.
- F. Loadcenter type panelboards are not acceptable as a substitute for specified panelboards.

2.5 ENCLOSED CIRCUIT BREAKERS:

- A. General: Enclosed circuit breakers describe single circuit breakers used for overcurrent protection and/or disconnecting means, and provided with an enclosure suitable for the location installed. Enclosed circuit breakers used for service entrance applications shall be listed as such.
- B. Circuit Breakers: Provide bolted molded-case circuit breakers of the types and ratings indicated on the drawings.
- C. Ground and Neutral Terminals: Provide each circuit breaker enclosure with manufacturer's standard ground and neutral terminal lugs. Provide provisions to bond neutral bar to ground where required by the NEC for separately derived systems.
- D. Circuit Breaker Enclosures: Circuit breaker enclosure shall be sized to provide the minimum required terminal clearance of the largest circuit breaker frame size that the enclosure is designed to accommodate in accordance with the NEC and product listing. Provide enclosures for surface mounting unless otherwise noted on the plans. Cover shall have permanent provisions to lock the circuit breaker in the OFF position. Enclosure and cover shall have matching baked gray enamel finish over a rust inhibitor coating. Each circuit breaker enclosure shall be identified with an engraved plastic nameplate that identifies the function of the breaker or load served as appropriate, and the system voltage.

3. EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions under which electrical panels are to be installed, and identify any conditions that are detrimental to the proper completion of the work. Do not proceed with the installation until unsatisfactory conditions have been corrected in an acceptable manner and the location is made free of moisture, dust, dirt, and damage from construction activity.

3.2 INSTALLATION OF PANELS AND ENCLOSURES

- A. Install panels and enclosures as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC standards and NECA's "Standards of Installation," and in compliance with recognized industry practices to ensure that products fulfill requirements.
- B. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standard 486A.
- C. Fasten enclosures firmly to walls and structural surfaces, ensuring that they are permanently and mechanically anchored.
- D. Provide properly wired electrical connections for panelboards within enclosures. Conductors shall be routed neatly in gutter spaces. Conductors of multiphase branch circuits #6AWG and smaller shall be bundled with cable ties at intervals of not less than 12 inches.
- E. Provide typed panel circuit directory card upon completion of the Project. Where changes are made prior to final acceptance, a new circuit directory shall be provided.
- F. Provide engraved plastic laminate nameplate with designation matching the drawings at each panel and circuit breaker enclosure. The nameplate shall identify system voltage and location of upstream disconnecting means in accordance with NEC requirements. Refer to Section 260553 Electrical Identification.
- G. Label all panel and circuit breaker enclosures with the voltage and color of each phase conductor and neutral. Label should be applied to the inside of the panel door with printed adhesive backed label. For distribution panels without doors, voltage, phase and neutral colors shall be identified with an engraved nameplate permanently attached to the face of the panel.
- H. Do not splice wires within panels.

3.3 GROUNDING

- A. Provide separate equipment ground bus connections for all panels and circuit breaker enclosures. Tighten connections to comply with tightening torques specified in UL 486A to assure permanent and effective grounds.

3.4 FIELD QUALITY CONTROL

- A. Prior to energization of electrical circuitry, check all accessible connections to manufacturer's tightening torque specifications.
- B. Prior to energization of panels, check phase-to-phase and phase-to-ground insulation resistance levels of busses with ohmmeter to ensure no short circuits are present.
- C. Prior to energization of branch circuits and feeders, check phase-to-phase and phase-to-ground insulation resistance levels of conductors with ohmmeter to ensure no short circuits are present.
- D. Following energization of branch circuits and feeders, check phase to phase, phase to neutral, phase to ground, and ground to neutral voltages of each circuit. Verify circuit rotation is correct. Measure amperage of each phase and neutral and check against expected values specific to the load.
- E. Prior to Project completion, measure load current in each panel phase supply conductor when building is operating under normal conditions. Rearrange branch circuits as necessary to achieve balanced loading to within 20% per phase.

3.5 ADJUSTING AND CLEANING

- A. Adjust operating mechanisms for free mechanical movement.
- B. All construction debris shall be removed from the inside and top of enclosures. Wipe down the entire enclosure and leave in "like new" condition.
- C. Touch-up scratched or marred surfaces to match original finishes.

END OF SECTION

SECTION 16140

WIRING DEVICES

1. GENERAL

1.1 Summary

- A. This Section describe the requirements of electrical wiring devices of the following types:
1. Receptacles
 2. Ground Fault Circuit Interrupters
 3. Cord Connectors
 4. Toggle Switches
 5. Timer Switches
 6. Temperature Switches and Thermostats
 7. Wall Plates

1.2 Related Documents

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Refer to section 262816 Circuit and Motor Disconnects for toggle switches used for motor and equipment disconnecting means.
- C. Refer to Section 265000 Lighting Fixtures for electronic lighting control devices.
- D. Refer to Section 273200 Telephone and Data Equipment and Conduit Systems for wall jacks used for communications systems.

1.3 Submittals

- A. Refer to Division 1 and Division 26 Section “BASIC ELECTRICAL REQUIREMENTS” for administrative and procedural requirements for submittals.
- B. Submit product data for the following:

1. Receptacles
2. Ground Fault Circuit Interrupters
3. Cord Connectors
4. Toggle Switches
5. Timer Switches
6. Temperature Switches and Thermostats
7. Wall Plates

1.4 Quality Assurance

- A. Code Compliance: Product use, dimensions, and installation methods shall comply with NFPA 70 "National Electrical Code."
- B. Product Listing: Provide only products that are listed and labeled by UL, ETL, or CSA.
- C. Provide products that comply with applicable NEMA standards.

1.5 Delivery, Storage, And Handling

- A. Wiring devices and plates shall be stored indoors, in the original packaging material or otherwise protected from moisture, dirt, and abrasions that cause damage to the finish and operation.

1.6 Sequencing And Scheduling

- A. Coordinate the installation of wiring devices and plates with wall finish work and painting.

2. PRODUCTS

2.1 General

- A. Wiring devices shall have the ratings indicated in the following specification or plans, but in no case less than 20 amps at 125VAC, unless specifically noted. All wiring devices shall be specification grade where available.
- B. Device plates and covers shall be suitable for the location installed, and in accordance with the National Electrical Code requirements for dry, damp, wet, and hazardous locations.
- C. Wiring devices shall be ivory in color.

2.2 Manufacturers

- A. Subject to compliance with the requirements, provide products by the following manufacturers:
1. Carlon
 2. Cooper Industries
 3. Crouse-Hinds
 4. Dayton
 5. Hubbell
 6. Intermatic
 7. Legrand – Pass & Seymour
 8. Leviton
 9. Thomas & Betts – Red Dot
 10. Or equal

2.3 Toggle Switches

- A. Toggle switches shall be specification grade, rated for 20A at 120/277VAC, 1HP at 120VAC, 2HP at 240VAC. Switches shall be back and side wired, self-grounding with grounding screw, quiet operation. Provide single pole, two pole, three-way, four-way, or single pole with lighted handle as indicated on the plans.
1. Single Pole: Leviton #1221-2 or equal (in color specified)
 2. Two Pole: Leviton #1222-2 or equal (in color specified)
 3. Three Way: Leviton #1223-2 or equal (in color specified)
 4. Four Way: Leviton #1224-2 or equal (in color specified)
 5. Lighted Handle: Leviton #1221-LHC or equal (Clear Handle)

2.4 Receptacles

- A. Receptacles shall be specification grade, single or duplex as indicated on the drawings. Provide 3-wire grounding type with back and side wired body. Standard convenience receptacles shall be rated for 20A at 125VAC and have NEMA 5-20R configuration. Receptacles shall have grounding terminals and grounding clip attached to one ear.
1. Single Receptacle: Leviton #5361 or equal (in color specified)
 2. Duplex Receptacle: Leviton #5362 or equal (in color specified)

- B. Provide single and three phase power receptacles of NEMA configuration indicated on the drawings. Receptacles shall have terminals for each conductor and ground. Provide locking type receptacles where indicated.

2.5 Ground Fault Circuit Interrupters

- A. Ground fault receptacles shall be specification grade, rated for 20A at 125VAC and have NEMA 5-20R configuration. Receptacle shall be provided with test and reset buttons, self-testing, and tamper and weather resistant, (Leviton #G5362-WT or equal in color specified).

2.6 Power Receptacles

- A. Power receptacles shall be industrial grade, grounding type, and shall match the voltage, amperage, and phase requirements of the load to be connected. The receptacle shall match the NEMA configuration of the plug supplied with the equipment. The NEMA configuration indicated on the plans is provided for bidding purposes. Contractor shall field verify equipment requirements prior to purchase.

2.7 Cord Connectors

- A. Cord connectors shall be provided by the Contractor where supplied equipment intended to be cord connected has not been provided with plug and/or cord.
- B. Male plugs and female connectors shall be industrial grade, grounding type, and shall match the voltage, amperage, and phase requirements of the load to be connected.
- C. Connectors shall be straight blade type unless locking type is specifically noted on the plans.
- D. Connectors shall be constructed with nylon body and integral cord clamp, with thermoplastic cover.
- E. Connectors shall be provided with a nylon insert with conductor clamps matching the wire gauge of the cord. All electrical components including conductor clamps, screws, and blades shall be constructed of solid brass.
- F. A typical male straight blade plug rated for 15A, 125V, NEMA 5-15P shall be equal to a Leviton #5266-C. Provide similar products for other required configurations.

2.8 Temperature Switches And Thermostats

- A. The following specification pertain to temperature switches used for building low temperature alarms and heating or ventilation control applications shown on the electrical plans, and where not specified under other sections of the project specifications.
- B. Temperature switches shall be heavy duty, industrial grade, cooling/heating type with SPDT contacts rated for 16A (inductive) at 120VAC. Enclosure shall be NEMA 4X. Temperature range shall be 30 to 110 deg F, with a 3 to 12 degree adjustable dead band. Switch shall be similar to Dayton #4LZ94 or approved equal.

2.9 Wiring Devices In Hazardous Locations

- A. Wiring devices in hazardous locations shall be listed and approved for installation in the area to be installed. Refer to plans for electrical classification of the space.
- B. Switches used for lighting control in Class I, Division 1 locations shall be a listed assembly approved for Class I Group B, C, and D locations, consisting of a cast iron alloy box with threaded hubs, mounting ears, and cover. Provide single, two, or three gang box as required. Switch shall be 1-pole, 2-pole, 3-way, or 4-way as required, and shall be rated for 20A at 120/277VAC, and for motor loads to 16A (80% of rating). Switch shall operate with winged lever that is capable of accepting a padlock. Lever shaft and screws used in the assembly shall be stainless steel. (Crouse Hinds EDS or EFD series or equal).

2.10 Wiring Device Accessories

- A. Wall Plates: Provide single and combination of types, and gang required to match and attach to the wiring devices at locations indicated. Provide stainless steel screws for securing plates to the devices. Screws shall match the color of the plate in finished locations. Provide wall plates with engraved legends were indicated conforming to the requirements of Section "Electrical Identification". Provide wall plates with the following features:
- B. Interior finished locations:
 - 1. Material and finish: Non-magnetic stainless steel
- C. Interior unfinished locations:
 - 1. Material and finish: Galvanized steel plate
- D. Interior wet or damp locations indicated as weatherproof:
 - 1. Material and finish: Gray cast metal box with matching cast metal cover and stainless steel screws.

2. Receptacles: Provide matching self-closing metal covers at convenience receptacles. Provide clear, heavy duty, impact resistant covers only at locations serving constantly in-use equipment such as sump pumps. Provide extra depth covers if necessary to accommodate equipment cord.
3. Switches: Provide covers with wing type operators with stainless steel shaft and toggle bracket.

E. Exterior locations:

1. Receptacles and Switches on Building Exterior Walls: Flush mount on building exterior wherever practical. For receptacles, provide dark bronze cast gasketed weatherproof heavy duty metal in-use cover. Provide extra depth covers if necessary to accommodate equipment cord. For switches, provide dark bronze weatherproof cover with wing type operators with stainless steel shaft and toggle bracket.

F. Corrosive Non-Hazardous Locations (UV Room and above SBR and sludge tanks):

1. Material and finish: Gray cast metal box with matching cast metal cover and stainless steel screws.
2. Receptacles: Provide matching self-closing metal covers at convenience receptacles. Provide clear, heavy duty, impact resistant covers only at locations serving constantly in-use equipment such as sump pumps. Provide extra depth covers if necessary to accommodate equipment cord.
3. Switches: Provide covers with wing type operators with stainless steel shaft and toggle bracket.

3. EXECUTION

3.1 Installation Of Wiring Devices And Accessories

- A. Install wiring devices and accessories as indicated, in accordance with manufacturer's instructions, applicable requirements of the NEC, and in accordance with recognized industry practices to fulfill project requirements.
- B. Coordinate with other work including wall construction, painting, electrical boxes and wiring installations.
- C. Install wiring devices only in electrical boxes which are clean and free from construction debris, dirt, and water.

- D. Install wiring devices after all wiring has been completed.
- E. Install wall plates after painting or final wall finishes has been completed.
- F. Where two light switches are controlling two separate 120 volt circuits and are ganged together, Contractor shall furnish and install barriers between switches.
- G. Where two or more switches or other similar wiring devices are indicated at a single location, they shall be installed under one multiple gang device plate and in an order appropriate to the location of the fixtures or devices being controlled.
- H. Duplex receptacles shall be mounted in a vertical position, unless noted otherwise on the Drawings.
- I. Wiring devices mounted over counters shall be installed above the countertop backsplashes and so as not to interfere with any cabinet work.
- J. Limit switches installed in hatches and doorways shall be securely mounted in a position that provides reliable operation. Contractor shall fabricate metal brackets or extensions as necessary to improve contact with actuator. All mounting hardware and brackets shall be 316 stainless steel.
- K. Limit switches installed in hatches and doorways shall be located so it does not impede access; or create a hazard with sharp edges or by snagging clothing.
- L. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for wiring devices. Where manufacturer's torqueing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standard 486A. Use properly scaled torque indicating hand tool.

3.2 Device Mounting Heights:

- A. Mounting Height: Subject to project requirements, install outlet boxes for wall mounted switches and receptacles at the following heights unless indicated otherwise on the plans. Dimensions given are from the finished floor (or grade) to the center of the outlet box:

1. Switches for lighting and equipment: 44 inches
2. Convenience receptacles in finished areas: 18 inches
3. Convenience receptacles adjacent to bathroom lavatories: 44 inches
4. Convenience receptacles in garages and utility rooms: 44 inches
5. Convenience receptacles above countertops and benches: 4 inches above back splash
6. Convenience receptacles on building exterior: Generally 24 inches but coordinate with siding or other exterior finish materials.
7. Convenience receptacles at exterior pedestals and equipment: 44 inches

3.3 Protection

- A. Protect installed components from damage. Replace damaged items prior to final acceptance.

3.4 Adjustments

- A. Program all automatic time switches to perform the scheduled operations as indicated on the plans or as directed by the Owner/Engineer during construction.
- B. Adjust limit switch actuators in accordance with manufacturer's instructions to obtain reliable operation and long life.

3.5 Field Quality Control

- A. Testing: Prior to energizing circuits, test wiring for electrical continuity, and for short-circuits. Ensure proper polarity of connections is maintained. Subsequent to energizing, test wiring devices and demonstrate compliance with requirements, operating each operable device at least six times.
- B. Test ground fault interrupter operation with both local and remote fault simulations in accordance with manufacturer recommendations.

END OF SECTION

SECTION 16142

ELECTRICAL CONNECTIONS FOR EQUIPMENT

1. GENERAL

1.1 Summary

- A. This Section describes the requirements of electrical power connections between conductors and to equipment.
- B. Electrical power connections described by this section apply to conductor connections operating at 600V or less including but not limited to:
 - 1. Conductor to conductor (splices)
 - 2. To wiring terminals of equipment including circuit breakers, panels, motor controllers, and wiring devices.
 - 3. To motors
 - 4. To low voltage transformers
 - 5. To lighting fixtures

1.2 Related Documents

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Electrical connections for equipment, not furnished as integral parts of equipment, are specified in Division 11, Division 13, Division 23 and other Division 26 sections, and are work of this section.
- C. Electrical connections to motor starters and controllers, not furnished as integral parts of equipment, are specified in applicable Division 26 sections, and are work of this section.
- D. Junction boxes and disconnect switches required for connecting motors and other electrical units of equipment are specified in applicable Division-26 sections, and are work of this section.
- E. Raceways and wires/cables required for connecting motors and other electrical units of equipment are specified in applicable Division-26 sections, and are work of this section.

- F. Refer to Section 260526 Grounding for connections of grounding electrode conductors and ground grids.

1.3 Submittals

- A. Refer to Division 1 and Division 26 Section “BASIC ELECTRICAL REQUIREMENTS” for administrative and procedural requirements for submittals.
- B. Submit product data for the following:
 - 1. Power distribution terminal blocks.
 - 2. Modular terminal blocks for control circuits.
 - 3. Splicing materials for conductors #6AWG and larger.

1.4 Quality Assurance

- A. Code Compliance: Product use and torque requirements shall comply with NFPA 70 "National Electrical Code."
- B. Comply with UL Standard 486 and subsections related to wiring connectors and splices.
- C. Comply with Product manufacturer’s installation requirements including torque values for securing conductors to terminals.
- D. Product Listing: Provide only products that are listed and labeled by UL, ETL, or CSA.

1.5 Delivery, Storage, And Handling

- A. Cable connectors and splice kits shall be kept in the original packaging material or otherwise protected from moisture, dirt, and abrasions that cause damage due to corrosion or extreme temperatures.

1.6 Sequencing And Scheduling

- A. Coordinate conductor connections with equipment installation and the general progress of the work.

2. PRODUCTS

2.1 Manufacturers

A. Subject to compliance with the requirements, provide products by the following:

1. Allen-Bradley
2. AMP Incorporated.
3. Appleton Electric Co.
4. Burndy Corporation.
5. Bussman
6. Crouse-Hinds
7. Hubbell Inc.
8. Ideal Industries, Inc.
9. IlSCO
10. Phoenix Contact
11. Square D Company.
12. Thomas and Betts Corp.
13. Or equal.

2.2 Materials And Components

- A. General: For each electrical connection indicated, provide complete assembly of materials, including but not necessarily limited to, pressure connectors, terminals (lugs), electrical insulating tape, electrical solder, electrical soldering flux, heat-shrinkable insulating tubing, cable ties, solderless wire-nuts, and other items and accessories as needed to complete splices and terminations of types indicated.
- B. Twist on Wire Connectors: All connectors shall be approved for grounding and bonding applications.
1. Interior Applications: Copolymer shell with metal conical spring insert for use in connecting copper conductors to #8AWG.
 2. Weatherproof Applications: Flame retardant shell with metal conical spring insert for use in connecting copper conductors to #8AWG UL listed for damp/wet locations. Provided with pre-filled 100% silicone based sealant.
 3. Underground Applications: Flame retardant shell with metal conical spring insert for use in connecting copper conductors to #8AWG UL listed for damp/wet and underground locations. Provided with pre-filled 100% silicone based sealant.

- C. Mechanical Lugs: Mechanical lugs shall be manufactured from 6061-T6 aluminum alloy, electro-tin plated, rated for 90 deg C, and shall be listed for use with aluminum and copper conductors. Provide multiple barrel lugs for parallel conductors.
 - 1. Mechanical Lugs for splicing conductors in above grade applications shall be provided with a 600V rated plastic coating with removable port and screw plugs. Coating shall be rated for -45 deg C. Each port shall be pre-filled with anti-oxidation compound.
- D. Compression lugs and splices for copper conductors shall be manufactured from high strength seamless copper tubing, electro-tin plated, and rated for 90 deg C. Dual rated AL/CU lugs and splices constructed of high strength aluminum alloy are acceptable for copper and aluminum conductors. Lugs and splices shall be marked with conductor size and the appropriate compression die to be used for proper installation.
- E. Crimp terminals and splices for conductors to #10AWG shall be manufactured from high strength copper alloy, electro-tin plated, color coded vinyl or nylon insulated, and UL listed for 600V, 105 deg C. Provide ring, forked with locking or flanged spade, or push on terminals as required.
- F. Splices for 600V Underground Conductors #6 AWG and Larger: Provide mechanical or compression inline connector with cast resin splice kit (3M Scotchcast or equal).
- G. Power Distribution Terminal Blocks: Provide 600V single or multi-conductor panel mount assemblies as required consisting of Al/Cu rated dual mechanical lugs mounted to or enclosed in a thermoplastic base. Lugs shall be constructed of tin plated, high copper content alloy. Terminal assembly shall be rated for 200 kA short circuit current when used with upstream fusing. Terminal assemblies shall be UL listed and provide the required spacing between uninsulated phase conductors in accordance with UL 1953 and UL508A. Terminals shall provide IP20 touch safe protection, or shall be provided with a plastic cover specifically designed for the assembly.
- H. Neutral and Grounding Terminal Assemblies for Branch Circuits: Provide uninsulated tin-plated, copper alloy bars for the termination of neutral and grounding conductors associated with branch circuits. Terminals shall be set screw compression designed to accommodate conductors from #14AWG to #6AWG. Bar shall include at least one lug for supply conductor that is sized in accordance with the amperage rating of the panel or equipment it is installed.
 - 1. Provide neutral bars with insulated mounting base where neutral bonding is not permitted by the NEC.

- I. Modular Terminals for Control Circuits: Terminal blocks installed in control panels shall be DIN rail mounted, IP20 touch safe, and consisting of tin plated copper alloy compression terminals with a pressure plate and captive screw, and enclosed in a molded self-extinguishing nylon (or polyamide) housing. Provide fused, feed thru, grounding, single or multi-level terminals as required. Terminals used for grounding conductors shall be colored green/yellow. Provide required accessories to form a complete installation including terminal bridges/jumpers, labels, end closing plates, and rail mounting clamps.
- J. Electrical Connection Accessories: Provide electrical insulating tape, heat-shrinkable insulating tubing and boots, electrical solder, electrical soldering flux, wire nuts and cable ties as recommended for use by accessories manufacturers for type services indicated.

3. EXECUTION

3.1 Inspection

- A. Inspect area and conditions under which electrical connections for equipment are to be installed and notify Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 Installation Of Electrical Connections

- A. Install electrical connections as indicated, in accordance with equipment manufacturer's written instructions and with recognized industry practices, and complying with applicable requirements of UL, NEC and NECA's "Standard of Installation" to ensure that products fulfill requirements.
- B. Coordinate with other work, including wires/cables, raceway and equipment installation, as necessary to properly interface installation of electrical connections for equipment with other work.
- C. Connect electrical power supply conductors to equipment conductors in accordance with equipment manufacturer's written instructions and wiring diagrams. Mate and match conductors of electrical connections for proper interface between electrical power supplies and installed equipment.
- D. Feeder and grounding conductors shall be installed continuous from terminal to terminal and only spliced only where necessary. The Contractor shall submit a request to the Engineer for permission to splice any feeder or associated grounding conductor unless instructions to provide a splice has been specifically identified on the plans.
- E. Below grade splices of feeder and branch circuits shall be avoided to the greatest extent possible. If required, and approved by the Engineer, provide products that are listed and approved for below grade and direct buried applications. Comply with the following:

1. All splices for conductors installed below grade shall be made in a concrete vault, or fiberglass reinforced concrete pull box.
 2. Feeder splices in conductors installed below grade shall be made with a cast resin splice kit.
 3. Branch circuit splices in conductors installed below grade shall be made with silicone filled wire nuts, or compression inline connector with heat shrink covering.
 4. All splices shall be water tight.
- F. Cover splices with electrical insulating material equivalent to, or of greater insulation resistivity rating, than electrical insulation rating of those conductors being spliced.
- G. Prepare cables and wires, by cutting and stripping covering armor, jacket, and insulation properly to ensure uniform and neat appearance where cables and wires are terminated. Exercise care to avoid cutting through tapes which will remain on conductors. Also avoid "ringing" copper conductors while skinning wire.
- H. Trim cables and wires as short as practicable and arrange routing to facilitate inspection, testing and maintenance.
- I. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturers published torque tightening values for equipment connectors. Accomplish tightening by utilizing proper torqueing tools, including torque screwdriver, beam-type torque wrench, and ratchet wrench with adjustable torque settings. Where manufacturer's torqueing requirements are not available, tighten connectors and terminals to comply with torqueing values contained in UL's 486A/B.
- J. Fasten identification markers to each electrical power supply wire/ cable conductor which indicates their voltage, phase and feeder number in accordance with Division-26 section "Electrical Identification". Affix markers on each terminal conductor, as close as possible to the point of connection.

3.3 Installation Of Terminal Assemblies

- A. Terminal blocks and assemblies shall be securely mounted to the interior of the enclosure being installed.
- B. Location of terminal assemblies shall be such as to comply with wire bending space requirements of the NEC and UL508A.

- C. DIN mounting rail shall be attached to metallic enclosure or mounting panel to assure proper bonding to the grounding system. DIN mounting rail in used in non-metallic enclosures shall be bonded by a grounding conductor.

3.4 Field Quality Control

- A. Upon completion of installation of electrical connections, and after circuitry has been energized with rated power source, test connections to demonstrate capability and compliance with requirements. Ensure that direction of rotation of each motor fulfills requirement. Correct malfunctioning units at site, then retest to demonstrate compliance.

END OF SECTION

SECTION 16170

CIRCUIT AND MOTOR DISCONNECTS

1. GENERAL

1.1 Summary

- A. This Section describe the requirements of electrical power disconnect switches for feeders and motors.

1.2 Related Documents

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Electrical disconnects for equipment, furnished with equipment specified in other sections shall comply with the requirements of this section.
- C. Motor starters and controllers furnished with equipment specified in other sections shall comply with the requirements of this section.
- D. Refer to Division 16 section Wiring Devices for single and two pole toggle switches used as a disconnecting means for fractional horsepower motors.
- E. Refer to Division 16 section Motor Controllers for combination type motor starters and variable frequency drives which incorporate disconnect switches in the same enclosure as the motor controller, and for manual motor starters.
- F. Refer to Division 16 section Electrical Identification for field labeling requirements.

1.3 Submittals

- A. Refer to Division 1 and Division 16 Section "BASIC ELECTRICAL REQUIREMENTS" for administrative and procedural requirements for submittals.
- B. Submit product data for each type of product specified.

1.4 Quality Assurance

- A. Code Compliance: Products and installation shall comply with the requirements of NFPA 70 "National Electrical Code."
- B. Comply with UL Standard 98 Enclosed and Dead-Front Switches
- C. Comply with NEMA Standard KS-1 Heavy Duty Enclosed and Dead-Front Switches (600V Maximum).
- D. Comply with Product manufacturer's installation requirements including torque values for securing conductors to terminals.
- E. Product Listing: Provide only products that are listed and labeled by UL or CSA.

1.5 Delivery, Storage, And Handling

- A. Store equipment in original packaging until ready for installation. Protect from damage due to construction activity, dirt, and moisture.

1.6 Sequencing And Scheduling

- A. Coordinate equipment installation with the general progress of the work.

2. PRODUCTS

2.1 Manufacturers

- A. Subject to compliance with the requirements, provide products by the following:

1. ABB
2. Allen-Bradley
3. Appleton Electric Co.
4. Crouse-Hinds
5. Cutler Hammer/Eaton Corp.
6. General Electric
7. Hubbell Inc.
8. Siemens
9. Square D Company.
10. Thomas and Betts Corp.
11. Or equal.

2.2 Circuit And Motor Disconnect Switches

- A. General: Provide circuit and motor disconnect switches in types, sizes, ratings, and enclosures as indicated. Provide NEMA 1 enclosures at all interior locations except as noted on the plans. Provide NEMA 3R or NEMA 4 enclosures with raintight hubs for outdoor locations and where weatherproof is noted on the plans. Provide NEMA 4X stainless steel or non-metallic enclosures where subject to corrosion, and where noted on the plans. Provide enclosures rated for Class I, Division 1 in designated areas indicated on the drawings.
- B. For motor and motor starter disconnects, provide units with horsepower ratings that are not less than the motor horsepower at the operating voltage.
- C. Switches shall have quick-make, quick-break operating mechanism and handle which shall be an integral part of the box and not the cover. Covers shall have dual interlocks to prevent unauthorized opening of the cover with the switch in the "ON" position or closing of the switching mechanism with the cover open.
- D. Switches shall be rated as heavy duty in accordance with NEMA Standard KS-1 unless otherwise specified.
- E. Switches used as the service entrance disconnecting means shall be service entrance rated.
- F. Switches shall have clearly marked on and off positions.
- G. Safety switches shall have switch blades visible in the "OFF" position when the cover is open. Disconnect switches shall have permanently attached arc suppressors hinged or otherwise attached to permit easy access to the line side lugs without removal of the arc suppressors.

- H. Enclosed rotary switches shall be permitted for use as equipment disconnecting means. Rotary switches shall be non-fused and rated for making or breaking loads.
- I. Single or two pole, horsepower rated, toggle switches shall be permitted for use as disconnecting means for fractional horsepower mechanical equipment.
- J. Safety and rotary type disconnect switches shall have provisions for padlocking in the "OFF" position, with three padlocks. Toggle switches shall be provided with a plate having permanently attached provisions for accepting a lock.
- K. Provide switches capable of being locked in both the "ON" and "OFF" position in outdoor locations with public access where indicated on the plans.
- L. Switch cable lugs shall be U.L. approved for copper and aluminum cables. All current carrying parts shall be plated by electrolytic process.
- M. Switches with metal enclosures shall be code gauge steel with rust inhibiting phosphate primer and baked enamel finish. Provide Stainless steel switches were specified.
- N. Rotary type switches with non-metallic enclosures shall be corrosion resistant NEMA 4X, 12 and IP69K rated. Enclosure shall be constructed of thermoplastic polyester resin. Cover shall form a water-tight seal by means of a neoprene gasket, and fastened with stainless steel screws. Switch shall have high visibility red lockable handle. Fusible Switches: Heavy duty switches, with fuses of classes and current ratings indicated. Where current limiting fuses are indicated, provide switches with non-interchangeable feature suitable only for current limiting type fuses, 200,000 AIC rated.
- O. Non-fusible Disconnects: Heavy duty switches of classes and current ratings as indicated, 10,000 AIC rated.

2.3 Switches For Classified (Hazardous) Locations:

- A. Heavy duty switches, with UL labels and listings for hazardous location classifications in which installed. Switching devices with hermetically sealed contacts are acceptable for lighting and equipment service disconnects.

3. EXECUTION

3.1 Installation Of Circuit And Motor Disconnects

- A. General: Provide circuit and motor disconnect switches as indicated and where required by the National Electric Code. Comply with switch manufacturers' printed installation instructions.
- B. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturers published torque tightening values for equipment connectors.

3.2 Identification

- A. Label all circuit and motor disconnect switches with the name of the equipment, the voltage, and the name of the power source with circuit number. The label shall include the location of the power source if it is not in the same room or not in direct line of site.

3.3 Field Quality Control

- A. Testing: Subsequent to completion of installation of electrical disconnect switches, energize circuits and demonstrate capability and compliance with requirements. Except as otherwise indicated, do not test switches by operating them under load. However, demonstrate switch operation through six opening/closing cycles with circuit unloaded. Open each switch enclosure for inspection of interior, mechanical and electrical connections, fuse installation, and for verification of type and rating of fuses installed. Correct deficiencies then retest to demonstrate compliance. Remove and replace defective units with new units and retest.

END OF SECTION

SECTION 16190
SUPPORTING DEVICES

1. GENERAL

1.1 Summary

- A. This Section describes the requirements for secure supporting of electrical equipment items by means of hangers, channel, clamps, and fasteners.

1.2 Related Documents

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Refer to Division 5 section "Miscellaneous Metals" for metal items used for supports and fastening equipment and materials.
- C. Refer to Division 26 section "Raceways" for specific requirements related to support of electrical conduit and other conductor raceways.

1.3 Submittals

- A. Product submittals are generally not required for supporting materials unless specifically noted on the drawings.

1.4 Quality Assurance

- A. Code Compliance: Products and installation shall comply with the requirements of NFPA 70 "National Electrical Code."
- B. Product materials shall comply with the applicable ASTM standards for metals and coatings.
- C. All products shall be suitable for the location which they are installed with respect to safety, durability, and longevity due to the effects of corrosion.

1.5 Sequencing And Scheduling

- A. Coordinate installation of supporting devices with the general progress of the work.

2. PRODUCTS

2.1 Manufacturers

- A. U-Channel Systems and Related Accessories: Subject to compliance with the requirements, provide products by the following:
1. Atkore International: Power-Strut, Unistrut
 2. Cooper Industries: B-Line
 3. Thomas and Betts Corp.: Kindorf, Superstrut
 4. Or equal.

2.2 Materials

- A. Indoor Dry Locations:
1. Supports, support hardware, and fasteners shall be protected with zinc coating or with treatment of equivalent corrosion resistance using approved alternative treatment, finish, or inherent material characteristic.
- B. Corrosive Locations (Includes Headworks Room, wet wells, below grade vaults, UV Room, and all interior and exterior locations with open channel or tanks):
1. Supports and support hardware shall be 304 stainless steel.
- C. Outdoors (non-corrosive):
1. Supports and support hardware shall be hot-dipped galvanized with stainless steel fasteners.

2.3 Manufactured Supporting Devices

- A. Raceway Supports: Hangers, clamps, straps, fasteners, and threaded rod:
1. Provide raceway clamps and straps that are specifically designed for electrical conduit and tubing, in sizes matching the raceway diameter.
 2. Raceway supports shall be constructed of materials that are suitable for the environment with regards to corrosion.

3. Threaded rod used for support of raceways shall have continuous ANSI standard thread for the entire length. Rod shall be low carbon steel or stainless steel in accordance with the material requirements specified for raceway supports.

B. U-Channel Systems:

1. Steel channels shall be 12 gauge, cold formed from hot rolled pickled and oiled strip steel.
2. Channels shall be slotted. Provide 1-5/8" x 13/16" or 1-5/8" as appropriate for weight and application.
3. Fittings including angle brackets, splice plates, connectors, floor mounting bases, and similar, shall be of the same manufacturer and material as the U-channel.

3. EXECUTION

3.1 Installation

- A. Install supporting devices to fasten electrical components securely and permanently in accordance with NEC requirements.
- B. Coordinate with the building structural system and with other electrical installation.
- C. Raceway Supports: Comply with the NEC and the following requirements:
 1. Conform to manufacturer's recommendations for selection and installation of supports.
 2. Strength of each support shall be adequate to carry present and future load multiplied by a safety factor of at least four. Where this determination results in a safety allowance of less than 200 lbs, provide additional strength until there is a minimum of 200 lbs safety allowance in the strength of each support.
 3. Install individual and multiple (trapeze) raceway hangers and riser clamps as necessary to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
 4. Support parallel runs of horizontal raceways together on trapeze-type hangers.

5. Support individual horizontal raceways by separate pipe hangers. Spring steel fasteners may be used in lieu of hangers only for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings only. For hanger rods with spring steel fasteners, use 1/4-inch-diameter or larger threaded steel. Use spring steel fasteners that are specifically designed for supporting single conduits or tubing. Space supports for raceways in accordance with NEC requirements.
 6. Support exposed and concealed raceway within 1 foot of an unsupported box and access fittings. In horizontal runs, support at the box and access fittings may be omitted where box or access fittings are independently supported and raceway terminals are not made with chase nipples or threadless box connectors.
- D. Miscellaneous Supports: Support miscellaneous electrical components as required to produce the same structural safety factors as specified for raceway supports. Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices.
- E. In open overhead spaces, cast boxes threaded to raceways need not be supported separately except where used for fixture support. Support sheet metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved type of fastener not more than 24 inches from the box.
- F. Fastening: Unless otherwise indicated, fasten electrical items and their supporting hardware securely to the building structure, including but not limited to conduits, raceways, cables, cable trays, busways, cabinets, panelboards, transformers, boxes, disconnect switches, and control components in accordance with the following:
- G. Fasten by means of wood screws or screw-type nails on wood, toggle bolts on hollow masonry units, concrete inserts or expansion bolts on concrete or solid masonry, and machine screws, welded threaded studs, or spring-tension clamps on steel. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts and machine or wood screws. Do not weld conduit, pipe straps, or items other than threaded studs to steel structures. In partitions of light steel construction, use sheet metal screws.
- H. Holes drilled for anchors in concrete shall not cut the main reinforcing bars. Fill holes that are not used.
1. Ensure that the load applied to any fastener does not exceed 25 percent of the proof test load.
 2. All fasteners shall have ANSI standard thread. Provide metric thread only where specifically required for the equipment being secured.

3. Typical fastener assembly shall include flat or fender washer, spring coil or toothed lock washer, and hex nut. Provide locking hex nut with nylon insert in areas subject to severe vibration.
- I. All supporting device materials shall be selected and installed a manner to reduce injury to personnel to the greatest extent possible.
 1. Conduit straps, supports, and fasteners along walkways, ladders, and other routes used for personnel access shall have no sharp edges or protruding elements that could cause injury or snag clothing. Use one hole straps wherever possible.
 2. Trim all excess of bolts and threaded rods flush with end nut to reduce personal injury. Where excess thread is required for adjustment, provide vinyl safety cap.
 - J. Galvanized Metal: Apply zinc cold galvanizing spray coating to metal hangers and supports where the galvanizing has been damaged by cutting during installation. Coat ends of U-channel supports and the like. Spray shall conform to ASTM A780 specifications. Spray color shall closely match color of original finish. (Clearco Silvercoat Bright or equal). Spray shall be applied in a neat manner with minimal overspray on non-damaged areas.

END OF SECTION

SECTION 16195

ELECTRICAL IDENTIFICATION

1. GENERAL

1.1 Summary

- A. This Section includes identification of electrical materials, equipment, and installations. It includes requirements for electrical identification components including but not limited to the following:
 - 1. Buried electrical line warnings.
 - 2. Identification labeling for cables and conductors.
 - 3. Operational instruction signs.
 - 4. Warning and caution signs.
 - 5. Equipment labels and signs.

1.2 Related Documents

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Division 9 Section “Painting” for related identification requirements.
- C. Division 26 Section “Wires and Cables” for color coding of conductors for identification.

1.3 Submittals

- A. Refer to Division 1 and Division 26 Section “BASIC ELECTRICAL REQUIREMENTS” for administrative and procedural requirements for submittals.
- B. Submit product data for the following:
 - 1. Electrical caution tape for underground installations.
 - 2. Text of all engraved nameplates that are not submitted for review under other sections. (Nameplates submitted for review elsewhere as part of submittals for electrical panels, control panels, etc., do not need to be submitted separately under this section).

3. Product data for all specified danger, warning and caution signs.
4. Product data for field applied labels including tape color and width, text color and height.

1.4 Quality Assurance

- A. Code Compliance: Products and installation shall comply with the requirements of NFPA 70 "National Electrical Code, and NFPA 70E "Standard for Electrical Safety in the Workplace", and OSHA.
- B. ANSI/NEMA Compliance: Products shall comply with the requirements of Standard Z535 and related subsections.

1.5 Sequencing And Scheduling

- A. Coordinate installation of identification labeling with the general progress of the work.
- B. Components and equipment that are energized or placed in service shall be properly labeled with all Code required safety information such as voltage and source of power. It is unacceptable to delay the application of safety related information until the end of project.

2. PRODUCTS

2.1 Manufacturers

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 1. Brady Worldwide, Inc.
 2. Brimar Industries, Inc.
 3. Global Industrial Inc.
 4. Ideal Industries, Inc.
 5. Lablemaster, inc.
 6. Panduit Corp.
 7. Seton Co.
 8. Or equal.

2.2 Electrical Identification Products

- A. Underground Line Marking Tape: Permanent, bright-colored, continuous-printed, metallic detectable tape compounded for direct-burial service not less than 6 inches wide by 4 mils thick. Printed legend indicative of general type of underground line below.
- B. Wire/Cable Designation Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound, cable/conductor markers with preprinted numbers and letter.
- C. Plasticized Card Stock Tags: 15 Mil double sided matte vinyl with metal grommet and nylon tie. Tags shall include ANSI standard colors, text, and graphics, and satisfy OSHA and NFPA 70E requirements.
- D. Engraved, Plastic Laminate Labels, Signs, and Instruction Plates: Engraving stock 3 ply plastic laminate, typically 1" high, and 3" in length or as required for text. Provide engraved legend in white letters on black face and punched for mechanical fasteners.
- E. Factory Printed Labels with Adhesive Backing: Labels shall be vinyl with permanent, weather, sunlight, and chemical resistant ink. Labels shall comply with ANSI Z35.4-2011.
- F. Field Printed Labels with Adhesive Backing: Labels shall be vinyl with permanent, weather, sunlight, and chemical resistant dry thermal transfer ink. Labels shall be 3/4" high and white with 1/4" high black lettering unless indicated otherwise.
- G. Baked-Enamel Danger, Warning and Caution Signs for Interior or Exterior Use: Preprinted 40 mil aluminum signs, punched for fasteners, with colors, legend, and size appropriate to the location.
- H. Fasteners for Laminated Plastic Nameplates and Metal Signs: Self-tapping stainless steel screws or number 10/32 stainless steel machine screws with nuts and flat and lock washers.

3. EXECUTION

3.1 Installation

- A. Lettering and Graphics: Coordinate names, abbreviations, colors, and other designations used in electrical identification work with corresponding designations specified or indicated. Install numbers, lettering, and colors as approved in submittals and as required by code.
- B. Install identification signs and labels in accordance with manufacturer's written instructions and the requirements of NEC. The requirements of this section do not relieve the Contractor from supplying identification required by the NEC or other codes.

- C. Sequence of Work: Where identification is to be applied to surfaces that require finish, install identification after completion of finish work.
- D. Install permanent or temporary identification signs and labels when equipment is placed into service for the safety of personnel and operation of the equipment. Identification products damaged during construction shall be replaced at project completion.
- E. Install labels at locations indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment.
- F. Field printed adhesive backed labels shall be used to provide additional information regarding equipment such as identifying source panel and circuit numbers, and the function of each switch in grouped installations. They shall not be used as a substitute for engraved plastic name plates that are required elsewhere in these specifications.
- G. Equipment Identification: Apply equipment identification labels of engraved plastic laminate on each major unit of electrical equipment in building. This includes communication/signal/alarm systems, unless unit is specified with its own self-explanatory identification. Provide single line of text, with $\frac{1}{4}$ " high lettering on 1" high nameplate (2-inch-high where two lines are required), white lettering in black field. Text shall match terminology and numbering of the Contract Documents and shop drawings. Nameplates shall be secured with stainless steel fasteners or suitable two part epoxy. Apply nameplates for each unit of the following categories of electrical equipment.
 - 1. Panelboards, electrical cabinets, and enclosures
 - 2. Disconnect switches
 - 3. Electrical switchgear and switchboards
 - 4. Motor control centers
 - 5. Motor starters and VFDs
 - 6. Pushbutton stations
 - 7. Contactors
 - 8. Dry type transformers
 - 9. Access doors and panels for concealed electrical items
- H. High Leg Marking: On 4-wire delta connected systems where the midpoint of one phase is grounded, the conductor or busbar having the higher voltage to ground shall be permanently marked orange. Electrical service equipment and panels having this condition shall be permanently identified as such by a field applied label on the cover.
- I. Available Fault Current: Service equipment shall be legibly marked to indicate the maximum available fault current, and the date the calculation was made. Label shall be field applied, vinyl adhesive with minimum $\frac{1}{4}$ " high lettering. Contractor shall request fault current information from the engineer or the utility company representative.

- J. Arc-Flash Hazard Warning: Electrical equipment such as switchboards, switchgear, panelboards, industrial control panels, meter socket enclosures, motor control centers, motor controllers, and other equipment that is likely to require examination, adjustment, servicing, or maintenance while energized shall be field or factory marked to warn persons of potential arc-flash hazards in compliance with the requirements of the NEC. Label shall adequately warn of the hazard using effective words, colors, and/or symbols in accordance with ANSI Z35.4-2011.
- K. Service Disconnecting Means: The disconnecting means for electrical services and feeders supplying buildings shall be clearly identified as such with engraved nameplate with minimum 1/4" high lettering.
- L. Other Disconnecting Means: Each disconnecting means for equipment shall be legibly marked to indicate its purpose. Equipment name used on the disconnect label shall exactly match the name of the equipment as marked in the field. Label shall be field applied, vinyl adhesive with minimum 1/4" high lettering.
- M. Motors: Each motor or motor driven equipment shall be clearly marked with identification that matches the labeling on the disconnecting means, unless located and arranged such that the associated disconnecting means is evident. Label shall be field applied, vinyl adhesive with minimum 1/4" high lettering. Do not apply a second identification label on the equipment where labeled by equipment supplier.
- N. Series Combination Systems: Where permitted by the specifications, equipment enclosures containing engineered series combination systems shall be field marked in accordance with NEC requirements to identify that a series rating has been applied.
- O. Ground Fault Protection: Label all branch circuits and receptacles protected by an upstream ground fault device in accordance with NEC.
- P. Voltage and Phase of Conductors: Refer to Section 260519 Wires and Cables for identification requirements.
- Q. Identification of Junction, Pull, and Connection Boxes for Feeders: Install factory printed labels indicating voltage of conductors contained with the box. Labels shall be 2-1/4" high with black text and orange background. Install field printed adhesive label to identify origin and destination of conductors. Install labeling on outside of box cover.
- R. Branch Circuit Identification at Junction Boxes: Junction boxes containing branch circuit conductors shall be field marked to indicate the panel and circuit numbers of the enclosed conductors. Marking shall be by field applied vinyl adhesive label on the exterior side of the cover. In concealed and unfinished spaces, circuit information may be legibly written on the box cover with a permanent black marker.

- S. Underground Electrical Line Identification: During trench backfilling, for exterior underground power, signal, and communications lines, install continuous underground plastic line marker, located directly above line at 6 to 8 inches below finished grade. Where multiple lines installed in a common trench or concrete envelope, do not exceed an overall width of 16 inches; install a single line marker.
- T. Spare Conductor Information: Spare conductors and cables installed for future use shall be clearly marked with identification indicating source, and circuit numbers or purpose. Match identification markings with designations used in panelboards shop drawings, Contract Documents, and similar previously established identification schemes for the facility's electrical installations.
- U. Receptacles: Install field printed 3/8" high clear adhesive backed label with black text at each receptacle plate that identifies the receptacle source panel and circuit number. Apply label to top of the wall plate, directly above the switch, and level.
- V. Lighting Switches: Install field printed 3/8" high clear adhesive backed label with black text at each multi-gang lighting switch assembly, or at adjacent switches installed in separate boxes, to indicate the purpose of the switch where it is not apparent. Apply label to top center of the wall plate and level.
- W. Communication System: All junction and terminal boxes containing communication cables shall be clearly identified as "Communication System" with a field applied vinyl label. Label shall be white vinyl adhesive with minimum 1/4" high black text. A second label shall be applied to indicate the specific system or equipment the cabling is associated with.

END OF SECTION

SECTION 16420

SERVICE ENTRANCE

1. GENERAL

1.1 Summary

- A. This Section describes the requirements for electrical service entrance installations, including the responsibilities of the Contractor and Electric Utility Company.
- B. The requirements of this section apply to all work from the connection point at the Electric Utility Company equipment to the building or structure service disconnecting means.

1.2 Related Documents

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Refer to applicable Division 2 sections for specific requirements related to excavation and backfill for electrical conduit and equipment installation.
- C. Refer to Division 26 section "Raceways" for specific requirements related to electrical conduit and installation.
- D. Refer to Division 26 section "Grounding" for specific requirements related to grounding equipment and conductors.

1.3 Submittals

- A. Product Data: Submit manufacturer's data on meter socket enclosures, including fault current ratings, circuit breakers, quantities and types.

1.4 Quality Assurance

- B. Codes and Standards:
 - 1. Electrical Code Compliance: Comply with applicable local code requirements of the authority having jurisdiction and NEC, including Articles 230, 250, and 338, as applicable to installation, and construction of service-entrances.

2. Utility Company Standards: Comply with local utility company standards (Green Mountain Power).

1.5 Sequencing And Scheduling

- A. Schedule installation of service-entrance conduit, and equipment with utility company and the work of other trades.
- B. Coordinate the size and location of metering equipment with utility company and project site conditions.
- C. Coordinate locations of all electric utility structures including pads, vaults, and junction boxes with utility company and project site conditions.
- D. Coordinate with other electrical work including raceways, electrical boxes and fittings, and cabling/wiring work, as necessary to interface installation of service-entrance work with other work.

2. PRODUCTS

2.1 Manufacturers

- A. Manufacturers: Subject to compliance with requirements, provide meter socket products of one of the following:
 1. Midwest
 2. Millbank
 3. General Electric Company
 4. Square D Company.
 5. Cutler-Hammer
 6. Siemens

2.2 Meter Sockets

- A. General: Provide meter sockets, enclosures and ancillary components, of types, sizes, and ratings indicated, which comply with the local utility company requirements. Equip with proper number of over current devices as indicated on the drawings and as required for complete installation. Where types, sizes, or ratings are not indicated, comply with NEC, UL and established industry standards for those applications indicated.

3. EXECUTION

3.1 Examination

- A. Examine areas and conditions under which service-entrance equipment and components are to be installed, and notify engineer of conditions detrimental to proper completion of the work. Do not proceed with the work until satisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 Installation Of Service-Entrance Equipment

- A. Install service-entrance equipment as indicated, in accordance with the Utility Company requirements, equipment manufacturer's written instructions, and with recognized industry practices, to ensure that service-entrance equipment fulfills requirements. Comply with applicable installation requirements of NEC and NEMA standards.
- B. Furnish and Install fuses, if any, in service-entrance equipment.
- C. Set field-adjustable and circuit breakers for pickup and time-current sensitivity ranges as indicated, subsequent to installation of devices and CB's.
- D. Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torqueing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds 486A and B, and the National Electrical Code.
- E. Provide a label on service entrance disconnect that identifies the available fault current in accordance with NEC requirements. The information shall be obtained from the Utility Company or the Engineer.

3.3 Utility Company Coordination

- A. Subject to the requirements of the Project, the Utility Company (Green Mountain Power - GMP) shall be responsible for the following:
 - 1. Providing trench, conduit, and backfill specifications.
 - 2. Installation of Contractor supplied conduit and supports on utility pole.
 - 3. Connecting secondary service conductors at transformer.
 - 4. Inspecting conduit installations.

5. Disconnection of existing service conductors at transformer.
6. Removal of existing utility pole, transformers, and overhead lines.

B. Subject to the requirements of the Project, the Contractor will be responsible for:

1. Scheduling all work and equipment deliveries in advance with GMP prior to any required installations.
2. Scheduling all power outages in advance with Owner.
3. Furnishing and installing pedestals and racks to support outdoor, above grade, service entrance equipment.
4. Furnishing conduit and supports for utility pole riser in accordance with Utility Company Standards.
5. Providing trench and backfill under inspection of GMP personnel.
6. Furnishing and installing all underground conduits including trenching.
7. Providing and installing trench electrical warning tape.
8. Construction of all conduit banks.
9. Furnishing and installing meter socket and associated conduit.
10. Notifying GMP for inspector prior to backfilling conduit installation.
11. Removal of existing service conductors and equipment.
12. The Owner will assume ownership after system is energized.
13. The Owner shall pay Utility Company charge for connection of the new plant electrical service to GMP.

3.4 Field Quality Control

- A. Prior to energization of service-entrance equipment, check accessible connections for compliance to manufacturer's torque tightening specifications.
- B. Prior to energization of service-entrance equipment, check with ground resistance tester, phase-to-phase and phase-to-ground insulation resistance levels to ensure requirements are fulfilled.
 - 1. Prior to energization, check circuitry for electrical continuity, and for short-circuits.

3.5 Grounding

- A. Provide equipment grounding connections for service-entrance equipment as indicated. Tighten connections to comply with tightening torques specified in UL Std 486A to assure permanent and effective grounding.

3.6 Adjusting And Cleaning

- B. Adjust operating mechanisms for free mechanical movement.
- C. Touch-up scratched or marred enclosure surfaces to match original finishes.

3.7 Demonstration

- A. Upon completion of installation of service-entrance equipment and electrical circuitry, energize circuitry and demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and retest to demonstrate compliance.

END OF SECTION

SECTION 16450

GROUNDING

1. GENERAL

1.1 Summary

- A. This Section describes the requirements of electrical grounding and bonding work pertaining to all electrical systems and equipment.
- B. The extent of the electrical grounding and bonding work includes the following:
 - 1. Furnishing and installing all grounding/bonding conductors and equipment specifically indicated on the Contract drawings and specifications.
 - 2. Furnishing and installing all grounding/bonding conductors and equipment required by manufacturer's installation instructions for equipment provided as part of the Project.
 - 3. Furnishing and installing all grounding/bonding conductors and equipment not specifically indicated on the Contract drawings and specifications, but required by the National Electrical Code.

1.2 Related Documents

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Refer to Section 264100 Lightning Protection System for specific requirements related to lightning protection system grounding conductors and electrodes.

1.3 Submittals

- A. Refer to Division 1 and Division 26 Section "BASIC ELECTRICAL REQUIREMENTS" for administrative and procedural requirements for submittals.
- B. Product Data: Submit manufacturer's data on grounding and bonding products and associated accessories.

1.4 Quality Assurance

- A. Code Compliance: Comply with applicable local electrical code requirements of the authority having jurisdiction, and NEC as applicable to electrical grounding and bonding, pertaining to systems, circuits and equipment.
- B. UL Compliance: Comply with applicable requirements of UL Standards No.'s 467, "Electrical Grounding and Bonding Equipment", UL Std 486A, "Wire Connectors", and 869A "Electrical Service Equipment", pertaining to grounding and bonding of systems, circuits and equipment.
- C. Product Listing: Provide only products that are listed and labeled by UL, ETL, or CSA.
- D. Work shall be performed in accordance with the National Electrical Contractors Association (NECA) National Electrical Installation Standards (NEIS), and in accordance with recognized industry practices.

1.5 Delivery, Storage, And Handling

- A. Store all wire and cable on spools until time of installation, and protect conductor insulation from damage. Conductors with damaged insulation should not be installed.
- B. Conductors stored outside shall be wrapped in plastic and shall have ends sealed to prevent entrance of moisture and dirt.
- C. Protect installed conductors from damage. Bundle and coil within the equipment enclosure or junction box until ready for termination.

1.6 SEQUENCING AND SCHEDULING

- A. Coordinate the installation of grounding conductors and equipment with site work, the construction of concrete foundations and slabs, structural steel, and walls.

2. PRODUCTS

2.1 Manufacturers

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering grounding and bonding products which may be incorporated in the work include, but are not limited to, the following:

1. Arlington Industries
2. Burndy Corporation.
3. Erico Products Inc. (Cadweld)
4. Crouse Hinds - Cooper Industries.
5. Harger Lightning & Grounding
6. Ideal Industries, Inc.
7. Joslyn Corporation.
8. OZ Gedney - Emerson Corp.
9. Thomas and Betts Corp.
10. Or equal.

2.2 Grounding And Bonding

- A. General: Provide electrical grounding and bonding systems indicated or required; with assembly of materials including cables/wires, connectors, solderless lug terminals, grounding electrodes and plate electrodes, bonding jumper braid, surge arresters, and additional accessories needed for a complete installation. Where materials or components are not indicated nor specified, provide products which comply with NEC, UL, and IEEE requirements and with established industry standards for those applications indicated.
- B. Grounding Conductors: All conductors shall be copper unless specifically noted on the drawings. Provide copper conductors with conductivity of not less than 98% at 20 degrees C (68 degrees F). Conductors shall be solid or stranded to match phase conductors, or as required by the NEC.
- C. Bonding Jumper Braid: Copper braided tape, constructed of 30-gage bare copper wires and properly sized for indicated applications.
- D. Flexible Jumper Strap: Flexible flat conductor, 480 strands of 30-gage bare copper wire; 3/4" wide, 9-1/2" long; 48,250 CM. Select braid with holes sized for 3/8" diameter bolts and protect braid with copper bolt hole ends.
- E. Grounding Electrodes: Steel with copper welded exterior, 3/4" dia. by 10 feet.
- F. Electrical Grounding Connection Accessories: Provide electrical insulating tape, heat-shrinkable insulating tubing, welding materials, bonding straps, as recommended by accessories manufacturers for type service indicated.
- G. Irreversible Compression Connections: Utilize connector manufacturer's tools and dies that have been specifically designed for the connection type and conductor size. All connectors shall be pre-formed, pure wrought copper, engraved with the manufacturer's name, model number, conductor size range, and listing. (Burndy Hyground products or equal).

- H. Field Welded Connections: Comply with manufacturer's for procedures, appearance, and quality of welds. (NVent Enrico Cadweld products or equal).
- I. Intersystem Bonding: Provide multi-terminal grounding bridge suitable for bonding telecommunications systems to the building ground electrode system.

3. EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions under which electrical grounding and bonding connections are to be made. Do not proceed until conditions are suitable for proper completion of work.

3.2 INSTALLATION OF ELECTRICAL GROUNDING AND BONDING SYSTEMS

- A. General: Install electrical grounding and bonding systems as indicated, and in accordance with manufacturer's instructions and applicable portions of NEC.
- B. Coordinate with other electrical work as necessary to interface the installation of electrical grounding and bonding system work with other work.
- C. Grounding conductor connections conductor to conductor, or conductor to grounding electrode, shall be made with an irreversible compression connector or welded.
- D. Ground electrical service system neutral at service entrance equipment to grounding electrodes.
- E. The grounding electrode system shall connect to the following if present at the building or structure:
 - 1. Metal underground water pipe
 - 2. Metal frame of the building or structure
 - 3. Foundation rebar (if accessible)
 - 4. Ground rings
 - 5. Ground rods
- F. Bond system grounded conductors (neutral), service equipment enclosures, exposed noncurrent carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, telecommunication systems, and mechanical systems, to the building or structure grounding electrode system.

- G. The following systems and equipment shall be grounded/bonded where applicable to the Project:
1. Metal structures and building components
 2. Metal piping and raceways
 3. Metal ducts
 4. Metal stairs and platforms serving equipment
 5. AC and DC electrical power systems
 6. Service entrance equipment
 7. Metal enclosures housing electrical equipment and wiring
 8. Data systems
 9. Communication systems
 10. Alarm systems
 11. Surge protection devices
 12. Separately derived systems
 13. Auxiliary power systems
 14. Lighting poles
 15. Antenna supports and masts
- H. An equipment ground conductor shall be installed in all raceway systems. Ground conductor sizes shall be in accordance with the National Electrical Code and/or as indicated on the Drawings.
- I. Terminate feeder and branch circuit equipment grounding conductors at listed grounding lugs or terminals.
- J. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torquing requirements are not indicated, tighten connections to comply with tightening torque values specified in UL 486A to assure permanent and effective grounding.
- K. Install braided type bonding jumpers with code-sized ground clamps on water meter piping to electrically bypass water meters.
- L. Grounding electrode, grounding equipment, and bonding conductors shall be routed to minimize length, be properly secured and protected, properly identified, concealed where permitted, and installed in a neat workmanlike manner.
- M. Grounding electrode conductors shall not be spliced unless necessary and permitted by the NEC. Where required, splices shall be made with compression connectors or exothermic welding products.

- N. Grounding electrode conductors passing through floor slabs, walls, etc., shall be sleeved in rigid non-metallic conduit.
- O. Bare copper conductors shall not be installed in soils containing cinders or other corrosive material.
- P. Conductors shall be installed without sharp bends and enough slack to reduce stress on connections and to permit flexibility where required.
- Q. All grounding conductors subject to mechanical damage shall be protected by rigid steel conduit or other suitable steel guards effectively grounded to the enclosure at each end of its length.
- R. Install clamp-on connectors on clean metal contact surfaces, to ensure electrical conductivity and circuit integrity.
- S. Connections to water pipes, including water meter or other similar device bypass connections, shall be made only after the surface of the pipe at the point of connection has been thoroughly cleaned and brightened and immediately prior to actually making the connection the contact surfaces are to be coated with an anti-oxidizing compound that is suitable for the materials."
- T. All equipment ground bus, ground pads, frames, enclosures, etc. shall have the connection surfaces thoroughly cleaned and brightened just prior to actually making the connection. Touch-up exposed painted surfaces that have been damaged by the connection preparation.

3.3 FIELD QUALITY CONTROL

- A. Underground and concrete encased grounding electrode systems shall be approved by the Engineer prior to being buried or encased.
- B. Visually inspect all grounding system connections to assure all work is complete prior to installing covers and placing equipment into service.
- C. Retighten all grounding conductor lugs at service entrance equipment, electrical panels, transformers, motor controllers, and other major equipment items to manufacturer's recommended torque specification prior to placing into service.

END OF SECTION

SECTION 16495

TRANSFER SWITCHES

1. GENERAL

1.1 Summary

- A. This Section describes the requirements of electrical power transfer switches rated 600V and less of the following types:
 - 1. Automatic Transfer Switches

1.2 Related Documents

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Refer to Division 26 section “GENERATORS” for related requirements pertaining to auxiliary power systems.
- C. Refer to Division 26 section Electrical Identification for field labeling requirements.

1.3 Submittals

- A. Refer to Division 1 and Division 26 Section “BASIC ELECTRICALREQUIREMENTS” for administrative and procedural requirements for submittals.
- B. Submit product information including the following:
- C. Product data for each transfer switch including general description, features, options, all electrical ratings, listings and approvals. All supplied options shall be clearly identified.
- D. Dimensioned plans, sections, and elevations showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and materials lists.
- E. Wiring diagrams, elementary or schematic, differentiating between manufacturer-installed and field-installed wiring.

- F. Operation and maintenance data for products: Operating and maintenance data shall cover each type of product, including all features and operating sequences, both automatic and manual. List all factory settings of relays and provide relay setting and calibration instructions. Provide spare parts data.

1.4 Quality Assurance

- A. Code Compliance: Products and installation shall comply with the requirements of NFPA 70 "National Electrical Code."
- B. UL Compliance: Equipment shall be listed for use as service equipment and shall comply with UL1008, "Standard for Automatic Transfer Switches for Use in Emergency Standby Systems".
- C. NFPA Compliance: Equipment shall comply with the following:
- D. NFPA 99, "Essential Electrical Systems for Health Care Facilities".
- E. NFPA 110, "Emergency and Standby Power Systems".
- F. IEEE Compliance: Standard 446, "IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications".
- G. NEMA Compliance: Standard ICS 10-2005, "Electromechanical AC Transfer Switch Equipment".
- H. IEC Compliance: Equipment shall comply with the following:
 - 1. IEC 60947-6-1, Low Voltage Switchgear and Control Gear; Multifunction Equipment; Automatic Transfer Switching Equipment
 - 2. EN61000-4-5 Surge Immunity Class 4 (voltage sensing and programmable inputs only)
 - 3. CISPR 11, Radiated Emissions
 - 4. IEC 1000-4-2, Electrostatic Discharge
 - 5. IEC 1000-4-3, Radiated Electromagnetic Fields
 - 6. IEC 1000-4-4, Electrical Fast Transients (Bursts)
 - 7. IEC 1000-4-5, Surge Voltage
 - 8. IEC 1000-4-6, Conducted RF Disturbances
 - 9. IEC 1000-4-8, Magnetic Fields
 - 10. IEC 1000-4-11, Voltage Dips and Interruption

1.5 Warranty

- A. Automatic transfer switches shall be guaranteed to be free from electrical and mechanical defects for a period of two years after final acceptance. Any replacement parts or adjustments, including labor made necessary by such defects or adjustments, shall be rectified without cost to the Owner, and to the satisfaction of the Engineer.

1.6 Delivery, Storage, And Handling

- A. Store equipment in original packaging until ready for installation. Protect from damage due to construction activity, dirt, and moisture.

1.7 Sequencing And Scheduling

- A. Coordinate equipment installation with the general progress of the work.

2. PRODUCTS

2.1 Manufacturers

- B. This specification describes the features of an ASCO/Schneider Electric Series 7000 automatic transfer switch. Subject to compliance with the requirements, provide products by the following:

1. ASCO/Schneider Electric
2. Caterpillar
3. Generac
4. Kohler
5. Russelectric
6. Zenith/General Electric
7. Or equal.

2.2 Mechanically Held AUTOMATIC Transfer Switch

- A. The transfer switch shall be open transition type.
- B. The transfer switch shall have a maintenance bypass.
- C. The transfer switch shall be electrically operated and mechanically held. The electrical operator shall be a momentarily energized, single-solenoid mechanism. Transfer switches utilizing multiple mechanically interlocked over current devices are not acceptable.

- D. The switch shall be mechanically interlocked to ensure only three possible positions, normal power, stand-by power or maintenance bypass. The switch shall be positively locked and unaffected by momentary outages, so that contact pressure is maintained at a constant value and contact temperature rise is minimized for maximum reliability and operating life.
- E. All main contacts shall be silver composition.
- F. Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. A manual operating handle shall be provided for maintenance purposes. The handle shall permit the operator to manually stop the contacts at any point throughout their entire travel to inspect and service the contacts when required.
- G. Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof, which are not intended for continuous duty, repetitive switching or transfer between two active power sources are not acceptable.
- H. Where neutral conductors are to be solidly connected as shown on the plans, a neutral conductor plate with fully rated AL-CU pressure connectors shall be provided.
- I. Withstand and Closing Ratings
 - 1. The ATS shall be rated to close on and withstand the available rms symmetrical short circuit current at the ATS terminals with the type of overcurrent protection shown on the plans. UL1008 Withstand and Close-on ratings as be as follows when used with specific circuit breakers:

ATS Size (Amperes)	Withstand & Closing Rating MCCB (240V)	Withstand & Closing Rating MCCB (480V)
70 – 100A	22KA	22KA
150A-230A	65KA	25KA
260-400A	65KA	42KA
600-1200	65KA	65KA

- J. Microprocessor Controller
 - 1. The controller shall be connected to the transfer switch by an interconnecting wiring harness. The harness shall include a keyed disconnect plug to enable the controller to be disconnected from the transfer switch for routine maintenance.
 - 2. The controller shall direct the operation of the transfer switch. The controller's sensing and logic shall be controlled by a built-in microprocessor for maximum reliability, minimum maintenance, and inherent serial communications capability.

3. A single controller shall provide single and three phase capability for maximum application flexibility and minimal spare part requirements. Voltage sensing shall be true RMS type and shall be accurate to $\pm 1\%$ of nominal voltage. Frequency sensing shall be accurate to $\pm 0.1\text{Hz}$. Time delay settings shall be accurate to $\pm 0.5\%$ of the full scale value of the time delay. The panel shall be capable of operating over a temperature range of -20 to +70 degrees C.
4. The controller shall be enclosed with a protective cover and be mounted separate from the transfer switch unit for safety and ease of maintenance. Sensing and control logic shall be provided on printed circuit boards. Interfacing relays shall be industrial grade plug-in type with dust covers.

K. Controller Display and Keypad

1. An environmentally sealed graphical LCD display and password protected keypad shall be an integral part of the controller for viewing all available data and setting desired operational parameters. Operational parameters shall also be available for viewing and limited control through communications port. The following parameters shall only be adjustable via DIP switches on the controller:
 2. Nominal line voltage and frequency
 3. Single or three phase sensing on normal
 4. Transfer operating mode configuration, (open transition, or delayed transition)
 5. All instructions and controller settings shall be easily accessible, readable and accomplished without the use of codes, calculations, or instruction manuals.

L. Source status screens shall be provided for both normal & emergency to provide digital readout of voltage and frequency. Note: Single phase sensing on emergency

1. The backlit graphical display shall have multiple language capability. Languages can be selected from the user interface.

M. Voltage and Frequency Sensing

1. The voltage and frequency of each phase of the normal and emergency sources shall be continuously monitored, with the following pick-up, drop out, and trip settings:

Parameter	Dropout/Trip	Pickup/Reset
Undervoltage	70 to 98%	85 to 100%
Overvoltage	102 to 116%	2% below trip
Underfrequency	85 to 98%	86 to 100%
Overfrequency	101 to 111%	2% below trip

N. Repetitive accuracy of all settings shall be within 1% at +25C

O. Voltage and frequency settings shall be field adjustable in 1% increments either locally with the display and keypad or remotely via serial communications port access.

P. Time Delays

1. A time delay shall be provided to override momentary normal source outages and delay all transfer and engine starting signals, adjustable 0 to 6 seconds. It shall be possible to bypass the time delay from the controller user interface.
2. A time delay shall be provided on transfer to emergency, adjustable from 0 to 60 minutes 59 seconds for controlled timing of transfer of loads to emergency. It shall be possible to bypass the time delay from the controller user interface.
3. A generator stabilization time delay shall be provided after transfer to emergency adjustable 0 or 4 seconds.
4. A time delay shall be provided on retransfer to normal, adjustable 0 to 9 hours 59 minutes 59 seconds. Time delay shall be automatically bypassed if emergency source fails and normal source is acceptable.
5. A cooldown time delay shall be provided on shutdown of engine generator, Adjustable 0 to 60 minutes 59 seconds.
6. All adjustable time delays shall be field adjustable without the use of special tools.
7. A time delay activated output signal shall also be provided to drive an external relay(s) for selective load disconnect control. The controller shall have the ability to activate an adjustable 0 to 5 minutes 59 seconds time delay in any of the following modes:
 - a) Prior to transfer only.
 - b) Prior to and after transfer.
 - c) Normal to emergency only.
 - d) Emergency to normal only.
 - e) Normal to emergency and emergency to normal.
 - f) All transfer conditions or only when both sources are available.

Q. In the event that the alternate source is not accepted within the configured Failure to Accept time delay, the common alert indication shall become active.

R. The controller shall also include the following built-in time delay for delayed transition operation.

S. Delayed Transition Switches

1. Provide automatic transfer switches with a timed load disconnect position where indicated.
2. The switch shall transfer the load in delayed transition (break – before –make) mode. Transfer is accomplished with a user – defined interruption period in both directions.

3. The load disconnect time delay shall be configured to be active for all transfers or to be bypassed in the event that the voltage of all three phases of the source the load is connected to drop below 70% of nominal.
4. A time delay for the load disconnect position for delayed transition operation adjustable 0 to 5 minutes 59 seconds in 1 second increments.

T. Additional Features

1. The user interface shall be provided with test/reset modes. The test mode will simulate a normal source failure. The reset mode shall bypass the time delays on either transfer to emergency or retransfer to normal.
2. A set of contacts rated 5 amps, 30 VDC shall be provided for a low-voltage engine start signal. The start signal shall prevent dry cranking of the engine by requiring the generator set to reach proper output, and run for the duration of the cool down setting, regardless of whether the normal source restores before the load is transferred.
3. Auxiliary contacts rated 10 amps, 250 VAC shall be provided consisting of one form C contact indicating normal source availability, and one form C contact indicating emergency source availability, and one additional relay that can be configured to represent multiple alarm options. Contacts shall indicate actual availability of the normal and stand-by power sources, as determined by the voltage sensing pickup and dropout settings for each source.
4. LED Indicating lights shall be provided, one to indicate when the ATS is connected to the normal source (green) and one to indicate when the ATS is connected to the stand-by power source (red).
5. LED indicating lights shall be provided and energized by controller outputs. The lights shall provide true source availability of the normal (green) and emergency (red) source, as determined by the voltage sensing trip and reset settings for each source.
6. LED indicating light shall be provided to indicate switch not in automatic mode (manual); and blinking (amber) to indicate transfer inhibit.
7. LED indicating light shall be provided to indicate any alarm condition or active time delay (red).
8. Provide the ability to select “commit/no commit to transfer” to determine whether the load should be transferred to the emergency generator if the normal source restores before the generator is ready to accept the load.
9. A variable window inphase monitor shall be provided in the controller. The monitor shall control transfer so that motor load inrush currents do not exceed normal starting currents, and shall not require external control of power sources. The inphase monitor shall be specifically designed for and be the product of the ATS manufacturer.
10. An engine generator exercising timer shall be provided to configure weekly and bi-weekly automatic testing of an engine generator set with or without load. It shall be capable of being configured to indicate a day of the week, and time weekly testing should occur.

11. Self Diagnostics – The controller shall contain a diagnostic screen for the purpose of detecting system errors. This screen shall provide information on the status input signals to the controller which may be preventing load transfer commands from being completed.
12. Communications Interface – The controller shall be capable of interfacing, through an optional serial communication port with a network of transfer switches, locally (up to 4000 ft.). Standard software specific for transfer switch applications shall be available by the transfer switch manufacturer. This software shall allow for the monitoring, control, and setup of parameters.
13. Data Logging: The controller shall have the ability to log data and to maintain the last 300 events, even in the event of total power loss. The following events shall be time and date stamped and maintained in a non – volatile memory.
 - a. Event Logging
 - 1) Data and time and reason for transfer normal to emergency
 - 2) Data and time and reason for transfer emergency to normal
 - 3) Data and time and reason for engine start
 - 4) Data and time engine stopped
 - 5) Data and time emergency source available
 - 6) Data and time emergency source not available
 - b. Statistical Data
 - 7) Total number of transfers
 - 8) Total number of transfers due to source failure
 - 9) Total number of day's controller is energized
 - 10) Total number of hours both normal and emergency sources are available
 - 11) available
 - 12) Total time load is connected to normal
 - 13) Total time load is connected to emergency
 - 14) Last engine start
 - 15) Last engine start up time
 - 16) Input and output status

U. Enclosure

1. The ATS shall be furnished in an NEMA 1 enclosure unless noted otherwise on the plans.
2. Controller shall have flush-mounted display with LED indicators for switch position and source acceptability. It shall also include test and time delay bypass switches.
3. All customer connections shall be wired to a common terminal block to simplify field-wiring connections.
4. Finishes

- a. Clean ferrous surfaces to be painted free of oil, grease, welding slag, and spatter, mill scale, corrosion, and dirt.
- b. Paint with rust-inhibiting primer and finish enamel. Apply primer to clean, dry surface immediately after cleaning. Use manufacturer's standard material and procedure except as required to produce a total dry film thickness not less than 2.5 mils. Use finish coat of manufacturer's approved standard color. Provide a finish free from runs, sags, peeling, and other defects.

3. EXECUTION

3.1 Installation

- A. Panel Mounting: Surface mount enclosure as shown on drawings.
- B. Identify components in accordance with Division 26 Section "Electrical Identification."

3.2 Connections

- A. Check connectors, terminals, bus joints, and mountings for tightness. Tighten field connected connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A and UL 486B.

3.3 Grounding

- A. Provide equipment grounding connections for transfer switch units as indicated and as required by NEC. Tighten connectors to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounding.

3.4 Cleaning

- A. Upon completion of installation, inspect interiors and exteriors of accessible components. Remove dust, dirt, foreign matter, paint splatters and other spots, dirt, and construction debris. Vacuum interior. Touch up scratches and mars of finish to match original finish.

3.5 Field Quality Control

- A. Preliminary Tests: Perform electrical tests as follows:

1. Measure, with insulation resistance tester, phase-to-phase and phase-to-ground insulation resistance levels to assure requirements are fulfilled. Disconnect control circuits for this test to prevent damage.
 2. Check for electrical continuity of circuits and for short circuits.
- B. Manufacturer's Field Services: Provide services of a factory service representative to assist with demonstrations and field tests.
- C. Field Tests: Energize transfer switches and demonstrate functioning of all devices, components, and sequences. Give seven calendar days' advance notice of the tests, and perform tests in presence of Owner's representative.
- D. Tests shall be coordinated with tests of generator plant and run concurrently with them. Tests shall include the following:
1. Simulate power failure of normal source.
 2. Simulate power failure of stand-by source with normal sources available.
 3. Simulate low phase to ground voltage for each phase of normal source.
 4. Checking, measuring, and optimizing all adjustable time delays.
- E. Test Failures: Correct deficiencies identified by tests and make ready for retest. Verify equipment meets the specified requirements.
- F. Reports: Maintain a written record of observations and tests. Report defective materials and workmanship and retest corrected defective items. Submit written test reports. Include a record of all adjustable relay settings and measured time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

3.6 Demonstration

- G. Training: Furnish the services of a factory authorized service representative to instruct Owner's personnel in the operation and maintenance of transfer switches and related equipment. Provide a minimum of 2 hours of on-site instruction scheduled seven days in advance.

END OF SECTION

SECTION 16515

LIGHTING FIXTURES AND CONTROLS

1. GENERAL

1.1 Summary

- A. This Section describes the requirements of lighting fixtures and lighting control devices.

1.2 Related Documents

- B. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.3 Submittals

- A. Refer to Division 1 and Division 26 Section "BASIC ELECTRICAL REQUIREMENTS" for administrative and procedural requirements for submittals.
- B. Submit product data for the following where included in the Project:
 - 1. Lighting Fixtures
 - 2. Lighting Control Devices
- C. Submittal information for lighting fixtures shall include product description and image, provided options, dimensioned drawings, photometric information, ratings, approvals and listings. Provide lamp and ballast information where applicable. Submit fixture shop drawings in booklet form with separate sheet for each fixture, assembled in "luminaire type" alphabetical or numerical order, with proposed fixture and accessories clearly indicated on each sheet.
- D. Submittal information for lighting control devices and systems shall include operational description, programming information including available settings, wiring diagrams, ratings, approvals, and listings.

1.4 Quality Assurance

- A. Code Compliance: Product construction, use, and installation methods shall comply with NFPA 70 "National Electrical Code."

- B. Product Listing: Provide only products that are listed and labeled by UL, ETL, or CSA.
- C. Standards Compliance: Comply with applicable requirements of the following standard organizations pertaining to lighting fixtures and control devices:
 - 1. NEMA – National Electrical Manufacturers Association
 - 2. UL – Underwriters Laboratories
 - 3. IES – Illuminating Engineering Society of North America
 - 4. DLC – Design Lighting Consortium
 - 5. IDA – International Dark Sky Association
- D. Energy Efficiency Rebates: All lighting fixture and control products shall qualify for the maximum rebate that is available from Efficiency Vermont for the type of product being supplied.

1.5 Warranty.

- A. Lighting fixtures, related components, and control devices shall be guaranteed to be free from electrical and mechanical defects for a period of one year after final acceptance.
- B. Refer to lighting fixture schedule on the plans for extended warranty requirements of specific fixture types.

1.6 Delivery, Storage, And Handling

- A. Store equipment in original packaging until ready for installation. Protect from damage due to construction activity, dirt, and moisture.
- B. Handle lighting fixtures carefully to prevent damage, breaking, and scoring of finishes. Do not install damaged units or components; replace with new.

1.7 Sequencing And Scheduling

- A. Coordinate equipment installation with the general progress of the work.
- B. Sequence lighting installation with other work to minimize possibility of damage and soiling during remainder of construction.

1.8 Extra Materials

- A. Furnish stock of replacement lamps amounting to 5 percent (but not less than one lamp in each case) of each type and size lamp used in each type unit.

2. PRODUCTS

2.1 Lighting Fixtures

- A. General: The products indicated on the Contract Drawings and or specified in these product specifications are based on the features of the identified manufacturers. The products of alternate manufacturers will be considered as substitutions and will be acceptable if judged by the Architect/Engineer to be of similar physical size, capacity, construction, quality, features and performance characteristics, and if the requirements of Division 1 section "SUBMITTALS " are satisfied.
- B. Fixture Schedule: Various fixture and illumination requirements are indicated on the drawings. Fixtures must comply with minimum requirements as stated herein. Review architectural drawings and specifications to verify ceiling types, modules, suspension systems appropriate to installation.
- C. Provide lighting fixtures, of sizes, types and ratings indicated; complete with, but not limited to, housings, LED arrays, LED drivers, heat dissipation features, reflectors, and wiring. Ship fixtures factory-assembled, with those components required for a complete installation. Design fixtures with concealed hinges and catches, with metal parts grounded as a common unit.
- D. Wiring: Provide electrical wiring within fixtures and controls suitable for connecting to branch circuit wiring, minimum No. 18 AWG.
- E. LED Fixtures:
 - 1. Arrays shall utilize high output LEDs with individual precision optics to collect and redirect the light.
 - 2. Integral cast aluminum heat sink.
 - 3. Electronic Class II driver
 - 4. LED's shall be rated for +50,000 hours life
 - 5. Fixture and LED array shall be warranted for 5 years or as indicated on the lighting fixture schedule.
- F. Exit LED:
 - 1. Provide red LED's shielded with acrylic panel designed for even illumination of "exit" panel.

G. Halogen:

1. Provide par 36 sealed beam type specifically designed for emergency lighting applications where specified.

H. Battery Backup Emergency and Exit Lighting:

1. Provide the following as indicated on the plans and schedules:
 - a. Self-contained exit and emergency lighting units with style, shape, and trim as indicated.
 - b. Self-diagnostic or Continuous Verification types shall conduct periodic tests to verify proper operation; at a minimum, 90 minute, monthly and semi-annual intervals. Malfunction during any self-test shall be through external visual status indicator.
 - c. Battery: Sealed, maintenance-free, nickel cadmium type with 10 year nominal life. Provide battery heaters where installed outdoors or in unheated locations.
 - d. Charger: Minimum two-rate, fully automatic, solid-state type, with sealed transfer relay.
 - e. Operation: Relay turns lamp on automatically when supply circuit voltage drops to 80 percent of nominal or below. Lamp operates for duration of outage, up to 1.5 hours, or as indicated in the lighting fixture schedule. Lamp automatically disconnected from battery of voltage approaches deep-discharge level. When normal voltage is restored, battery is automatically recharged within 16 hours and then floated on trickle charge.
 - f. Control panel contains low-voltage disconnect switch, LED indicator light, test switch, and concealed terminals for remote lamp head connection.
 - g. Emergency two head fixtures shall have integral lamp heads mounted on housing with 90-deg for wall mount and 180-deg for ceiling mount, 2-way locking swivel joints for aiming. Lamp types and lenses as indicated.

2.2 LIGHTING CONTROL

- A. General: All lighting control devices shall be fully compatible with the lighting fixtures being controlled and approved by the manufacturer. Use of the control device shall not reduce or affect the original warranty supplied with the lighting fixture including all components such as lamps, ballasts, and LED boards and drivers. Provide all required components necessary to achieve the operation described on the plans whether specifically identified or not.
- B. Photocells: Provide photocells for exterior lighting that are integral to the fixture or as separate units as indicated on the drawings. Separate photo control units shall have gray Lexan ® housing with 180 degree swivel and 1/2" conduit nipple suitable for box mounting, 120VAC, 1800W rated SPST contact, -40 to 140 degree F temperature rating, (Tork #2001, or equal by Intermatic or Mulberry).
- C. Externally Mounted Motion Sensing (Exterior Fixtures): Externally mounted and wired motion sensors shall be supplied for exterior fixtures where indicated. Sensors shall have 180 degree field of sensing up to 70 feet, adjustable 4 to 12 minute off delay, rated for 300W @ 120VAC. Sensors shall be wet location listed with white, black, or dark bronze to match the color of the fixture that they control, and include adjustable mounting stem for connection to a 1/2" threaded conduit hub.
- D. Occupancy and Vacancy Sensors: Provide infrared, ultrasonic, or dual technology occupancy and vacancy sensors with wall switch or ceiling mount configuration as indicated on the drawings. Sensors shall be suitable for the location installed and compatible with the lighting being controlled. Sensors shall be supplied with all required accessories necessary for complete installation. Sensors, power packs, and relays shall be rated for 120V or 277V circuits as required, and shall have a contact rating of 20A. Sensors shall include adjustable time delay and sensitivity. Ceiling mounted sensors shall be white. Wall switch sensors shall be the same color as other wiring devices installed in the space. Provide products by Wattstopper, Leviton, Hubbell Lighting, or equal.

1. EXECUTION

3.1 Examination

- A. Examine areas and conditions under which lighting fixtures are to be installed, and substrate for supporting lighting fixtures. Notify Building Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 Installation Of Lighting Fixtures

- A. Install lighting fixtures at locations and heights as indicated, in accordance with fixture manufacturer's written instructions, applicable requirements of NEC, NECA's "Standard of Installation," NEMA standards, and with recognized industry practices to ensure that lighting fixtures fulfill requirements.

- B. Provide fixtures and/or fixture outlet boxes with hangers to properly support fixture weight and comply with earthquake prone area requirements. Submit design of hangers, method of fastening, other than indicated or specified herein, for review by Engineer.
- C. Install flush mounted fixtures properly to eliminate light leakage between fixture frame and finished surface.
- D. Fasten fixtures securely to indicated structural supports; and ensure that pendant fixtures are plumb and level. Provide individually mounted pendant fixtures longer than 2 feet with twin stem hangers. Provide stem hanger with ball aligners and provisions for minimum one inch vertical adjustment. Mount continuous rows of fixtures with an additional stem hanger greater than number of fixtures in the row.
- E. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds 486A, and the National Electrical Code.
- F. Provide additional supports for surface mounted fixtures greater than 2 feet in length or diameter in addition to the outlet box fixtures stud, or in accordance with manufacturer's instructions.

3.3 Installation Of Lighting Controls

- A. Install photo controls on the north or east side of the building where practical. Adjust sensor position to minimize daylight operation between dusk and dawn.
- B. Adjust occupancy and vacancy sensor sensitivity and time delay such that they are suitable for the area covered. Make final adjustments as directed by the Owner.

3.4 Field Quality Control

- A. Perform the following tests prior to the Date of Substantial Completion:
 - 1. Test that all lighting units are operating.
 - 2. Test all lighting controls including switching and automatic occupancy sensors.
 - 3. Test all battery units with unit testing switch.
 - 4. Test all outdoor building mounted fixtures at night to verify photocell and motion sensor automatically operate the light and the local bypass switch overrides this control.
 - 5. Test operation of pole mounted lighting at night to verify operation of each fixture, and that the associated controls function to the satisfaction of the Owner.

2.3 Adjusting And Cleaning

- A. Clean lighting fixtures of dirt and construction debris upon completion of installation. Clean fingerprints and smudges from lenses.
- B. Protect installed fixtures from damage during remainder of construction period.
- C. Re-clean lighting fixtures as needed just prior to substantial completion.
- D. Adjust sensitivity and time delays of all sensors to the satisfaction of the Owner.

3.5 Grounding

- A. Provide equipment grounding connections for lighting fixtures as indicated. Tighten connections to comply with tightening torques specified in UL Std 486A to assure permanent and effective grounds.

3.6 Demonstration

- A. Upon completion of installation of lighting fixtures, and after building circuitry has been energized, apply electrical energy to demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.
- B. Train Owner on the operation of each lighting control system and device type including sensor sensitivity and time delay adjustments.

END OF SECTION

SECTION 16620

GENERATORS

1. GENERAL

1.1 Summary

- A. This Section describes the requirements of electrical power generators, related components, and accessories.

1.2 Related Documents

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Refer to Division 26 section “TRANSFER SWITCHES” for related requirements pertaining to auxiliary power systems.
- C. Unless specified to be provided integral to the generator assembly, mechanical equipment and systems related to generator ventilation, fuel delivery, and exhaust is work of Division 23.
- D. Refer to site/civil plans and specifications for requirements of concrete pads used to support generator equipment.

1.3 Submittals

- A. Refer to Division 1 and Division 26 Section “BASIC ELECTRICAL REQUIREMENTS” for administrative and procedural requirements for submittals.
- B. Submit the following product information:
 - 1. Product data for each generator including general description, features, options, electrical ratings, engine ratings, fuel usage at various loading, sound levels, listings and approvals. All supplied options shall be clearly identified. Provide minimum fuel pressure and usage for gaseous units.
 - 2. Dimensioned plans and elevations of generator that identifies locations of major equipment, minimum clearances, conductor entry locations, installed features and devices, and materials lists.

3. Wiring diagrams, elementary or schematic, differentiating between manufacturer-installed and field-installed wiring.
4. Base Mounted Diesel Fuel Tanks: Material construction, fuel capacity, and dimensioned plan and elevation drawings indicating the location of all fuel fill, vent, and pipe connection points.
5. Weatherproof Enclosures: Material construction and paint, snow, rain, and wind ratings as applicable, sound attenuation ratings measured at standard distances, dimensioned plans and elevations showing all access doors, air flow louvers, and exhaust outlets.
6. Emissions Compliance: Submit certification that generator emissions comply with the emission limits specified in §5-271 of the State of Vermont Air Pollution Control Regulations. Compliance with these emissions limits shall be demonstrated by confirming that the generator meets the engine certification requirements of title 40 of the Code of Federal Regulations Part 89, or by obtaining a written emissions guarantee from the manufacturer. Emissions compliance certification must be submitted prior to installation.
7. Operation and Maintenance Manuals: Operating and maintenance data shall cover each type of product, including all features and operating sequences, programmable controller operation. List all factory default and “as left” settings of configurable parameters and alarm setpoints. Include periodic maintenance schedules, recommendations, and procedures.
8. Agreement to Maintain: Prior to time of final acceptance, the Installer shall submit 4 copies of an agreement for continued service and maintenance of engine-driven generator sets, for Owner's possible acceptance. Offer terms and conditions for furnishing parts and providing continued testing and servicing, including replacement of materials and equipment, for one-year period with option for renewal of Agreement by Owner.
9. Provide manufacturer certified test record prior to engine-driven generator set being shipped from factory to project location.
10. Provide manufacturer's field start up test report, including completed installation checklist, and values of default and field adjusted settings.
11. Provide load bank test report showing voltage, oil pressure, and coolant temperature as a function of load in 15 minute increments for the duration of the test.

1.4 Quality Assurance

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of engine-driven generator units and ancillary equipment, of types, ratings and characteristics required, whose products have been in satisfactory use in similar service for not less than 10 years.
- B. Installer's Qualifications: Firm with at least 5 years of successful installation experience on projects with engine-driven generator units similar to those required for this project.
- C. Code Compliance: Products and installation shall comply with the requirements of NFPA 70 "National Electrical Code."
- D. UL Compliance: Equipment shall Comply with applicable requirements of UL2200, "Standard for Stationary Engine Generator Assemblies".
- E. NFPA Compliance: Equipment shall comply with the applicable requirements of the following:
- F. NFPA 37, "Standard for Installation and Use of Stationary Combustion Engines and Gas Turbines".
- G. NFPA 101, "The Life Safety Code".
- H. NFPA 110, "Standard for Emergency and Standby Power Systems".
- I. IEEE Compliance: Standard 446, "IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications".
- J. ANSI/NEMA Compliance: Comply with applicable requirements of ANSI/NEMA MG 1, "Motors and Generators," and MG 2, "Safety and Use of Electric Motors and Generators."

1.5 Warranty

- A. Engine-generator set and all ancillary components shall be guaranteed to be free from electrical and mechanical defects for a period of two years after final acceptance. Any replacement parts or adjustments, including labor made necessary by such defects or adjustments, shall be rectified without cost to the Owner, and to the satisfaction of the Engineer.

1.6 Delivery, Storage, And Handling

- A. Deliver engine-driven generators properly packaged and mounted on pallets, or skids to facilitate handling of heavy items. Utilize factory-fabricated type containers or wrappings for engine-generator and components which protect equipment from damage.

- B. Store engine-driven generator equipment in original packaging and protect from weather and construction traffic. Wherever possible, store indoors; where necessary to store outdoors, store above grade and enclose with watertight wrapping.
- C. Handle engine-driven generator equipment carefully to prevent physical damage to equipment and components. Do not install damaged equipment; remove from site and replace damaged equipment with new.

1.7 Sequencing And Scheduling

- A. Coordinate equipment installation with the general progress of the work.

2. PRODUCTS

2.1 Equipment To Be Furnished:

- A. Bolton Valley, VT Wastewater Treatment Facility
 - 1. Engine: 4 Cycle, 6 Cylinder, Turbocharged Air-to-Air Diesel
 - 2. Generator: 60KW, Standby, 1800 RPM, Brushless Permanent Magnet
 - 3. Voltage: 120/240V 1Phase, 3Wire
 - 4. Enclosure Type: Weatherproof and Sound Attenuated, 75DbA @ 23 feet (100% Load).
 - 5. Fuel Tank: Base tank with minimum 24 hour capacity at 100% load

2.2 Manufacturers

- A. Manufacturers: Subject to compliance with requirements, provide generator sets of one of the following:
 - 1. Caterpillar
 - 2. Generac
 - 3. Kohler Co.
 - 4. Approved equal.

2.3 Generator Sets

- A. General: Except as otherwise indicated, provide manufacturer's standard engine-driven generator set and auxiliary equipment as indicated by published product information, and as required for a complete installation. Construct unit in compliance with applicable standards; and with additional construction features as indicated.
- B. Engine-Driven Generator: Provide packaged electrical power engine-driven generator assembly units with standby rating as indicated.
- C. Generator shall operate at a governed speed of 1800 RPM, and rated 80 percent power factor for continuous operation, voltage and phase as indicated, 60 Hz at 500 feet altitude, at 85 deg. F (29 deg. C).
- D. Equip generator with 6-cycle, 1800 RPM engine with fuel type specified, horsepower as required; liquid cooled. Provide unit-mounted radiator, blower fan, water pump, thermostat, and radiator duct flange capable of cooling engine with up to 0.5 inches water static pressure on fan. Equip engine with low-oil pressure, high water temperature, low coolant, and automatic overspeed safety shutdown devices. Connect engine drive directly alternator through semi-flexible steel disk coupling.
- E. Equip set with associated control equipment to automatically start engine, transfer load to standby power upon failure of normal power source, transfer load back to normal power upon its restoration and stop engine.
- F. Provide 4 pole, rotating field, brushless, rare earth permanent magnetic alternator complying with NEMA MG1, IEEE, and ANSI standards for temperature rise and motor starting. Three phase alternators shall be provided with (12) reconnectable leads to permit multiple voltage configurations. Provide with sealed bearings, self-ventilated and drip-proof construction, vacuum impregnated windings with epoxy varnish, 130 degree C (standby), class H insulation.
- G. Provide solid state voltage regulator (1/2%) suitable for use with harmonic loads that provides adjustment of regulated voltage within approximately 10%. Provide unit capable of voltage recovery, within regulated range, of 7 seconds following sudden load increase from 0 to 100 percent of rated load, and with voltage dip not to exceed 20 percent upon application of rated load at rated power factor.
- H. Cushion-mount engine-generator on heavy steel base with vibration isolators to reduce possibility of torsional vibration.
- I. Starting System: Provide engine-generator unit with 12-volt, 2-wire, negative ground, starting system including 12-volt positive engagement solenoid shift-starting motor, batteries and 45-ampere, or greater, automatic battery charging alternator with solid-state voltage regulation.

- J. Instrument Control Panel: Provide engine-generator unit with unit mounted electronic programmable controller for system control, monitoring, and diagnostics. Controller shall include environmentally sealed operator interface with digital display with password protected keypad. Controller shall be capable of displaying engine and electrical operating values, with ability to communicate to remote devices via RS485 protocol.
- K. Controller Provisions for Remote Monitoring: Provide generator control panel with the following interfaces for remote control and monitoring. Provide optional expansion modules where necessary to achieve the specified communications:
 - 1. USB and RS485 connections for connection of a PC to perform software upgrades and diagnostics.
 - 2. Dedicated user inputs for remote emergency stop switch, remote 2-wire start for transfer switch, and auxiliary shutdown.
 - 3. One (1) configurable relay output standard with five (5) additional relays provided with expansion module. Relays shall be rated for not less than 2A@125VAC, and 2A@30VDC. Each relay shall be configurable to display active state as open or closed. Relays shall be initially configured to indicate running, service warning, failure/fault, low fuel, and battery low voltage alarm.

2.4 Engine-Generator Set Accessories

A. Weatherproof Sound Attenuated Enclosure (Where Specified)

- 1. Weather resistant 16 gauge steel enclosure with polyester powder coat paint.
- 2. Lockable doors providing full access to all serviceable components. Provide chrome plated or stainless steel flush latches.
- 3. Stainless steel fasteners
- 4. GFCI Receptacle
- 5. Roof load equal to 50 lbs. per sq. ft.
- 6. Rain test equal to 5" per hour.
- 7. Acoustic Insulation meeting UL 94 HF-1 flammability classification, meeting sound attenuation indicated in unit description.
- 8. Color: White, beige, or dark gray.

B. Battery and Battery Charger:

- 1. Provide 12-volt, lead acid, high discharge rate batteries. Each battery cell shall have electrolyte minimum and maximum level indicators, and flip top flame arrestor vent cap.

2. Batteries shall have sufficient capacity so that, with the charger disconnected, the total system voltage does not fall below 85% of normal battery voltage with the following demands:
 - a. Five consecutive starting attempts of 10 seconds cranking each at 10 second intervals between attempts for a total of fifty seconds of actual cranking.
 - b. Twelve hours operation of the control and instrumentation panel.
 3. Battery charger shall be full wave rectifier type utilizing silicon controlled rectifiers as the power control elements. Construction shall be modular with plug-in control units for easy replacement.
 4. Charger shall maintain 1/2 of one percent voltage regulation from no-load to full-load for line voltage variations of 10% and frequency variations of 3 Hertz from 60 Hertz. Charger shall maintain float voltage of 1.4 Volts per cell and a nominal equalizing voltage of 1.6 volts per cell.
 5. Charger shall be capable of continuous operation in an ambient temperature of 40 degrees C. (104 degrees F.) without derating.
 6. Charger shall be housed within the weatherproof enclosure in a NEMA type 1 ventilated enclosure with a hinged door. All components shall be accessible from the front.
 7. Provide charger protection from both AC and DC transients. Chargers shall be able to recharge a fully discharged battery system without tripping AC protective devices. AC circuit breaker shall not trip under any DC load condition, including short circuit on output terminals. Chargers shall have fused AC input and shall have DC output protection.
 8. Chargers shall have capacity for supplying the following demands simultaneously:
 - a. Recharging in 12 hours a fully discharged battery.
 - b. Control and instrument panel.
 9. Chargers shall not discharge the batteries when the AC power fails.
- C. Circuit Breakers: Provide unit mounted, in-line molded case circuit breaker that is appropriately sized to protect the generator output.
1. Circuit breakers shall be 100% rated.

2. Circuit breakers smaller than 250A frame shall have fixed thermal magnetic or electronic adjustable trip.
 3. Circuit breakers with 250A frame or larger shall be electronic adjustable trip.
 4. Circuit breakers operating at 208VAC or 240VAC, shall have an interrupting rating of not less than 50kA rms.
 5. Circuit breakers operating at 480VAC, shall have an interrupting rating of not less than 18kA rms.
- D. Provide emergency stop pushbutton and panel illumination lights.
- E. Provide auxiliary dry type contacts which close on engine start.
- F. Provide 1000 watt, 120 Volt engine block heater with thermostatic controls to maintain engine coolant at proper temperature to fulfill start-up requirements of NFPA 99.
- G. Provide critical grade exhaust silencers with drain, wall thimble and piping. Mount within generator set enclosure.
- H. Fuel System: Unit shall be provided with self-contained double wall, UL142 listed, fuel cell mounted to the underside of engine-generator support frame. The fuel cell shall be sized to provide 24 hours continuous service at 100% rated electrical load. In addition, the fuel cell shall meet the following requirements:
1. Textured epoxy based rubberized coating to protect tank against harsh environmental conditions and corrosion.
 2. Integral lifting lugs designed to permit lifting complete assembly including empty fuel tank, generator, and enclosure.
 3. Lockable fuel fill cap.
 4. Normal vent with cap and riser.
 5. Emergency pressure relief vents.
 6. Fuel level mechanical gauge.
 7. Fuel level sending unit wired to generator controller.

8. Leak detection switch wired to generator controller to indicate primary fuel tank leak.
9. Openings for electrical conduit stub ups.
- I. Remote Emergency Stop Switch
 1. The generator shall be furnished with an emergency stop switch with a break glass enclosure for remote mounting and field wiring.

3. EXECUTION

3.1 Examination

- A. Examine areas and conditions under which engine-driven generator units are to be installed. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.2 Installation Of Engine-Driven Generator Sets

- A. Install engine-driven generator units as indicated, in accordance with the equipment manufacturer's written instructions, and with recognized industry practices, to ensure that engine-generator units fulfill requirements. Comply with NFPA and NEMA standards pertaining to installation of engine-generator sets and accessories.
- B. Coordinate with other work, including raceways, electrical boxes and fittings, fuel tanks, piping and accessories, as necessary to interface installation of engine-generator equipment work with other work.
- C. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds 486A, B and the National Electrical Code.
- D. Provide galvanized steel or stainless steel anchors to secure generator to concrete pads. Size shall be in accordance with manufacturer's recommendations to satisfy seismic requirements.

3.3 Grounding

- A. Provide equipment grounding connections for engine-driven generator units as indicated. Tighten connections to comply with tightening torques specified in UL Std 486A to assure permanent and effective grounding.

3.4 Field Quality Control

A. Start-up Testing:

1. Engage local equipment manufacturer's representative to perform start-up and building load tests upon completion of installation, with the Engineer in attendance; provide certified test record. Tests are to include the following:
 - a. Check fuel, lubricating oil, and antifreeze in liquid cooled models for conformity to the manufacturer's recommendations under environmental conditions present.
 - b. Test prior to cranking engine for proper operation, accessories that normally function while the set is in a standby mode. Accessories include: engine heaters, battery charger, generator strip heater, remote annunciator.
 - c. Check, during start-up test mode, for exhaust leaks, path of exhaust gases outside the building, cooling air flow, movement during starting and stopping, vibration during running, normal and emergency line-to-line voltage and phase rotation.
 - d. Test, by means of simulated power outage, automatic start- up by remote-automatic starting, transfer of load, and automatic shut-down. Prior to this test adjust, for proper system coordination, transfer switch timers. Monitor throughout the test, engine temperature, oil pressure, battery charge level, generator voltage, amperes, and frequency.
 - e. Provide on-site four hour load test utilizing portable load bank, (100% load). Contractor shall supply all fuel required for load test and shall refill tank at completion of test.
2. Upon completion of installation demonstrate capability and compliance of system with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting. Initial testing and retesting to be at no cost to Owner.

3.5 Spare Parts

- A. Provide one set of replaceable filters of each type.

3.6 Fuel

- A. Contractor shall supply all fuel required for start-up and testing, and shall fill tank prior to final acceptance.

3.7 Personnel Training

- A. Building Operating Personnel Training: Provide one day (8 hours) of on-site training for the building personnel in procedures for starting-up, testing and operating engine-driven generator sets. In addition, provide training for Owner's personnel basic maintenance procedures related to fluids, filters and battery.

END OF SECTION

SECTION 16670

LIGHTNING PROTECTION SYSTEM

1. GENERAL

1.1 Summary

- A. The work covered by this section of the specifications consists of furnishing all labor, materials, and items of service required for the completion of a functional and unobtrusive lightning protection system as approved by the architect, engineer, and in strict accordance with this section of the specifications and the applicable contract drawings.
- B. The contract drawings only indicate the buildings and structures which are to receive a lightning protection system, and provide a general arrangement of the copper ground grid around the perimeter. The placement and quantity of air terminals and connections to the grounding system shall be the responsibility of the lightning protection system designer and installer.
- C. The following shall be provided with a lightning protection system:
 - 1. Headworks/Operations/UV building with adjoining concrete SBR & sludge tank structure

1.2 Objective

- A. To provide safety for the building and occupants by preventing damage to building structure caused by lightning.

1.3 Related Documents

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to this Section.
- B. Requirements of the following Division 26 Sections apply to this section:
 - 1. Basic Electrical Requirements.
 - 2. Basic Electrical Materials and Methods.

1.4 Codes and Standards

- A. The following specifications and standards of the latest issue form a part of this specification:

1. Lightning Protection Institute Installation Standard, LPI 175
2. National Fire Protection Association Lightning Protection Standard, NFPA 780
3. Underwriters Laboratories, Inc. Installation Requirements, UL96A

1.5 Submittals

- A. Complete design drawings showing the type, size, and locations of all grounding down conductors, through roof/through wall assemblies, roof conductors, and air terminals shall be submitted to the architect and engineer for approval.

1.6 Designer Qualifications

- A. The lightning protection system shall be designed by a qualified designer who is normally engaged in this type of work. The designer shall be employed by the lightning protection system installer.

1.7 Installer Qualifications

- A. The installation shall be accomplished by an experienced lightning protection installation company that has the following associations:
 1. United Lightning Protection Association, Inc.
 2. The Lightning Protection Institute
 3. National Electrical Contractors Association
 4. Lightning Safety Alliance
 5. National Fire Protection Association
 6. Underwriters Laboratory

1.8 Quality Assurance

- A. The lightning protection system shall conform to the requirements and standards for lightning protection systems of the ULPA, LPI, UL, and NFPA. Upon completion, an application shall be made to the Underwriters Laboratories, Inc. for inspection and certification and shall be delivered to the owner ensuring that the concealed components have also been monitored during job progress.

2. PRODUCTS

2.1 System Description

- A. The system shall consist of a complete conductor network at the roof and include air terminals, connectors, splicers, bonds, copper down leads, and proper ground terminals. Copper down lead conductors shall be utilized even when aluminum is required on the roof. Down lead conductors in conduit shall not be brought directly through the roof. Through roof assemblies with solid brass or stainless-steel rods shall be utilized for this purpose. Structural steel may be utilized in the installation as outlined by UL, NFPA, and LPI.

1.9 Acceptable Products

- A. The system to be furnished under this specification shall be the standard product of manufacturers regularly engaged in the production of lightning protection equipment and shall be the manufacturer's latest approved design. The equipment shall be UL listed and properly UL labeled.
- B. All equipment shall be new and of a design and construction to suit the application where it is used in accordance with accepted industry standards and LPI, UL, and NFPA code requirements.

1. Qualified Manufacturers

- a) Advanced Lightning Technology
- b) East Coast Lightning Equipment
- c) Thompson Lightning Protection
- d) Or equal

2.2 Lightning Protection Equipment

- A. All materials shall be copper and bronze and of the size, weight, and construction to suit the application and used in accordance with LPI, UL, and NFPA code requirements. Class I sized components may be utilized on roof levels 75 feet and below in height. Class II sized components are required for roof levels over 75 feet in height. Bolt type connectors and splicers shall be utilized on Class I and Class II structures. Pressure squeeze clamps are not acceptable. All mounting hardware shall be stainless steel to prevent corrosion.

2.3 Aluminum Components

- A. Aluminum materials may not be used except on roofs that utilize aluminum, galvalume or galvanized metal roofing components. On aluminum, galvalume or galvanized metal roofs or where aluminum, galvalume or galvanized metal parapet caps exist, the entire roof lightning protection equipment shall utilize aluminum components to insure compatibility. However,

the down leads and grounding are to utilize copper with the bimetal transition occurring at the through roof assembly with an approved bimetal through roof assembly.

2.4 Lightning Arresters

- A. A surge arrester at the main electrical service entrance is required by Underwriters Laboratories UL96A lightning protection codes and in order to obtain the UL Master Label certification. It shall be the responsibility of the electrical contractor to install or verify that a surge arrester is installed on the main electrical service.

3. EXECUTION

3.1 Quality Assurance

- A. If any departure from the contract drawings or submittal drawings covered below are deemed necessary by the Contractor, details of such departures and reasons therefore shall be submitted as soon as practical to the architect/engineer for approval.

3.2 Coordination

- A. The Contractor shall submit the lightning protection system approval drawings early in the project such that locations of conduit sleeves and building envelope penetrations can be identified and installed as the work progresses.
- B. The lightning protection installer will work with other trades to insure a correct, neat and unobtrusive installation. The roofing contractor will be responsible for sealing and flashing all lightning protection roof penetrations as per the roof manufacturer's recommendations. However, the lightning protection contractor will be required to coordinate locations of through roofs and submit details of through roof penetrations as required. The lightning protection contractor shall use a compatible adhesive to adhere lightning protection components to the roof when required. The lightning protection contractor shall furnish and install the adhesive and obtain an approval of the compatible adhesive from the roof manufacturer/contractor prior to the installation. Should the roofing contractor/manufacturer require any special walk pads, membrane patches, pavers, etc. under the components of the lightning protection system, it shall be the responsibility of the roofing contractor to furnish and install such items. The lightning protection installer shall be responsible for marking the roof with all conductor and/or pad locations.
- C. Conduit sleeves of adequate size shall be installed in walls, floors, foundation, and footings as necessary to conceal the down lead conductors as much as possible.
- D. Conduit installation shall be coordinated with the pouring of concrete footings, foundations, and walls.

3.3 PERFORMANCE

- A. It shall be the responsibility of the lightning protection installer to assure a sound bond to the main water service and to assure interconnection with other ground systems.

3.4 Completion

- A. Upon completion of the installation, the lightning protection installer shall secure and deliver to the owner the Underwriters Laboratories, Inc. Master Label certification.

END OF SECTION

SECTION 310000

EARTHWORK

1. GENERAL

1.1 GENERAL

- A. Attention shall be directed to Specification Section 011000 - Summary of Work.
- B. The work under this section includes all excavation, refill, backfill, fill, compaction and restoration for structures, pipes, utilities, and roadways.
 - 1. Topography, existing ground elevations and proposed final ground elevations are shown on the drawings. The contours of existing surfaces are believed to be correct, but do not purport to be absolutely so. The Contractor shall satisfy themselves, by actual examination of the site of the work, as to the existing contours and elevations and the amount of work required under this section. If Contractor finds discrepancies in existing elevations, they shall notify the Engineer in writing.
 - 2. Material encountered in the excavation may include water and sewer pipe, storm drains, or other utility services and may also include lumber, masonry and other materials from previous constructions. The Contractor shall make their own investigations to determine the presence of these utilities or materials from former construction. The bid by the Contractor and its acceptance by the Owner shall be considered a mutual agreement that the removal and disposal of all materials encountered in excavating the project, regardless of nature and size, will be considered as included under the lump sum bid and that there shall be no addition to the contract prices for the items if the operation is more difficult or costly than is implied by the preliminary information and that there shall be no deduction from the contract prices if the operation is less difficult or costly than is implied by the preliminary information.
 - 3. The Contractor shall protect existing utilities, the location of which are shown approximately on the drawings or which are located in the field by the Engineer or others. Utilities whose location is not known shall be protected insofar as possible. All costs for repair of broken or damaged utilities shown on plans or unknown locations, will be the responsibility of the Contractor.
 - 4. Soil Investigation Data is presented in the bidding documents for informational purposes only. Refer to Specification Section 023000 – Subsurface Investigation. The Contractor must inspect the site and assume all responsibility as to the nature and behavior of the soil and of ground water which may be encountered in the excavations. The Contractor should review this information carefully particularly with regards to removal of unsuitable material and dewatering of excavations.
 - 5. Prior to commencing work at the site, other than necessary clearing and grubbing, the Contractor shall submit to the Engineer, their proposed plan for the methods and sequence of excavation and groundwater control for informational purposes only.

6. If the Contractor elects to use sheeting and shoring support systems, they shall employ a geotechnical engineer licensed in the State of Vermont to assist in the design of these systems.
 7. Soldier piles or steel sheet piling shall be cut off and left in place if they are installed deeper than an elevation defined by the intersection of the lateral support line with a line extending downward from the edge of the nearby foundation at a slope of 1H:1V, if that foundation and/or interior slab is supported by soil (i.e., not deep foundations).
- C. The Contractor is prohibited from reusing any material excavated during the course of the project without the express written permission from the Engineer.

1.2 CONTRACT DOCUMENTS

- A. Attention shall be directed to the General Conditions for the definition of the Contract Documents. This division of these specifications is a part of the Contract Documents as defined in the General Conditions. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other parts of these specifications.

1.3 RELATED SECTIONS

- A. The following items appurtenant to the work are a part of the contract work specified under other sections of these specifications but are mentioned here for cross reference purposes.
1. Specification Section 312319 –Dewatering
 2. Specification Section 314000 – Shoring and Underpinning

1.4 SOILS TESTING

- A. The Contractor shall be responsible for all soil testing related expenses.
- B. At the discretion of the Engineer, areas of fill may be selected for soil compaction testing. If the Engineer determines soil compaction testing is needed, it is the responsibility of the Contractor to provide the necessary data for the compaction testing.
- C. In the event a soil compaction test fails to meet the standard, the Contractor shall bare the full cost to rectify the deficient area to meet the compaction standards. Compaction retesting shall be done at the Contractor's expense.

1.5 SUBMITTALS

- A. The Contractor shall submit, at their own expense, three (3) gradation tests from each material source for each material type for the Engineer's review and approval. Any material used during construction that hasn't been approved by the Engineer and fails to

meet the gradation standards as outlined within the Contract Documents, shall be removed and replaced with an approved material at the Contractor’s expense.

- B. The Contractor shall submit shop drawings related to all material and construction methods associated with the compaction and backfilling.
- C. The Contractor Shall submit:
 - 1. Product data for non-woven geotextile fabric.
 - 2. Materials Test Reports: Contractor shall be responsible for submitting to the Engineer test reports for materials to be used as fill or backfill from a qualified testing agency a minimum of five (5) business days in advance of the time planned for incorporating the material into work. Use of proposed materials for fill or backfill by the contractor prior to testing and approval or rejection shall be at the Contractor’s risk. Any removal or remediation work necessary as a result of placing fill or backfill by the Contractor prior to acceptance by the Engineer will be performed by the Contractor at no additional expense to the Owner. Test results submitted to the engineer for a materials use as a fill or backfill product shall include:
 - a. Gradation test results (performed in accordance with ASTM D 6913 or AASHTO T 27 & T 11).
 - b. Laboratory compaction curve, (performed in accordance with ASTM D 1557 or AASHTO T180 Method D).
 - c. Report shall identify which material gradations listed in section 9.e of this specification are met by the product being tested.

1.6 QUALITY ASSURANCE

- A. Unless otherwise stated within this Specification section, the Contractor shall follow the stated material and construction standards located within the latest edition of the Vermont Agency of Transportation (VAOT) Standard Specifications for Construction.

2. PRODUCTS

2.1 PIPE EMBEDMENT MATERIALS

- A. Coarse Aggregate for Concrete, 3/8 Inch – VAOT 704.02B
 - 1. Pipe embedment material shall consist of satisfactorily graded, free-draining granular material reasonably free from loam, silt, clay, and organic material, and meet the following gradation requirements:

Sieve Designation	Percentage by Mass (Weight) Passing Square Mesh Sieves
1/2 inch (12.5mm)	100
3/8 inch (9.50 mm)	85 – 100
No. 4 (4.75 mm)	10 – 30
No. 8 (2.36 mm)	0 – 10
No. 16 (1.18 mm)	0 – 5

2.2 GEOTEXTILE FABRIC

- A. Geotextile Fabric: The geotextile fabric enveloping crushed stone shall meet the following criteria:

Property	Criteria	Test Method
Grab Strength (lbs.)	Min. 80	ASTM D4632
Puncture Strength (lbs.)	Min. 25	ASTM D4833
Trapezoid Tear (lbs.)	Min. 25	ASTM D4533
Apparent Opening Size	No. 70-100 U.S. Sieve Size	ASTM D4751

Fabric should be needle-punched non-woven material. Seams should be overlapped a minimum of 12 inches.

2.3 STRUCTURE BACKFILL

- A. Granular Backfill for Structures, VAOT 704.08A
1. Granular backfill for structures shall consist of satisfactorily graded, free-draining granular material reasonably free from loam, silt, clay, and organic material, and meet the following gradation requirements:

Sieve Designation	Percentage by Mass (Weight) Passing Square Mesh Sieves
3 Inch (75.0 mm)	100
No. 4 (4.75 mm)	45 – 75
No. 100 (0.150 mm)	0 – 12
No. 200 (0.075 mm)	0 – 6

2.4 BACKFILL MATERIAL FOR TRENCHES

- A. Material used for backfill shall be the same material excavated during construction. Material previously excavated shall not be used if organic matter, peat, clay, debris, asphalt, rocks over 12” in size, and boulders are present. At the Engineer’s discretion, they may reject unearthed material for trench backfill.

2.5 ROADWAY

- A. Refer to Specification Section 321000 – Paving and Surfaces.

3. EXECUTION

3.1 EXCAVATION AND BACKFILL

- A. All excavation work whether cut, general excavation, or trenching shall conform to the following provisions as applicable.

1. Extent: Excavation shall be performed to elevations and dimensions indicated, plus sufficient space to permit erection of forms, shoring, drains, construction of structures and the inspection of the work. Side slopes of open cut excavations shall not be steeper than permitted by OSHA rules.
2. Materials to be Excavated: The Contractor shall excavate all materials of whatsoever nature encountered. Rock excavation shall be as specified elsewhere in this section of these specifications.
3. Over Excavation Correction: Excavation beyond indicated or authorized limits shall be refilled with approved gravel, other approved suitable granular soil material, or approved crushed stone, compacted to 98 percent (Modified Proctor) of the maximum dry density within 3% of optimum moisture content as specified herein, or concrete meeting the requirements of these specifications, as required by the Engineer at no additional cost.
4. Subgrade Preparation and Protection:
 - a. Excavate as required to expose natural undisturbed soils to accommodate foundations. Elevations to reach natural soils may vary. Protect subgrades from disturbance. Use equipment that will allow for minimal disturbance of the subgrades (e.g., smooth bladed buckets in silty soils). Hand trim excavations as necessary. Remove all loose materials.
 - b. Use working mats consisting of 12-inches of Granular Backfill around structures or 6-inches of crushed stone enveloped in geotextile fabric below footings and floor slabs to protect against disturbance of subgrades in wet conditions.
 - c. Notify Engineer a minimum of 24 hours prior to excavations to schedule a review of foundation subgrade conditions.
5. Dewatering:
 - a. In addition to the following, the Contractor shall refer to the requirements of Specification Section 312319 – Dewatering.
 - b. The Contractor shall provide, at their own expense, adequate pumping, and drainage facilities to keep all excavation and work sufficiently dry from groundwater and/or surface runoff so as to not adversely affect construction product or procedures nor cause excessive disturbance of underlying natural ground or footing and slab subgrades. The Contractor shall similarly control water entering the excavation as a result of construction operations, such as washing of concrete equipment and tools and the like.
 - c. Slope excavations as necessary so ground or surface water will not collect on foundation and slab-on-grade subgrades. Provide sumps outside footing areas as necessary to collect ground or surface water.
 - d. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. The Owner's Representative will inform the Contractor where water removed from excavations may be discharged. Maintain until dewatering is no longer required.
 - e. Under no circumstances place concrete or fill, lay piping, or install appurtenances in excavations containing free water.
6. Frost Protection:

- a. Slope excavation as necessary so ground or surface water will not collect on foundation and slab-on-grade subgrades. Provide sumps outside footing areas as necessary to collect ground or surface water.
 - b. Protect subgrades from freezing.
 - c. If subgrade freezes, remove all frozen soil and replace with compacted Structural Backfill or Crushed Stone as directed by the Engineer at no additional cost to the Owner.
 - d. Do not place frozen fill.
 - e. Do not form foundations or slabs on frozen subgrades.
7. Drainage Control: The Contractor shall control the grading around the structures so that the ground shall be pitched in order to prevent water from running into the excavated areas and to prevent damage to other structures or work. Water shall not be conducted onto adjacent property. Excavation shall be performed in a manner and sequence that will provide drainage at all times.
8. General Excavation for Structures shall be done to provide proper bearing for excavations, to produce the proper grade and dimensions for the finished construction and in a satisfactory manner.
9. Rock Excavation:
- a. Definition: For the purposes of this contract work, rock shall be defined as any solid rock or boulder two (2) cubic yards or more in volume and any hard natural material or rock ledge that will withstand removal by the usual mechanical excavation methods such as power shovels or toothed bulldozer blades and that normally requires blasting or continuous drilling or barring for removal. The Engineer shall be the sole judge as to whether material encountered shall be classified as rock in accordance with the above description.
 - b. Approval: No rock shall be removed until so approved by the Engineer.
 - c. General Requirements: As stated in the earth excavation paragraph of this section of these specifications, the pertinent parts shall apply to rock excavation.
 - d. Trench Rock Excavation for Pipe and Conduits: Rock in trenches for piping and conduit shall be excavated a minimum of six (6) inches below the exterior of the pipe or conduit bottom and one foot beyond the outside of the pipe on both sides or a minimum width of three (3) feet, whichever is larger and filled with approved compacted pipe bedding material to the required invert elevation.
 - e. Rock Excavation for structures: Rock for structures shall be excavated a minimum of one (1) foot outside the face of the footing and to a depth of six (6) inches below the outside surface of the bottom-slab of the structure.
10. Unsuitable Materials: If material unsuitable for subgrade for pavement, piping or foundations in the opinion of the Engineer, is found below the grade to which excavation would normally be carried, in accordance with the drawings and/or specifications, it shall be removed to a depth as requested by the Engineer. Unsuitable materials removed from below pavement, piping, or foundation subbase elevations shall be excavated laterally to a 1H:1V plane extending from the bottom edge of the pavement or piping. Replacement fill may consist of Granular Fill, Crushed Gravel, Crushed Stone enveloped in non-woven geotextile fabric, or 2000 psi lean

concrete. Granular fill may be from on-site or off-site sources but must meet requirements as specified in this specification. Materials excavated or stripped during earthwork which is unsuitable as determined by the Engineer for fill and backfill shall be removed from the site and properly disposed of off the Owner's property or right-of-way. The Engineer shall be notified before removal of unsuitable material. Material, which is unsuitable for foundation, in the opinion of the Engineer, but which is found above the elevation, to which the excavation would normally be carried in accordance with the drawings and/or specifications, shall be removed from the site. Where present, buried utilities should be located and removed and/or relocated along with any trench backfill to at least outside the new foundation influence zone.

11. Fill and Backfill:

- a. Foundation for Fill and Backfill: Foundations for fills shall be prepared in an approved manner by removing all unsuitable materials. All vegetation, peat, organic topsoil or subsoil, trash, debris, roots, stumps and any compressible or otherwise deleterious materials shall be stripped from the existing ground surface and removed from excavations prior to placement of fill or backfill. The base excavations which have been allowed to weather and which are unsuitable for bonding shall be picked, roughened or scarified and then compacted with at least four passes of a suitable vibratory compactor before any fills are placed to make a bond with the material to be placed on them.
- b. Material General Requirements: No unsuitable material shall be incorporated in the work. Frozen material and boulders shall not be used. Suitable materials from excavation which conform to the requirements herein or are approved by the Engineer shall be used for fill and backfill except where these specifications have more stringent or special requirements for certain parts of the contract work. Material from any rock excavation shall not be used as backfill. All fills and backfills shall be made with materials available which are acceptably graded, containing stone, gravel and sand without too large percentage of silts or clays, or too wet for proper placement. Fill and backfill material shall not contain individual roots, vegetation masses, peat, muck or other organic or undesirable matter. Fill and backfill material shall not contain any debris, wood, broken glass, metal, stones larger than six (6) inches or 2/3 loose lift thickness in largest diameter, granite blocks, broken concrete, thin brick and block masonry material, masonry rubble (crushed masonry may be mixed with fill as long as gradation of mix meets gradation requirement for proposed use of fill) or other objectionable material. The material within two (2) feet of finish grade in any areas to be paved and within five feet horizontally of any structure shall contain no stone having any dimension exceeding six (6) inches or 2/3 loose lift thickness. When no special material requirements are specified herein or indicated on the Contract Drawings, gravel, bank-run gravel or crushed stone enveloped in non-woven geotextile filter fabric shall be used.
- c. Placing: Materials placed shall, unless otherwise permitted or required, be specially compacted by depositing in approximately horizontal layers not exceeding the thickness stated hereinafter but in no case thicker than twelve inches before compaction and unless sufficiently moist as spread, shall be wetted

to the extent required in such manner as to secure the uniform moistening of all portions of each layer. Each layer shall be compacted by suitable vibratory tampers which will secure the required degree of compaction. Materials used in fills shall be deposited carefully to avoid injury to structures, pipe and conduit. Backfill simultaneously on each side of foundation walls. Where horizontal fill layers meet a natural or excavated slope, the layer shall be keyed into the slope by cutting a bench to remove all loosened soil to firm, undisturbed soil. The surface of benches shall be compacted to the same requirements as apply to the area being filled. No fill shall be placed or compacted during unfavorable weather conditions. When work is interrupted by heavy rains or snow, fill operations shall not be resumed until the moisture content and density of previously placed fill are as specified hereinafter.

1. In Embankment: Fill shall be placed in layers not more than twelve inches thick loose measure or as specified in this specification, whichever is less.
2. Around Structures. Fill and backfill shall be placed in layers not more than six inches thick loose measure or as specified in this specification, whichever is less. No heavy machinery shall be allowed within five feet of the structure during placing. Material shall not be placed until the structure can satisfactorily withstand the loads imposed by fill and backfill. Only material free from large stones (exceeding 4-inches) shall be placed within five (5) feet of any structure. Backfills at structures shall be brought up evenly on all sides to avoid damage to the structure by uneven loading.
3. In Trenches: After piping and conduit have been installed, bedded, tested, inspected, approved by the proper authorities and observed by the Engineer, sand, as specified in this specification, shall be carefully placed and tamped in thin layers around and to a level of one foot above the top of the piping and conduits. The remaining excavation shall be backfilled with approved material, in layers not more than twelve inches thick loose measure or as specified in this specification, whichever is less, before compaction by vibration, rolling or ramming. Only material free from large stones (exceeding 4-inches or 2/3 loose lift thickness, whichever is less) shall be placed within five feet of any pipe or conduit. No heavy equipment or traffic shall be allowed over the pipe until at least four (4) feet or the minimum shown on the drawings of compacted backfill has been placed.
4. Under Structures: Fill and backfill below structures shall be crushed gravel and shall be placed in layers not more than six inches thick loose measure or as specified in this specification, whichever is less.

3.2 BEDDING

- A. The Contractor shall refer to the Contract Drawings for areas required for trench bedding.
- B. The Contractor shall, if necessary, dewater the trench prior to the placement of pipe bedding. Dewatering operation expenses shall be borne by the Contractor. Unless otherwise stated within the Contract Documents, the Contractor shall use the Standard

Method Test as outlined in AASHTO T-99 Method C (Standard Proctor) to compact to 95% of the maximum density for the pipe bedding material.

3.3 COMPACTION

- A. General: All fills and backfills shall be compacted sufficiently so that structures, paving and other construction shall not settle and so that they shall not allow movement of earth and shall prevent subsequent settlement.
- B. Determination of Compaction: All percentages of compaction specified herein shall be of the maximum dry density at the optimum moisture content as established by Method D of AASHTO Standard T180 (ASTM D1557) (Modified Proctor) and verified by AASHTO Standard T147 (ASTM D1556) or Nuclear method (ASTM D-2922).
- C. Frequency: Testing frequency within pre-load fill will be performed at each compacted fill layer, at least 1 test every 2000 sq. ft. or less, but in no case shall there be fewer than 3 tests per 1-foot lift of backfill soils placed.
- D. Tests Prior to Compaction: At least one modified proctor test and one gradation test (in accordance with ASTM C 111 and ASTM C 136) shall be made on a representative sample of each of the materials that will be incorporated in compacted earthwork. These tests shall be made by an independent testing laboratory, acceptable to the Engineer and paid by the Contractor. A copy of all test results shall be delivered to the Engineer.
- E. Tests After Field Compaction: The Owner reserves the right to have compaction tests performed by an independent laboratory with all testing costs borne by the Owner. These field density tests will be made to determine the actual in-place densities being attained.
- F. Correction of Improper Compaction: If any of the field density test results fail to meet the density as specified herein for the earthwork involved, then the Contractor shall remove all of the earthwork in that portion of the work involved as determined by the Engineer and shall replace it in accordance with these specifications to the required density at no additional cost to the Owner. After the work is replaced additional field density tests will be made by a qualified independent testing laboratory retained by the Owner and the Contractor shall reimburse the Owner for all costs for such additional testing.
- G. Required Compaction: Compaction shall be to the following densities:

Fill and Backfill Location	Modified Proctor Density Percent
Under Structures	95
Beside structure foundation walls	95
Top two feet under pavements	95

Under pavements below top two feet	95
Trenches through unpaved areas	95
In embankment	95

- H. In addition to the stated degree of compaction, all fill and backfill shall receive at least the compactive effort given in the following table. Lift thickness shall not exceed that shown for the compaction method selected, except that the first lift of fill or backfill placed over natural ground in wet conditions may be as much as twelve inches thick. Application of the minimum compactive effort does not relieve the Contractor from their requirement to achieve the specified degree of compaction.

Compaction Method	Maximum Stone Size	Maximum Loose Lift Thickness		Minimum Number of Passes	
		Below Structures and Pavement	Less Critical Areas	Below Structures and Pavement	Less Critical Areas
Hand-operated vibratory plate or light roller in confined areas	4"	6"	8"	6	4
Hand-operated vibratory drum rollers weighing at least 1,000#	6"	8"	10"	6	4
Light vibratory drum roller, minimum dynamic force 3,000# per ft. of drum width	6"	10"	14"	6	4
Medium vibratory drum roller, minimum dynamic force 5,000# per ft. of drum width	8"	12"	18"	6	4
Large vibratory drum roller, minimum dynamic force 8,000# per ft. of drum width	10"	16"	24"	6	4

I. Moisture Control:

1. Water shall be added to fill material which does not contain sufficient moisture to be compacted to the specified densities. Water shall be clean, potable, and free from debris. Fill and backfill material containing excess moisture shall be required to dry prior to or during compaction to a moisture content not greater than three percentage points (3%) above optimum moisture (as determined by the laboratory modified proctor test) except that material which displays pronounced elasticity or deformation underfoot or under load shall be required to dry to optimum moisture content before it is placed and compacted, if that is required to achieve specified compaction. At the contractor's option,

material which is too wet may be removed and replaced with satisfactory material at no additional cost to the Owner.

3.4 MISCELLANEOUS EARTH EXCAVATION AND EXTRA EARTH EXCAVATION

- A. The Engineer may require the Contractor to perform miscellaneous excavation, not otherwise indicated on the Contract Documents. Backfilling requirements shall be the same, unless otherwise noted, as those listed within this Specification Section.
- B. Refer to Specification Section 012000 – Measurement and Payment for payment regarding any miscellaneous earth excavation.

3.5 DEWATERING

- A. In addition to the following, the Contractor shall refer to the requirements of Specification Section 312319 – Dewatering.

3.6 FROST PROTECTION

- A. Slope excavation as necessary so ground or surface water will not collect on foundation and slab-on-grade subgrades. Provide sumps outside footing areas as necessary to collect ground or surface water.
- B. Protect subgrades from freezing.
- C. If subgrade freezes, remove all frozen soil and replace with compacted Structural Backfill or Crushed Stone as directed by the Engineer at no additional cost to the Owner.
- D. Do not place frozen fill.
- E. Do not form foundations or slabs on frozen subgrades.

3.7 UNSUITABLE MATERIAL

- A. If material unsuitable for subgrade for pavement, piping or foundations in the opinion of the Engineer, is found below the grade to which excavation would normally be carried, in accordance with the drawings and/or specifications, it shall be removed to a depth as requested by the Engineer.
- B. Unsuitable materials removed from below pavement, piping, or foundation subbase elevations shall be excavated laterally to a 1H:1V plane extending from the bottom edge of the pavement or piping.
- C. Replacement fill may consist of Granular Fill, Crushed Gravel, Crushed Stone enveloped in non-woven geotextile fabric, or 2000 psi lean concrete.

1. Granular fill may be from on-site or off-site sources but must meet requirements as specified under this Specification.
- D. Materials excavated or stripped during earthwork which is unsuitable as determined by the Engineer for fill and backfill shall be removed from the site and properly disposed of off the Owner's property or right-of-way. The Engineer shall be notified before removal of unsuitable material.
- E. Material, which is unsuitable for foundation, in the opinion of the Engineer, but which is found above the elevation, to which the excavation would normally be carried in accordance with the drawings and/or specifications, shall be removed from the site.
- F. Where present, buried utilities should be located and removed and/or relocated along with any trench backfill to at least outside the new foundation influence zone.

3.8 SURPLUS EXCAVATED MATERIALS

- A. The Owner does not wish to retain ownership of surplus excavated materials. The Contractor shall assume full responsibility for all costs of disposing of the surplus excavated material. In general, surplus excavated material shall be removed from the site and properly disposed of after approval is given by the Engineer.

3.9 SITE GRADING

- A. Grading shall be done to bring the work to the grades and elevations shown on the drawings.
- B. Rough Grading: Proper allowances shall be made for paving. Rough grading shall be reasonably even and free from irregularities and shall provide positive drainage away from structures without ditching or pools. No heavy equipment shall be used within five feet of structure walls.
- C. Fine Grading: Any depressions which may occur shall then be filled with additional suitable materials and the surface then re-graded until true to the lines and grade required. The areas to be fine graded for loaming and seeding shall be raked to remove all stones and other unsatisfactory materials and shall be suitably compacted.

END OF SECTION

SECTION 311100

CLEARING AND GRUBBING

1. GENERAL

1.1 DESCRIPTION

- A. The work to be performed under this section consists of furnishing all tools, equipment, labor and transportation required for clearing and grubbing identified areas within the project boundaries.

1.2 LEGAL REQUIREMENTS

- A. The Contractor shall be responsible for obtaining all permits and obeying all Federal, State, County and City laws, by-laws, ordinances, resolutions and regulations, which pertain to their work.

1.3 RELATED SECTIONS

- A. The following items appurtenant to the work are a part of the contract work specified under other sections of these specifications but are mentioned here for cross reference purposes.
 - 1. Section 024100 – Demolition and Abandonment
 - 2. Section 028100 – Waste Material Disposal
 - 3. Section 310000 – Earthwork

2. PRODUCTS

- 2.1 None used.

3. EXECUTION

3.1 SITE CLEARING

- A. Remove trees, shrubs, grass, other vegetation, improvements, or obstructions interfering with installation of new construction.
- B. Remove items elsewhere on site or premises as specifically indicated. Removal includes digging out stumps and roots.
- C. Strip topsoil to whatever depths encountered to prevent intermingling with underlying subsoil or other objectionable material. Remove heavy growths of grass from areas before stripping.

- D. Stockpile removed topsoil in storage piles in areas shown on plans or where directed. Construct storage piles to freely drain surface water. Cover storage piles if required to prevent windblown dust.
- E. Dispose of unsuitable or excess topsoil same as specified for waste material.

3.2 CLEANING AND GRUBBING

- A. Clearing and grubbing shall consist of the complete removal and disposal of all trees, brush, stumps, roots, grass, weeds, rubbish and all other obstructions resting on or protruding through the surface of the existing ground and the surface of the excavated areas.
- B. Unless otherwise shown on the plans, clearing and grubbing shall be accomplished within all areas designated on plans, or as directed by the Engineer. Areas designated for site grading shall also be cleared and grubbed; however, selective clearing will be performed in some areas by retaining selected trees. The trees selected by the Engineer for saving shall be protected from construction equipment by the Contractor in a manner approved by the Engineer and meeting the criteria for such protection as required by the applicable governmental agency.
- C. All stumps within the irrigation zones shall be grubbed to a depth of 18 inches below existing grade and replaced with compacted backfill.
- D. Within all other areas where clearing and grubbing is required, all stumps, roots and other debris projecting through or appearing on the surface of the ground shall be removed to a depth of 18 inches below the compacted surface.
- E. No stumps, roots, or perishable matter of any description shall remain under concrete slabs or footings or contained in pipeline trenches or other excavations.
- F. As an exception to the above provisions, trees within a stormwater retention area, which are not involved in an area of excavation and trees along the banks drainage swales should be trimmed, protected and left standing. Brush and shrubs on banks drainage swales and stormwater retention areas shall be cut off at ground level. In stormwater retention areas, only that portion of the retention area to be excavated shall be grubbed.

END OF SECTION

SECTION 312319

DEWATERING

1. GENERAL

1.1 CONTRACT DOCUMENTS

- A. Attention shall be directed to the General Conditions for the definition of the Contract Documents. This division of these specifications is a part of the Contract Documents as defined in the General Conditions. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other parts of these specifications.

1.2 WORK INCLUDES

- A. The Contractor shall provide all labor and furnish, install, and maintain all material and equipment required to provide adequate and satisfactory dewatering and drainage of excavations. The Contractor may choose any satisfactory method for handling groundwater or surface water encountered in the work and shall assume all responsibility for the adequacy of the methods, materials, and equipment employed. The Contractor shall refer to Specification Section 310000 – Earthwork and take all precautions necessary to prevent loosening or softening of the subgrade. In this regard, the Contractor shall at all times be prepared to alter the construction method or order of work if there is evidence that dewatering is not sufficient or as otherwise directed by the Engineer.
- B. The Contractor shall provide pumping equipment and devices to properly remove and dispose of all water entering trenches and excavations for manholes. The grade shall be maintained dry until the manholes to be installed therein are complete. All dewatering required by pumping and drainage shall be performed without damage to the trench, pavements, pipes, electrical conduits or other utilities.
- C. The Contractor may remove the dewatering system from the Project site upon completion of dewatering. Cut off wells a minimum of 36 inches below underlying construction or ground surface, whichever is lower, and fill well with sand or cap well. Dewatering wells shall be surveyed for as-built locations.

1.3 RELATED SECTIONS

- A. The following items appurtenant to the work are a part of the contract work specified under other sections of these Specifications but are mentioned here for cross reference purposes.
 - 1. Specification Section 310000 – Earthwork
 - 2. Specification Section 314000 – Shoring and Underpinning

1.4 PUMPING, DEWATERING, AND DRAINING

- A. Reference standards: The latest edition of the following standards, as referenced herein, shall be applicable.
 - 1. American Society of Testing and Materials (ASTM)
 - 2. American Waterworks Associations (AWWA)
 - 3. American National Standards Institute (ANSI)

1.5 SUBMITTALS

- A. Submittals and certifications for the following items of work in this section shall be furnished in accordance with Specification Section 013300 – Submittals.
 - 1. Submit “as-built” drawings showing the locations of wells or well points before backfilling.
- B. Dewatering plans shall be reviewed and approved by a Professional Engineer licensed in the State of Vermont. Submit plans stamped by Vermont PE.
- C. Submit qualifications for installer of Dewatering systems. Installer shall have a minimum experience of 5 projects with similar characteristics.

1.6 MEASUREMENT AND PAYMENT

- A. No separate payment will be made for the work under this section and all costs in connection therewith shall be included in the prices bid for the items including excavation.

2. PRODUCTS

- 2.1 None used.

3. EXECUTION

3.1 EXECUTION

- A. The Contractor shall, at all times during construction, provide ample means and devices with which to remove promptly and dispose properly of all water entering structure, trench, and manhole excavations and keep them acceptably dry until the structures to be built thereon are completed. All water pumped or drained from the work shall be disposed of in a suitable manner without damage to the sewer, pavements, pipes, electrical conduits, or any other work or property. Existing or new sanitary sewers shall not be used to dispose of drainage.
- B. Drainage shall be adequate. Pipe and masonry shall not be laid in water or submerged within 24 hours after being placed or prior to backfilling. Water shall not flow over new masonry within 4 days after placement. Pipe and conduit which becomes submerged shall be removed and the excavation dewatered and restored to proper condition prior to

reinstalling the pipe and conduit. In no event shall water be allowed to rise so as to set up unequal pressures in the structures until the concrete or mortar has set at least 24 hours. The Contractor shall constantly guard against the possibility of flotation of the pipe after being laid. They shall place adequate backfill promptly to prevent this occurrence, and their method of handling drainage and carrying on their operations shall always be adequate to prevent flotation.

- C. Failure to provide adequate drainage for trenches may result in the necessity for the Contractor to do additional work of excavation below grade and refilling at their own expense.
- D. Erosion and Turbidity Control. The Contractor shall build sediment traps, construct stream by-passes, apply vegetative soil stabilization practices, spread protective layers of straw or hay mulch, terrace or scarify slopes, provide gravel inlet filters for storm drains and ditches, and/or employ other means to prevent erosion and to prevent turbid water from being discharged to streams.

END OF SECTION

SECTION 312500

EROSION AND SEDIMENTATION CONTROLS

1. GENERAL

1.1 CONTRACT DOCUMENTS

- A. Attention shall be directed to the General Conditions for the definition of the Contract Documents. This division of these Specifications is a part of the Contract Documents as defined in the General Conditions. All applicable parts of the balance of the Contract Documents are equally as binding for this Section as for all other parts of these Specifications.
- B. In the event of conflict between these requirements and pollution control laws, rules, or regulations of other Federal or State or local agencies, the more restrictive laws, rules, or regulations shall apply.

1.2 WORK INCLUDES

- A. Furnish all labor, materials, tools and equipment, and perform all operations necessary for soil erosion prevention and sedimentation control work indicated on Drawings and specified herein. All work shall be in accordance with the Vermont Standards and Specifications for Erosion Prevention and Sediment Control (latest edition).
- B. This work shall consist of the installation and maintenance of Best Management Practices (BMPs) such as but not limited to: silt fence, stone check dams, inlet controls, matting, mulching and seeding as shown on the plans, ordered by the Engineer, or as deemed necessary during the life of the contract to control soil erosion and/or to be in compliance with federal, state, and local laws.
- C. The Contractor shall submit a Notice of Intent (NOI) and a copy of the Erosion Prevention and Sediment Control Plan, obtain coverage and fully comply with Vermont DEC Construction General Permit 3-9020 (Stormwater Runoff from Small Construction Sites).
- D. The Owner will require that the Contractor submit an Erosion Prevention and Sedimentation Control Plan, prepared by a person Vermont trained and experienced in erosion and sedimentation control methods and techniques, to the Owner for approval. The absence of the Owner's requirement for submittal of an erosion prevention and sedimentation control plan shall not be interpreted as a dismissal of the other conditions and requirements of this section.

1.3 RELATED SECTIONS

- A. The following items appurtenant to this work are specified under other sections of these Specifications and are mentioned here for cross-reference purposes only:
 - 1. Section 011000 – Summary of Work

2. Section 015000 – Temporary Facilities and Controls
3. Section 011010 – Permits
4. Section 310000 – Earthwork

1.4 PROJECT CONDITIONS

- A. Earthmoving activities shall be conducted in such a manner so as to prevent accelerated erosion and resulting sedimentation.
- B. The Contractor shall design, implement, and maintain erosion and sedimentation control measures which effectively prevent erosion and sedimentation.

1.5 GENERAL METHODOLOGY

- A. Erosion and sedimentation control methods shall consider all factors which contribute to erosion and sedimentation including, but not limited to, the following:
 1. Topographic features of the project area.
 2. Types, depth, slope and area extent of the soils.
 3. Proposed alteration of the area.
 4. Amount of run-off from the Project area and the upstream watershed area.
 5. Staging of earthmoving activities.
 6. Temporary control measures and facilities for use during earthmoving.
 7. Permanent control measures and facilities for long term protection.
 8. Maintenance program for the control facilities including disposal of materials removed from the control facilities or Project area.
- B. All temporary erosion control and sediment runoff control work, as well as permanent erosion control and sediment runoff control work, shall, in general, conform to all of the requirements of the Vermont Standards and Specifications for Erosion Prevention and Sediment Control (latest edition).

2. PRODUCTS

2.1 GENERAL

- A. The product specifications described in this section shall be considered minimum requirements and shall not relieve the Contractor from meeting the requirements of DEC or any other authority having jurisdiction.

2.2 SEDIMENT BARRIERS

- A. Sediment barriers shall be geotextile fabric silt fence, filter curtain, stone, or other approved materials that will prevent sedimentation.
- B. Sediment barriers shall be used as storm drain inlets, across minor swales and ditches, and at other applications where the structure is of a temporary nature and structural strength is not required. Sediment barriers are temporary berms, diversions, or other

barriers that are constructed to retain sediment on-site by retarding the filtering storm runoff.

C. Recommended Materials and Dimensions:

1. Hay or Straw Bales:

- a. Bales should be bound with twine.
- b. Bales should be anchored to the ground with fence posts, wood picks, or any naturally decomposable materials. Two anchors per bale are required.
- c. Bales should not exceed the dimensions of 2.4' x 6' x 2'.

2. Stone:

- a. Height: 1.5 – 2 feet (uniform top elevation)
- b. Top Width: 3 – 5 feet
- c. Side Slopes: 3:1 maximum
- d. Cross-Sectional Area: 20 ft² (per tributary acre)
- e. Material: Coarse rock or stone (see details)

3. Silt Screen:

- a. Shall be non-corrosive flexible membrane, netting, or screening designed and manufactured for the purpose of screening silts, soils, and floating debris, subject to Engineer's review and approval.

2.3 DIVERSION TERRACES (BERMS)

A. Diversion terraces shall be used as a temporary measure installed on the uphill side of the disturbed areas, in order to divert surface run-off away from unstabilized slopes and the Project area.

B. Recommended Minimum Dimensions:

1. Height: 1.5 feet
2. Top Width: 2 feet
3. Side Slope: 2:1 maximum
4. Material: Soil

2.4 MULCH

A. Used alone or in conjunction with other structural or vegetative erosion control measures, mulch is applied to any disturbed area which is subject to erosion, for protection of disturbed soil or newly reseeded areas.

B. Recommended Methods and Materials:

1. Material: Hay, straw, woodchips
2. Methods: Spread by hand tools on small plots and by mechanical blower on larger areas. Tacked by passing a tracked construction vehicle over the mulched area.
3. Rates:
 - a. Hay or Straw: 90-100 lbs per 1,000 sq. ft.
 - b. Woodchips: 500-900 lbs per 1,000 sq. ft.

2.5 TEMPORARY STABILIZATION

A. Vegetation:

1. The planting of temporary vegetative cover shall be performed on disturbed areas where the earthmoving activities will be ceased for a period of more than 45 days. The vegetation shall provide short-term rapid cover for the control of surface run-off and erosion, until permanent vegetation can be established, or earthmoving activities can resume. Permanent vegetation shall be as specified in Specification Section 129243 – Landscaping. Temporary vegetation shall meet the State of Vermont requirements for rates of application and planting season.

B. Erosion Control Products:

1. Erosion control products meeting the Vermont Standards and Specifications for Erosion Prevention and Sediment Control (latest edition) shall also be allowed for temporary erosion control. Products proposed for use by the Contractor shall be submitted and approved by the Engineer.

3. EXECUTION

3.1 GENERAL

- A. The Contractor shall install erosion and siltation control systems prior to commencing construction.
- B. The erosion and siltation control systems shall be maintained for the duration of construction activities and subsequently for a period of time until a good stand of grass has developed, or the soil is adequately stabilized.
- C. The Contractor shall be responsible for removing erosion and siltation control systems following approval by the Project Engineer.

END OF SECTION

SECTION 314000

SHORING AND UNDERPINNING

1. GENERAL

1.1 CONTRACT DOCUMENTS

- A. Attention shall be directed to the General Conditions for the definition of the Contract Documents. This division of these Specifications is a part of the Contract Documents as defined in the General Conditions. All applicable parts of the balance of the Contract Documents are equally as binding for this Section as for all other parts of these Specifications.

1.2 WORK INCLUDES

- A. The Contractor shall shore and brace excavations, provide all sheeting (sheet piling and/or soldier pile and lagging), and protect all slopes and earth/riverbanks to prevent cave-ins, to protect persons and adjacent construction, and to permit proper execution of the work. All sheeting, shoring and bracing shall have sufficient strength and rigidity to withstand the pressure exerted and maintain the walls of the excavation properly in place and protect all persons or property from injury or damage.
- B. All sheeting, shoring and bracing shall be designed by a Professional Engineer registered in Vermont and paid by the Contractor. When excavations are made adjacent to existing structures, or in paved areas, particular care shall be taken to adequately sheet, shore and brace the sides of the excavation to prevent any undermining of or settlement beneath the structures or the pavement.
- C. The underpinning of adjacent structures or pavement shall be done when necessary. The foundation material under any pavement which is undermined shall be replaced and satisfactorily compacted or when required by the Engineer, the pavement shall be removed by the Contractor and the entire expense of such removal of pavement and subsequent replacement thereof shall be borne by the Contractor.
- D. The removal of sheeting, shoring and bracing shall be done in such a manner as not to endanger or damage either the new structure or any existing structure or property and so as to avoid cave-ins or sliding of the slopes. All holes or voids left by the removal of sheeting, shoring, or bracing, shall be satisfactorily filled and compacted.
- E. The Contractor should note that conditions exist which may require the use of shoring. No additional payment shall be made for the use of sheeting, shoring or bracing if required, unless otherwise shown or stated in the Contract Documents.
- F. Excavations shall not extend beyond the right-of-way. Where tiebacks or soil nails are required as part of the Contractor's shoring submittal, the Contractor shall be responsible

for securing permission from adjacent landowners to install such systems within the respective landowner's right-of-way.

- G. The Contractor shall verify the locations and elevations/inverts of all existing utilities and features prior to commencing installation of any shoring system.

1.3 RELATED SECTIONS

- A. The following items appurtenant to the work are a part of the contract work specified under other sections of these specifications but are mentioned here for cross reference purposes:
 - 1. Section 310000 – Earthwork
 - 2. Section 312319 – Dewatering

1.4 REFERENCE STANDARDS

- A. ASTM A328 - Steel Sheet Piling.
- B. NFPA - National Forest Products Association.
- C. OSHA - Occupational Safety and Health Administration
- D. Vermont Agency of Transportation (VTTrans) Standard Specification

1.5 SYSTEM DESCRIPTION

- A. The construction of the excavation support systems shall include but not be limited to soldier piles, lagging, trench boxes, wood sheeting and steel sheeting, including bracing members such as walers, struts, shores and tieback anchors and all other system members as determined to be needed by the Contractor and/or their Shoring Engineer.
- B. The Contractor shall assume soils to be considered Soil Type "C" as discussed in "OSHA Construction Standard for Excavation", 29 CFR Part 1926.650-.652, Subpart P unless the Contractor obtains an appropriate analysis to show otherwise, in accordance with OSHA standards.

1.6 SUBMITTALS

- A. Submittals and certifications for the following items of work in this section shall be furnished in accordance with Specification Section 013300 – Submittals.
- B. The Contractor shall submit signed and sealed working drawings showing the proposed shoring and underpinning with accompanying calculations and details, as prepared by a licensed Professional Engineer registered in Vermont.
- C. Submittal review by Engineer shall be for review of the Contractor's understanding of the shoring needs and constraints and shall not relieve the Contractor and their Engineer of

responsibility to properly shore and support excavations. The Contractor shall be solely responsible for adequacy of shoring systems.

- D. The submittal should include:
1. The locations and dimensions of the shoring elements.
 2. The maximum design depth of cut in front of the shoring.
 3. Details, arrangement and sequence of the shoring systems installation.
 4. Design and test loads on soil or rock anchors if required.
 5. Elevations of: excavation stages, anchors, bracing, permissible depths to which the excavation may be carried before installing and preloading bracing and/or anchors.
 6. Locations of existing utilities and underground structures with respect to proposed anchor locations
 7. Methods for limiting ground loss under existing structures while installing anchors, if required.
 8. Methods for controlling settlements and lateral movements of the existing structures, pavement and/or features.
 9. Methods for surveying adjacent structures and features.
 10. Contingency plans if vibrations or movements meet threshold and limit values as defined below in Part III.
 11. Calibration records for load cells, jacks and pressure gages or other equipment to be used in stressing and testing the tiebacks.
 12. Suitable installation equipment and methods (e.g. vibratory or impact driving).

1.7 PRECONSTRUCTION AND POST CONSTRUCTION SURVEY

- A. The Contractor shall conduct a pre-construction survey of all buildings and water supplies within approximately 200 feet of the work area. The Contractor shall perform a post-construction survey to evaluate the condition of all structures and water supplies after construction. The survey shall include, but not necessarily be limited to, video tapes, digital photographs and notes/sketches, as required, which identify the existing interior and exterior conditions of all structures and portions thereof.
- B. The Contractor and shoring Contractor shall identify locations where existing conditions identified in the pre-construction survey indicate the presence of existing damage if present. The Contractor and shoring Contractor shall take appropriate precautions to prevent further damage in those locations.

2. PRODUCTS

2.1 MATERIALS

- A. Wood: tongue and groove; #3 common Douglas Fir or Hemlock; or Utility Grade Southern Pine; NFPA grading. When treated timber sheet piling is required by the shoring designer, preservative materials shall conform to the requirements of AASHTO M 133. The type and method of treatment and the net retention of preservatives shall be as recommended in AASHTO M 133, AWPA C3, 12 lb/ft³.

- B. Steel: ASTM A328. The steel sheet piling shall conform to AASHTO M 202/M 202M (ASTM A 328/A 328M). Used steel sheet piling in good condition and acceptable to the Owner will be allowed.
- C. Concrete: concrete used in rock sockets or other shoring applications shall meet requirements of Section 501 of NHDOT Standard Specifications for Construction, latest revision.
- D. Trench Boxes: Fabricated steel.

3. EXECUTION

3.1 GENERAL

- A. The Contractor shall be solely responsible for the means and methods of excavation and for the design and construction of the excavation support systems.
- B. The support system shall be designed to support the maximum construction loads that will occur during construction.
- C. Excavation support systems shall be constructed so as to be able to support all vertical and lateral loads and other surcharge loads imposed on the system during construction including earth pressures, utility loads and other surcharges and construction loads in order to provide safe construction of the permanent structures and prevent movement and/or damage to adjacent soil, buildings, structures and utilities.
- D. Do not brace to concrete unless authorized by the Engineer and then only if concrete has reached its design strength as determined by compressive test of representative concrete cylinders which have been cured on site for a period of at least 14 days.
- E. Do not embed any part of or portion of excavation support system in the permanent work. Do not construct sleeves or openings in the structures to permit bracing through the structures unless authorized by the Engineer.
- F. The Contractor shall not perform excavations in unstable earth. Stabilize all earth materials behind support walls before excavation is allowed to proceed.
- G. The Contractor shall monitor vibrations associated with shoring installation. The Contractor shall provide and maintain at least two continuous recording seismographs. These shall have been calibrated in the past 10 months and shall be InstanTel model DS-377, DS-477 or Blastmate units, or equivalent. The peak particle velocity shall be less than 1.0 in/sec at the nearest structure. This is a minimum performance criterion. More stringent criteria may be needed to protect these features from damage. The Contractor and their excavation support designer are responsible for choosing the required criteria to provide that protection.

- H. The Contractor shall monitor all excavations and provide a means of determining movement of adjacent soil, pavement, buildings structures and utilities. The Contractor shall use the following as minimum performance criteria. More stringent criteria may be needed to protect these features from damage. The Contractor and their excavation support designer are responsible for choosing the required criteria to provide that protection.

Location	Criteria	Threshold Value	Limit Value
Adjacent Buildings	Settlement	1/8-inch	3/8-inch
	Horizontal Movement	1/8-inch	3/8-inch
Roads and Buried Utilities	Settlement	1/4-inch	3/8-inch
	Horizontal Movement	1/4-inch	3/8-inch

The Contractor shall provide monitoring data to the Engineer at least once per week.

- I. Where movement reaches threshold values, the Contractor shall stop work in that area and provide a plan for controlling further movements/damage to the Engineer for review before resuming construction following the revised plans. Upon reaching limit values or if damage is observed, the Contractor shall immediately cease excavation operations and correct such deficiency in the excavation support system that allowed for movement or damage and repair all damage at no additional cost to the owner. No construction which could induce more movement/damage shall resume until the Contractor obtains approval from the Engineer to proceed. All changes to the excavation support system shall be at no additional cost to the Owner and at no additional time for performance.
- J. Timber sheet piling shall be sawn with square corners and shall be free from defects, which might impair its strength or tightness. The piles shall be drift sharpened at their lower edges so as to wedge the adjacent piles tightly together. The tops of the piles shall be cut off to a straight line at the required elevation and shall be braced with waling strips, properly lapped and jointed at all splices and corners. The wales shall preferably be in one length between corners and shall be bolted near the tops of the piles unless otherwise permitted. Wales shall not be spliced except when permitted in the Contractor's design submittal.
- K. Lateral limits of the shoring and bracing should allow sufficient clearance to install proposed piping and manhole structures.

3.2 SHEETING LEFT-IN-PLACE

- A. Cut off all sheeting left-in-place at least three feet below the ground surface, whether such sheeting is ordered left in place, by the Engineer or is left in place for the convenience of the Contractor.

END OF SECTION

SECTION 321000

PAVING AND SURFACES

1. GENERAL

1.1 CONTRACT DOCUMENTS

- A. Attention shall be directed to the General Conditions for the definition of the Contract Documents. This division of these Specifications is a part of the Contract Documents as defined in the General Conditions. All applicable parts of the balance of the Contract Documents are equally as binding for this Section as for all other parts of these Specifications.

1.2 WORK INCLUDES

- A. Attention shall be directed to Specification Section 011000 – Summary of Work. The work includes all labor, materials, plant, and equipment for installation and repair of pavement as shown on the plans, as herein specified, and as directed by the Engineer.
- B. All pavements outside of the item pay limits that is damaged by the Contractor's operations shall be repaired and/or replaced by the Contractor at their own expense. All repair and/or replacement shall meet the specifications of this section.
- C. The work includes removal and disposal or recycling of existing paving, base and subbase, sweeping, shimming, cutting pavement, patching, crack sealing, tack coating, pavement installation, and all appurtenant work required for a complete job to the satisfaction of the Engineer and the Owner.
- D. Should any pavement over trenches settle within two (2) years of completion of the Contract work, the Contractor shall repair such pavement at their own expense as directed by the Engineer or the Owner. If the Contractor fails to make such repairs promptly upon receipt of notice to do so from the Owner, then the Owner may make such repairs as necessary and the Contractor shall pay the Owner for all costs incurred in making such repairs.
- E. Except as otherwise shown or specified, restore all necessary roads, drives, and parking areas according to the State of Vermont, Agency of Transportation, Standard Specifications for Construction, latest edition.

1.3 RELATED SECTIONS

- A. The following items appurtenant to the work are part of the contract specified under other sections of the specifications but are mentioned here for cross reference purposes.
 - 1. Specification Section 310000 – Earthwork
 - 2. Specification Section 321123 – Aggregate Base Courses

1.4 APPLICABLE SPECIFICATIONS

- A. References herein to "Standard Specifications" refer to specifications of the State of Vermont Agency of Transportation, Standard Specifications for Construction latest edition.

1.5 SUBMITTALS AND CERTIFICATIONS

- A. Submittals and certifications for the following items of work in this section shall be furnished in accordance with Specification Section 013300 – Submittals.
- B. The Contractor shall submit to the Engineer sworn material certificates from the suppliers of gravel base and bituminous concrete materials. The certificates shall indicate that the materials provided are in every way in conformance with the requirements of these specifications.

2. PRODUCTS

2.1 MATERIALS

- A. Paved Roads/Parking Areas/Driveways:
 - 1. At a minimum, the Contractor shall match existing subbase and pavement or the following specification, whichever is greater.
 - 2. Base course shall consist of 2" of Type II plant mix bituminous pavement conforming to VAOT Section 406 of the Standard Specifications placed on a prepared coarse crushed gravel base.
 - 3. Paved roads, parking areas, and driveways shall have a subbase consisting of 12" of gravel overlaid with 12" of crushed gravel (fine). Crushed gravel base shall be placed on an acceptable subbase and conform to Specification Section 321123 – Aggregate Base Course. The subbase course shall be compacted in two 6" lifts and shall be compacted to not less than 95% of Modified Proctor maximum dry density.
 - 4. Wearing course shall consist of 2" of Type III plant mix bituminous pavement conforming to VAOT Section 406 of the Standard Specifications.

3. EXECUTION

3.1 GENERAL

- A. New construction shall not protrude above the road surface, at any time, without due precaution being taken to eliminate a hazard. Wet wells and valve pits shall be to the elevations shown on plans. The Contractor shall be responsible for ensuring the proper elevation of all such constructions within the paving limits, as defined in this section, and all others they disturb outside these limits.

3.2 PAVED ROADS, PARKING AREAS, AND DRIVEWAYS

- A. Construction requirements shall be in accordance with VAOT Section 406 of the Standard Specifications.
- B. The base and wearing courses shall be compacted to a density equal to 92 – 95 percent of the average density of laboratory – prepared specimens compacted in accordance with ASTM D 1559 Section 3.5 except that the temperature of the mixture immediately prior to compaction shall be 285°F – 300°F.
- C. Paved roads, parking areas, and driveways shall have a 2" base course and a 2" wearing course.

3.3 REPAIR OF SUBSIDENCE

- A. Should any pavement over trenches settle within two (2) years of completion of the Contract work or otherwise as specified by Vermont Agency of Transportation Highways Permit or the local Town street opening permit, the Contractor shall repair such pavement at their own expense as directed by the Engineer or Owner. If the Contractor fails to make such repairs promptly upon receipt of notice to do so from the Owner, then the Owner may make such repairs as necessary, and the Contractor shall pay the Owner for all costs incurred in making such repairs.

END OF SECTION

SECTION 321123

AGGREGATE BASE COURSES

1. GENERAL

1.1 CONTRACT DOCUMENTS

- A. Attention shall be directed to the General Conditions for the definition of the Contract Documents. This division of these Specifications is a part of the Contract Documents as defined in the General Conditions. All applicable parts of the balance of the Contract Documents are equally as binding for this Section as for all other parts of these Specifications.

1.2 WORK INCLUDES

- A. The work under this section consists of furnishing and placing base course on a previously prepared subgrade or course as shown on the plans, as herein specified, or as directed by the Engineer.

1.3 RELATED SECTIONS

- A. The following items appurtenant to this work are specified under other sections of these specifications and are mentioned here for cross reference purposes only.
 - 1. Specification Section 310000 – Earthwork.
 - 2. Specification Section 321000 – Paving and Surfaces.

1.4 APPLICABLE STANDARDS

- A. The work in this section shall be performed in accordance with all applicable provisions of the following technical Reference Standards.
 - 1. Vermont AOT Standard Specifications for Construction, latest edition.

1.5 SUBMITTALS AND CERTIFICATIONS

- A. Submittals and certifications for the following items of work in this section shall be furnished in accordance with Specification Section 013300 – Submittals.

2. PRODUCTS

2.1 GENERAL PRODUCTS AND MATERIALS

- A. The materials shall consist of hard durable particles or fragments of stone or gravel. Materials that break up when alternately frozen and thawed or wetted and dried shall not be used for aggregate base course materials. Fine particles shall consist of natural or processed sand. The materials shall be free of injurious amounts of organic material and

unless otherwise specified, the percent wear of base course materials shall not exceed 40 percent as determined by AASHTO T 96, Grading A.

- B. Crushed stone and crushed ledge rock shall be processed material obtained from a source which has been stripped of all overburden. The processed material shall consist of clean durable fragments of ledge rock of uniform quality reasonably free of thin or elongated pieces.

2.2 GRADATION

- A. The required gradation of Sand material shall conform to Table 1.
- B. The required gradation of Gravel material shall conform to Table 1. The maximum size of stone particles shall not exceed 67% of the compacted thickness of the layer being placed but in no case larger than 6 inches.
- C. The required gradation of Crushed Gravel (coarse) material shall conform to Table 1. At least 50 percent of the material retained on the #4 sieve shall have a fractured face.
- D. The required gradation of Crushed Gravel (fine) material shall conform to Table 1. At least 50 percent of the material retained on the #4 sieve shall have a fractured face.
- E. The required gradation of Crushed Aggregate material for shoulders and shoulder leveling shall conform to Table 1.
- F. The required gradation of Crushed Gravel material for unpaved drives shall meet the gradation requirements of crushed gravel as shown in Table 1. This item shall be used for the surface course of drives which are not designated to be paved.
- G. The required gradation of Crushed Stone Base Course (Fine Gradation) shall conform to Table 1. Acceptable sand may be blended as necessary to obtain the proper gradation for the fine aggregate portion.

TABLE 1 BASE COURSE MATERIALS							
ITEM	SAND	GRAVEL	CR. GRAVEL (COARSE)	CR. GRAVEL (FINE)	CR.AGGREGATE FOR SHOULDERS	CR. STONE (FINE)	CR. STONE (COARSE)
SIEVE SIZE	% PASSING BY WEIGHT						
6"	--	--	--	--	--	--	--
5"	--	--	--	--	--	--	--
4"	--	--	95-100	--	--	--	--
3-½"	--	--	--	--	--	--	100
3"	--	--	--	--	--	--	90-100
2"	100	--	--	100	--	100	75-100
1½"	90-100	--	--	90-100	100	85-100	--
1"	--	--	--	--	90-100	--	50-80
½"	70-100	--	--	--	--	45-75	30-60
#4	60-100	20-60	25-50	30-60	45-65	20-45	15-40
#100	0-20	0-12	0-12	0-12	0-15	--	--
#200*	0-8	0-6	0-6	0-6	0-12	0-5	0-6

* Fraction passing the #4 sieve.

- H. The required gradation of Crushed Stone Base Course (Coarse Gradation) shall conform to Table 1. Acceptable sand may be blended as necessary to obtain the proper gradation for the fine aggregate portion.
1. The substitution of crushed stone meeting the gradation requirements of crushed stone base course (fine gradation) for all, or part of this item will not be permitted.

3. EXECUTION

3.1 GENERAL

- A. Upon approval, base course materials found within the project limits may be used under the specific item provided they meet the gradation requirements set forth in Table 1.

- B. Permission may be given to substitute gravel or a mixture of sand and gravel for any sand course when sand is designed as part of the base. Substitutions must be made across the entire section and will not be allowed for short or discontinuous segments.
- C. Permission may be given to substitute crushed gravel for gravel or crushed stone (fine gradation) for crushed gravel. The substitution must be made across the entire section and will not be allowed for short or discontinuous segments.
- D. Crushed aggregate base course materials shall be produced and placed in their final location with as little segregation as possible.
- E. Under no circumstance shall base course materials be placed on or above frozen materials.
- F. If the density requirements are not attained for any layer before the material freezes, no further material shall be placed on that layer.

3.2 PLACING

- A. The base course material shall be spread in the amount necessary for proper consolidation and shall be shaped true to grade and cross section by means of power graders or other approved equipment.
- B. The subgrade or preceding course shall be shaped to the specified crown and grade and maintained in a smooth condition free of holes and ruts. If the hauling equipment should cause ruts in the subgrade or previously placed base course, the equipment shall be operated only on the course being placed, behind the spreading equipment.
- C. Crushed gravel for shoulder leveling shall be spread uniformly along the area adjoining the edge of the pavement. The material shall be spread along both sides of guardrail where there is no curb.
- D. Care shall be taken to avoid segregation during placement. When base course material is dumped in piles, it shall be dumped on the course being placed and spread at once onto the previously placed layer. If spreading equipment is not available, dumping will not be permitted. Any segregation which occurs shall be remedied or the materials removed and replaced at no additional cost to the Owner.
- E. Crushed aggregate shall be hauled from an approved stockpile. Material obtained directly from a conveyor will not be placed on the roadway without first stockpiling.
- F. The Contractor's method of operation shall be such that oversized stones will not be delivered to the project.
- G. To prevent segregation of crushed aggregate during spreading and to assist in obtaining the required density of the mixture, water may be added to the crushed aggregate prior

to performing the grading operations. The course shall be maintained in the moist condition during grading operations.

- H. Prior to fine grading, hard spots in the surface of the top layer shall be eliminated by scarifying the top 4 inches.
- I. When the base course is to be surface-treated and no pavement is to be placed upon it, stones having any dimension greater than 3 inches shall be removed from the upper 4 inches of the top layer.
- J. Surface voids in crushed stone base course (fine gradation) shall be eliminated by the addition of filler material to just fill the voids. Any surplus filler material shall be removed. The finished surface shall be uniform, true to grade and free from segregation. The Contractor shall furnish and place filler material to correct any visible segregation prior to paving. The filler material shall be spread, scarified if required, into the course and recompacted to the required density. Filler material shall meet the gradation requirements of sand. The final gradation of crushed stone base course (fine gradation) shall meet the requirements of Table 1.

3.3 COMPACTION

- A. Unless shown on the plans or ordered otherwise, the compacted depth of sand courses shall not exceed 12 inches. The compacted depth of any layer of gravel, crushed gravel, or crushed stone placed shall not exceed 8 inches. The compacted depth of any layer of crushed ledge rock shall not exceed 24 inches.
- B. Compaction of base course material shall be done with approved vibratory rollers and adequate water to meet the requirements stated above. A roller producing a dynamic force of at least 27,000 pounds shall be used for layers up to 12 inches. For layers between 12 inches and 24 inches, the roller shall produce a dynamic force of at least 42,000 pounds. Rolling and shaping shall continue until the required density is attained.
- C. Rolling and shaping patterns shall begin on the lower side and progress to the higher side of the course while lapping the roller passes parallel to the centerline. Rolling and shaping shall continue until each layer conforms to the required grade and cross section and the surface is smooth and uniform.
- D. Water shall be uniformly applied over the base course materials during compaction in the amount necessary for proper consolidation.
- E. When vibratory equipment is being operated, the amplitude of vibrations will be adjusted as necessary to avoid causing damage to adjacent buildings and property.
- F. Except at inaccessible locations, such as guard rail, material used for shoulder leveling shall be set with a pneumatic-tired roller.

- G. The density of all Aggregate Base Course materials shall not be less than 95 percent of the maximum density as determined by AASHTO T 180 (Modified Proctor Density) or 95 percent of an accepted control strip.

3.4 INSPECTION AND TESTS

- A. Tests Prior to Material Installation.
 - 1. At least one test shall be made on a representative sample of each of the materials that will be used on this project. These tests shall be made by an independent testing laboratory, acceptable to the Engineer and paid by the Contractor. A copy of all test results shall be delivered to the Engineer prior to that material's incorporation into the work.
- B. Tests after Material Installation.
 - 1. The Owner reserves the right to have field gradation and compaction tests performed by an independent laboratory with all testing costs borne by the Owner subject to the provisions in Specification Section 014500 – Quality Control. Field density tests will be made to determine the actual in-place densities being attained.
- C. Testing for Gradation.
 - 1. Sampling procedure shall conform to AASHTO T 2. Testing procedure shall be in accordance with AASHTO T 27. Materials not meeting the gradation requirements shall not be used.
 - 2. The amount of material finer than the #200 sieve shall be determined according to AASHTO T 11 which specifies dry sieving after washing. Samples for acceptance testing of the material in place will be taken as the spreading operations progress on each lift just prior to the beginning of the compaction operations on that lift. For a preliminary determination of compliance with the specification for gradation, samples of sand and gravel may be taken from the pit and samples of crushed aggregate may be taken from the stockpile or from the final phase of the crushing operation.
 - 3. Previously tested and accepted material contaminated by earthen, organic, or other foreign matter, or degraded by hauling equipment, to such an extent that the material no longer meets the gradation requirements, shall be removed and replaced at the Contractor's expense.
- D. Density Testing.
 - 1. The density of sand courses shall be determined by AASHTO T 191 (Sand Cone Method), AASHTO T 204 (Drive Cylinder Method), or AASHTO T 238 (Nuclear Methods).
 - 2. The density of gravel and crushed gravel courses shall be determined by AASHTO T 191 (Sand Cone Method), or AASHTO T 238 (Nuclear Methods). The density of crushed stone base courses will be determined by the Nuclear Method.
- E. Control Strip Procedure.
 - 1. At the beginning of the compaction operation a control strip of at least 100 lineal feet in length and spanning the width of the section being placed may be constructed. The

density requirement shall be determined by compacting the control strip at a suitable moisture content until no further increase in density can be measured. The remainder of the course shall be compacted to a density not less than 95 percent of the maximum control strip density, as measured by the nuclear density testing equipment. A new control strip will be required when there is a significant change in the gradation of the material being placed, or a change in compaction equipment. Compaction of the control strip shall be done with approved vibratory rollers or compactors capable of producing a dynamic force of at least 27,000 pounds.

END OF SECTION

SECTION 321123

WIRE FENCES AND GATES

1. GENERAL

1.1 CONTRACT DOCUMENTS

- A. Attention shall be directed to the General Conditions for the definition of the Contract Documents. This division of these Specifications is a part of the Contract Documents as defined in the General Conditions. All applicable parts of the balance of the Contract Documents are equally as binding for this Section as for all other parts of these Specifications.

1.2 WORK INCLUDES

- A. The work under this section consists of furnishing and installation of wire fencing and gates as shown on the plans, as herein specified, or as directed by the Engineer.

1.3 RELATED SECTIONS

- A. The following items appurtenant to this work are specified under other sections of these specifications and are mentioned here for cross reference purposes only.
 - 1. Specification Section 033000 – Cast-in-Place Concrete.
 - 2. Specification Section 129243 – Landscaping.
 - 3. Specification Section 310000 – Earthwork.

1.4 SUBMITTALS AND CERTIFICATIONS

- A. Complete certified shop drawings shall be submitted in accordance with Specification Section 013300 - Submittals. The following information shall be provided:
 - 1. Detailed shop drawings with dimensions showing the plan views and sections of the material to be furnished for this project.
- B. Manufacturer's warranty.
- C. Manufacturer's installation instructions.

1.5 GUARANTEES

- A. The Contractor shall obtain, from the Manufacturer and furnish to the Owner, a Manufacturer's one (1) year guarantee. The guarantee shall cover all necessary labor, equipment, and replacement parts resulting from faulty or inadequate design, improper assembly or erection, defective workmanship and materials, leakage, breakage, or other failure for all equipment and components furnished by the Manufacturer. The guarantee period shall commence on the date of the Engineer's certificate of completion. The Owner shall incur no labor or equipment cost during the guarantee period.

1.6 QUALITY ASSURANCE

- A. The installer shall have sufficient experience with the type of fencing and gate as listed in this Specification Section and as shown on the Contract Drawings. Prior the installation of the fencing and gate, the Contractor shall submit to the Engineer the installer's qualifications for approval including past projects will similar scope and size.
- B. Any materials or work failing to meet the requirements of this section shall be rejected and replaced at the Contractor's expense.

2. PRODUCTS

2.1 FENCE MATERIALS

- A. High Tensile Wire Fencing
 - 1. The fencing shall be a five-wire fence which shall consist of 14-gauge high tensile wire. The wire shall have a minimum tensile strength of 170,000 psi and a breaking load of 1,380 lbs.
 - 2. Weight of zinc coating shall not be less than 1.8 ounces per square foot, as determined from the average result of two specimens, when tested in accordance with ASTM A 90/A 90M.
- B. Posts
 - 1. Posts shall be placed a maximum of 20 linear feet apart with posts located at every change in angle.
 - 2. Posts shall be a minimum of 10 feet in length, with a buried depth of 4.5 feet, consisting of 5-inch pressure treated wooden posts.
- C. Bracing
 - 1. Bracing shall be installed on posts at fence termination point and corners. Each bracing point shall have two posts placed horizontally on either side at a distance of 12 feet. A horizontal pole is run between the two bracing posts with a diagonal high tensile wire holding the system together.
 - 2. Bracing posts shall be a minimum of 10 feet in length, with a buried depth of 4.5 feet, consisting of 5-inch pressure treated wooden posts.

2.2 GATE MATERIALS

- A. Cantilever Swing Gate
 - 1. Contractor to refer to Contract Drawings for the gate sizes and dimensions.
 - 2. The gate shall be constructed of galvanized steel pipe (Sch. 40).
- B. Gate Posts
 - 1. Contractor to refer to Contract Drawings for the gate post size and dimensions.
 - 2. The gate posts shall be constructed of 2-7/8" OD galvanized steel pipe (Sch. 40) filled with concrete.

3. The gate shall be installed with a receiver post set 12' from the hinge post, as indicated on the Contract Drawings.

2.3 CONCRETE

- A. Concrete shall conform to ASTM C 94. Mix shall be designed to obtain concrete with a minimum 28-day compressive strength of 2,500 psi.

3. EXECUTION

3.1 INSTALLATION

- A. The equipment shall be installed by the Contractor in accordance with the instructions of the Manufacturer, Contract Drawings, and Specifications.
- B. Care shall be taken to prevent damage or injury to the fencing and gate materials during handling and installation. All material shall be carefully inspected for defects in workmanship and materials, all debris and foreign material cleaned out of openings, seals, all operating mechanisms operated to check their proper functioning, and all nuts and bolts checked for tightness.
- C. All fencing and gates shall be carefully erected and supported.
- D. Fencing installation shall not begin before the final grading has been completed and finish elevations have been established, unless otherwise approved.

3.2 EXCAVATION

- A. Excavations for post footings shall be drilled holes in virgin or compacted soil, of minimum sizes as indicated.
- B. Soil from excavations shall be spread uniformly adjacent to the fence line or on areas of Owner's property, as directed.
- C. When solid rock is encountered near the surface, the Contractor shall drill into the rock at least 12 inches for line posts and at least 18 inches for end, pull, corner, and gate posts. Holes shall be drilled at least 1 inch greater in diameter than the largest dimension of the placed post.
- D. If solid rock is below the soil overburden, Contractor shall drill to the full depth required except that penetration into rock need not exceed the minimum depths specified above.

3.3 SETTING POSTS

- A. Loose and foreign materials shall be removed from holes and the soil moistened prior to placing concrete.

- B. Tops of footings shall be trowel finished and sloped or domed to shed water away from posts. Hold-open devices, sleeves, and other accessories shall be set in concrete.
- C. Exposed concrete shall be kept moist for at least 7 days after placement or cured with a membrane curing material, as approved.
- D. Posts set into sleeved holes in concrete shall be grouted in with an approved grouting material.
- E. Posts set in concrete construction shall be set vertically, with tops aligned and held in position until concrete has been set.
- F. Prior to installation of the high-tension wire, all bracing shall be installed on posts at fence termination point and corners.

3.4 CONCRETE STRENGTH

- A. Concrete shall have attained at least 75 percent of its minimum 28-day compressive strength, but in no case sooner than 7 days after placement, before the gates are installed. Gates shall not be hung until the concrete has attained its full design strength. Samples and test concrete shall be taken to determine strength as specified in Specification Section 033000 – Cast-in-Place Concrete.

3.5 GATE INSTALLATION

- A. Gates shall be installed plumb, level, and secure, with full opening without interference. Ground-set items shall be installed in concrete for anchorage as recommended by the fence manufacturer. Hardware shall be adjusted for smooth operation and lubricated where necessary.

3.6 REPAIR

- A. During the course of shipping, handling, or installation, if any galvanized steel posts or gate are damaged so that the base metal is visible, the Contractor shall repair. The Contractor shall paint the damaged area with a minimum of two (2) coats of zinc-rich paint, or at the Manufacturer's paint recommendation.

END OF SECTION

SECTION 330507

UTILITY JACKING AND BORING

1. GENERAL

1.1 CONTRACT DOCUMENTS

- A. Attention shall be directed to the General Conditions for the definition of the Contract Documents. This division of these Specifications is a part of the Contract Documents as defined in the General Conditions. All applicable parts of the balance of the Contract Documents are equally as binding for this Section as for all other parts of these Specifications.

1.2 WORK INCLUDES

- A. The Work of this Section shall include the trenchless installation of steel casing pipes using jack and boring methods, and fusible carrier pipe, at the location and grades shown on the drawings.
- B. The Work of this Section includes furnishing of all supervision, material, labor, tools, equipment and incidentals necessary to perform the Work in accordance with these Specifications including but not limited to; installation, excavation, backfilling, and removal of the jacking and receiving pits; furnishing and auger boring of steel casing pipe; removal of penetrating obstructions; installation of carrier pipe and spacers within casing; filling or grouting of voids between the natural ground and the casing pipe; filling annular space between casing pipe and carrier pipe; soil disposal; soil stabilization; dewatering; backfill, site restoration; and cleanup.
- C. The Work shall fully conform to the requirements of all State, Federal, local statutes, laws, codes and regulations.
- D. The auger boring installation will be completed below active pavements, as shown on the Contract Drawings. The Contractor's boring activities shall at no time disrupt traffic. The Contractor shall be responsible for all pavement heave or settlement damage resulting from construction.
- E. The Contractor's selected equipment shall have the capability to provide full support of the auger boring face sufficient to prevent loss of ground that may result in ground settlement and damage to adjacent pavements and utilities.
- F. The Contractor is responsible for review and interpretation of the readily available subsurface data relative to selection of Contractor's means and methods for pit excavation and support, auger boring, and groundwater control.

- G. The Contractor shall perform additional test borings at no additional cost to the Owner to determine geotechnical and groundwater conditions, to complete the auger boring as considered necessary.
- H. The Contractor's boring system shall be equipped to allow withdrawal of the augers from the casing, to permit personnel to access to the face to facilitate removal of obstructions (e.g., cobbles and boulders), as necessary.
- I. The Contractor shall fill voids created by the removal of obstructions with grout before or, if that is not possible, immediately after moving the casing past the area of the resulting void. Any and all costs associated with the backfilling of voids shall be included in the pay item for the removal of obstructions during pipe jacking and boring excavation. The Contractor shall be prepared to advance the casing in a controlled manner while maintaining stability at the face and avoiding loss of ground.
- J. If additional ground and face stabilization is necessary, dewatering, soil stabilization and/or other approved means to maintain face stability and avoid loss or heave of ground prior to mining at the face and along the pipe alignment may be required at no additional cost to the Owner.

1.3 RELATED SECTIONS

- A. The following items appurtenant to this work are specified under other sections of these specifications and are mentioned here for cross reference purposes only.
 - 1. Specification section 310000 – Earthwork
 - 2. Specification Section 311100 – Clearing and Grubbing
 - 3. Specification Section 312319 – Dewatering
 - 4. Specification Section 314000 – Shoring and Underpinning
 - 5. Specification Section 330533 – HDPE Pipe

1.4 APPLICABLE STANDARDS

- A. The work in this Section shall be performed in accordance with all applicable provisions of the following technical Reference Standards.
 - 1. Vermont Agency of Transportation (VAOT), Highway Crossing Sleeves for Underground Utilities: Standard D-20
 - 2. American Society for Testing and Materials (ASTM)

1.5 SUBMITTALS AND CERTIFICATIONS

- A. Submittals and certifications for the following items of work in this Section shall be furnished in accordance with Specification Section 013300 – Submittals.
- B. The Contractor shall submit to the Engineer for approval the following;
 - 1. A list of completed projects with details of the types of installations, owner contact names, and telephone numbers shall be included within the last five (5) years.

2. Equipment list including make and model number and specifications (catalog cuts) of all major equipment proposed for use. The Contractor is responsible for the final determination of the drill rig size based on the length and depth of the actual runs, the subsurface conditions expected, etc.
 3. Monitoring plan for the proposed path of the casing installation, including location of monitoring points and surveying intervals.
 4. Method for Controlled Low Strength Material (CLSM) placement, including CLSM mix design, used for abandoning a boring.
 5. Method for grouting (e.g. grout hole locations, attachment of grout tube to outer circumference of casing, grid pattern for ground surface approach, etc.), including grout mix design, used for filling voids/ annular space between the casing and excavated boring.
 6. For instances where a utility is to be installed in the casing, method of installation and identification of the material to be placed between the casing and the utility carrier pipe. The material shall be nonconductive and retain its insulating properties during long-term submergence in water.
 7. Dewatering and methods of removing spoils material.
 8. Material certificates for proposed materials.
 9. Plan showing the work zone equipment configuration at the ends of the bore(s), staging areas, storage areas, location of slurry for pipe lubrication, cuttings and pit spoil-handling areas, and final placement areas.
 10. Boring procedure, thrust block design, tooling for drilling, verification that size and type of casing can withstand installation stresses and method to verify that installed casing is acceptable. Include details on the cutting shield at the head of casing and type of soil conveyance system to be utilized (e.g. wheeled carts, belt conveyor, slurry system, auger system, vacuum extraction system).
 11. Design of entrance and exit pits including shoring elements, type, depth, bracing size, etc. All flexible wall-system designs that are part of the construction submittal shall be stamped by a licensed and currently registered Vermont State Professional Engineer.
 12. Materials list including bentonite and bentonite additives proposed for pipe lubrication, along with material safety data sheets for all other materials used in the trenchless installation method.
 13. Steering and tracking equipment (e.g. laser & survey tools), procedures and proposed locations requiring surface or subsurface access.
 14. Outline of work safety plan. The Contractor is responsible for the safety of the proposed installation. The Contractor shall demonstrate to the Engineer that work safety plan is in place, including work in confined spaces and a written confined space plan (addresses prevention of unauthorized entry, type of hazard, work practices, monitoring, provision for attendant, duties of employees, rescue and emergency medical services, multi-employer operations, and provisions for review procedures).
- C. The Engineer shall not start work prior to receiving the Engineer's written approval. Approval will be based on the decision of the Engineer as to the acceptability of the proposed work plan and any variations to provide satisfactory installation of the pipe/casing and avoid damage to the surrounding area, structures, environment, etc.

- D. Approval of the work plan will also be subject to regulatory authorities having jurisdiction, including but not limited to;
 - 1. Vermont Agency of Transportation (VAOT).
- E. In the event that unsatisfactory results and/or damage occurs, the Contractor shall stabilize the area and stop work, modify the methods of installation, and submit them for review and approval.
- F. Trenchless pipe installation shall be of the length, size and type specified in the Contract documents and to the alignment and profile as shown on the plans.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Exercise care in transporting and handling to avoid damage to casing pipe.
- B. Store materials onsite in enclosures or under protective coverings.
- C. Reject all damaged materials (dented, split, cracked, flawed, etc.).
- D. Keep inside of pipe free of dirt and debris.

1.7 GROUND MOVEMENTS

- A. The Contractor shall be responsible for monitoring surface settlements and heave along the alignment centerline of each auger bore. Monitoring points shall consist of the following:
 - 1. In landscaped areas, minimum 3-foot length steel rods drilled or driven into the ground with the upper end of the rod flush with the grade and protected with a plastic or steel casing that allows a surveying rod to be placed over the settlement point.
 - 2. On pavements, a surveyor's nail driven into the ground (pavement) with the top of the nail flush with the grade that allows a surveying rod to be placed over the settlement point.
 - 3. Centerline monitoring points shall be placed at a spacing of 25 feet along each Auger Boring alignment, beginning 10 feet from the edge of the jacking pit. Monitoring points shall also be placed every 10 feet in lines transverse to centerline extending 30 feet to either side of centerline and at a spacing of 50 feet along the alignment.
 - 4. Settlement monitoring shall take place at least twice on different days for all points before beginning of boring/jacking. During boring monitor only points that are within 25 feet ahead and 50 feet behind the leading end of casing. Daily readings shall be continued until settlement is less than 0.02 feet per day. The Engineer may amend the frequency of monitoring. Monitoring data shall be submitted to the Engineer within 24 hours after measurements, in a tabular form with all consecutive readings for each point. Points shall be monitored to an accuracy of 0.01-foot and referenced to a benchmark located at least 125 feet from the pits or alignment.
 - 5. If any total settlement point movement exceeds 1/8-inch (through settlement or heave), notify Engineer and take actions to limit future settlement or to mitigate displacement.

6. If any total settlement point movement exceeds 1/4-inch (through settlement or heave), notify Engineer and stop work until Contractor can submit a location-specific mitigation plan and have the plan approved and implemented. There will be no additional compensation to the Contractor should the project be shut down due to excessive movements.

1.8 QUALITY ASSURANCE

- A. Qualifications of the Contractor showing that all trenchless installation operations will be performed by a competent driller who has successfully installed casing for the past five (5) years of similar size and type shown on the plans, via the proposed trenchless method.
- B. Designed drill path indicating compliance with the contract documents. Refer to the drawings for vertical and horizontal alignment requirements
- C. The Contractor's and Subcontractor's field personnel shall understand all Auger Boring design documents, submitted by the Contractor, and all related shop drawing information.
- D. The Contractor's field personnel shall have sufficient health & safety training and equipment to meet the criteria of the approved confined space plan.

2. PRODUCTS

2.1 TRENCHLESS PIPE INSTALLATION EQUIPMENT

- A. The trenchless pipe installation equipment shall be steerable by means of an electronic tool directional system with walkover receiver and shall provide bentonite clay slurry to completely seal around the installed casing pipe.
- B. The Owner shall have access to instrumentation and readings at all times during operation.
- C. The Contractor shall provide all materials for completing the installation and for adequate protection of the work.

2.2 STEEL CASING PIPE

- A. Steel casing pipe used for jacking shall have minimum yield strength of 36,000 psi and conform to ASTM A36 and ASTM A134. The minimum outside diameter of the steel casing pipe shall be as shown on the Contract Drawings. Minimum wall thickness shall be 0.625-inches plus additional 0.063-inches shall be provided for corrosion. Installation depth of casing pipe shall be as indicated on the Contract Drawings. Casing shall be capable of withstanding short term installation and construction loads, and long-term dead and live loads.

- B. Casing pipe joints shall be fully welded around the circumference of pipe with complete penetration weld at all joints complying with American Welding Society Code or a machined press fit connection such as manufactured by Permalok™, or approved equal, installed in accordance with the manufacturer's written recommendations.
- C. Refer to the Contract Drawings for the indicated casing pipe sizes.

2.3 CARRIER PIPE

- A. Pressure-rated HDPE pipe shall be used for carrier pipe installed by jack and bore, at the locations shown and as designated on the drawings. Pressure-rated HDPE pipe shall be Class 125 (DR17) conforming to the requirements of AWWA C900, latest revision. Pipe wall thickness shall conform to dimension-ratio (DR17) requirements.
- B. Contractor shall handle the carrier pipe in a manner that will not over-stress the pipe during insertion. Vertical and horizontal curves shall be limited so that the pipe does not over-deflect, buckle, or otherwise become damaged. Damaged portions of the pipe shall be removed and replaced at no additional cost to the Owner.
- C. Pipe, and pipe joints shall have sufficient strength to withstand annulus grouting without deformation, cracking or breakage.
- D. Refer to the Contract Drawings for the indicated carrier pipe sizes.

2.4 CASING SPACERS

- A. Casing spacers shall be used within the casing. Spacers shall be designed and installed to meet the clearance/lateral spacing shown on the Drawings.
- B. Casing spacers shall be manufactured by Cascade Waterworks Mfg., or approved equal. The spacer material shall be stainless steel.
- C. Spacers shall be sized to accommodate the carrier pipe, or multiple carrier pipes within the same casing pipe, as applicable.
- D. The spacers shall be located at approximate 5-foot intervals along the carrier pipe.

3. EXECUTION

3.1 PREPARATION

- A. The trenchless pipe installation equipment shall be operated by individuals trained by the manufacturer as experienced operators.
- B. The trenchless pipe installation equipment shall produce a stable tunnel with a minimum burial depth as shown on the drawings for the carrier pipe installation.

- C. Test pit underground utilities crossing before trenchless pipe installation.

3.2 OPERATION

- A. When water is encountered:
 - 1. Provide and maintain a dewatering system of sufficient capacity to remove water.
 - 2. Keep excavation free of water until backfill operation is in progress.
 - 3. Perform dewatering in such a manner that removal of soils particles are held to a minimum.
 - 4. Dewater as required by Specification Section 011010 – Permits.
- B. Maintain close observation to detect settlement or displacement of surface and adjacent facilities.
 - 1. Notify Engineer immediately if settlement or displacement is detected.
 - 2. Act to maintain safe conditions and prevent damage.

3.3 INSTALLATION

- A. Shore entrance and exit pits in accordance with the approved design.
- B. Adequately protect any utilities located within the thrust block's zone of influence.
- C. Survey the existing ground surface along the proposed path of casing installation prior to the start of work to set baseline data. Establish survey points in accordance with the approved design to determine presence/extent of ground movements.
- D. Install the casing as follows:
 - 1. The alignment of the casing shall conform to the following requirements:
 - a. Choose the ground entry and exit angles such that the casing can be installed along the alignment and profile indicated on the contract plans.
 - b. The entrance point(s) and exit point(s) shall be approved by the Engineer and physically located in the field by the Contractor.
 - c. The exit point shall be no more than +/- 1% of the bore length left or right of the location marked in the field.
 - d. The vertical depth, as specified in the contract documents, is the depth to which the casing shall be installed.
 - 2. Closely monitor the trenchless installation process to eliminate ground movements. If ground movements occur, stop work and immediately stabilize the area of concern.
 - 3. In the event that the bore hole must be abandoned before completion of the installation or the installation is out of tolerance, fill the abandoned bore hole with CLSM to prevent subsidence. Start pumping from the farthest point of progression of the abandoned bore hole back to the surface to eliminate encapsulating voids. The progression and restoration of the abandoned bore hole by CLSM placement will be at the Contractor's expense. The location of the new bore hole shall be approved by the Engineer prior to progression of the operation as per this specification.

4. Grout voids/ annular space between the casing and excavated boring in accordance with the methods approved in the submittal process.
 5. For instances where a utility is to be installed in the casing, place the utility carrier pipe within the casing such that they are electrically insulated from each other.
- E. Installing HDPE or Fusible PVC Pipe.
1. Provide a swivel to reaming assembly and pull section of pipe to minimize torsional stress on pull section after drilling pilot hole.
 2. Hold reaming diameter to 1.5 times the outside diameter of the pipe being installed.
 3. Protect pull section as it proceeds during pull back so that it moves freely and is not damaged.
 4. Pull detection wire along with the pipe. Extend wire into locator station at each end of the pipe.
 5. When connecting to adjacent pulled or non-pulled section of pipe, allow pull section of pipe to extend past termination point. Make tie-ins the next day after pullback of the pipe.
 6. Test pit pipe installation to verify horizontal and vertical alignment at Engineer's direction.
 - a. One test pit for every 500 feet along length of pipeline.
 - b. Engineer may order additional test pit for each test pit that reveals pipeline installation is not in compliance with the Contract Documents at no additional cost to the Owner.
 7. Replace portions of the pipeline not in compliance with the Contract Documents at Engineer's direction and at no additional cost to the Owner.
- F. Installing Locator Station.
1. Locator Stations.
 - a. Provide locator stations at each end of the pipe.
 - b. Flush mount underground locator as required by equipment supplier.
 - c. When pipe is connected to another type of pipe material, continue detector wire over the connecting pipe, so locator station is installed out of paved area.
 - d. In areas scheduled to be improved identify and protect station locations immediately after installation.
 - i. Space 3 stakes equally around the station.
 - ii. Extend at least 4 feet above existing grade.
 - iii. Flag with orange, fluorescent wrap within 6 inches from top of stakes.
 2. Detection Wire.
 - a. Install detection wire without splices as shown on equipment supplier's standard details.
 - b. Terminate detection wire inside locator box using proper sized crimp type connectors on wire ends.
 - c. Connect each wire to a terminal maintaining at least 18 inches slack in each wire for underground flush mounted locator stations.
 - d. Neatly coil slack wire in test station below terminal board.
 - e. Locate wires on top and along pipe.

- f. Allow adequate slack and support to protect wires from damage during backfilling operations.
- g. Test each detection wire for continuity after backfill is completed.
 - i. If test for continuity is negative, repair or replace at Engineers direction.
 - ii. After continuity is verified, connect each detection wire to terminal block in locator station.

3.4 FIELD QUALITY ASSURANCE

- A. Perform field testing of HDPE pipe following Specification Section 014523 – Testing and Results Expected.

3.5 NEARBY UTILITIES

- A. The Contract Drawings show existing buried utilities that are believed to be near the trenchless pipe installation alignment. There is no guarantee that these utilities are located as shown or that other utilities may be present. It will be the Contractor's responsibility to locate all nearby utilities or other subsurface obstructions that may interfere with the work by excavating windows on the pipeline alignment or other means.

3.6 RESPONSIBILITY

- A. The Contractor shall be fully responsible for the trenchless pipe installation operation. Any noticeable surface defects resulting from improper operation of this boring equipment shall be repaired by the Contractor at his expense.
- B. In case loose material is encountered and cave-ins occur or are anticipated, all trenchless installations shall be discontinued, approved shoring shall be provided, and all voids filled either by pressure grouting or other approved methods before installations is continued.
- C. Field conditions may require that the actual trenchless installation operations be continued without interruption in order to prevent undermining the roadway. Should the Engineer permit interruption of trenchless installation operations in these instances, the Contractor shall provide bulkheads and dewatering measures as approved by the Engineer.

3.7 SUCCESSFUL COMPLETION

- A. The contractor shall be considered as having completed the requirements of any directional boring when they have successfully completed the work and tested the pipe to the satisfaction of the Engineer.

3.8 TRENCHLESS PIPE INSTALLATION RECORDS

- A. After completion of the casing and piping installations, the Contractor shall submit to the Engineer the installation records detailing the As-Built location of the casing and piping, including but not limited to alignment, invert, top of casing and top of pipe.

END OF SECTION

SECTION 330509

FLEXIBLE CONNECTIONS

1. GENERAL

1.1 CONTRACT DOCUMENTS

- A. Attention shall be directed to the General Conditions for the definition of the Contract Documents. This division of these Specifications is a part of the Contract Documents as defined in the General Conditions. All applicable parts of the balance of the Contract Documents are equally as binding for this Section as for all other parts of these Specifications.

1.2 WORK INCLUDES

- A. Furnish all labor, materials, equipment, and incidentals required to install all flexible connections for buried piping systems as specified herein and as shown on the Contract Drawings as specified herein and as required for a complete installation whether or not shown or specified.

1.3 RELATED SECTIONS

- A. The following items appurtenant to this work are specified under other sections of these specifications and are mentioned here for cross reference purposes only.
 - 1. Specification Section 014523 – Testing and Results Expected.
 - 2. Specification Section 310000 – Earthwork.
 - 3. Specification Section 312319 – Dewatering.
 - 4. Specification Section 314000 – Shoring and Underpinning.
 - 5. Specification Section 330531 – PVC Pipe.
 - 6. Specification Section 330533 – HDPE Pipe.

1.4 SUBMITTALS AND CERTIFICATIONS

- A. Submit Manufacturer's literature and illustrations.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver flexible connectors to job in enclosed containers.
- B. Store flexible connectors in area protected from weather or possible damage.
- C. Handle to prevent damage.
- D. Reject any damaged materials.

1.6 QUALITY ASSURANCE

- A. Acceptable Manufacturers:
 - 1. Dresser Industries, Inc., Rockwell International, or equal (for liquid).
 - 2. Mertraflex Co., or equal (for air).
 - 3. Krausz, or equal

2. PRODUCTS

2.1 FLEXIBLE COUPLINGS

- A. Flexible couplings and/or adapters shall be provided by the Contractor for the alignment of similar types of pipe or connecting dissimilar pipe materials as required and at the Contractor's expense.
- B. All piping passing through exterior walls shall have a flexible coupling within 3'-6" of the outside of the wall or footing unless indicated otherwise.
- C. Dresser, Rockwell, or equal flexible couplings shall be provided where indicated on the Drawings.
- D. Couplings for connecting pipe shall be Dresser Style 38, or Rockwell 411.

3. EXECUTION

3.1 PREPARATION

- A. Thoroughly clean outside of pipes to be connected and inside of coupling to be installed.
- B. Lubricate outside of pipes to be connected and gaskets of couplings to be installed per manufacturer's recommendations or with soap and water solution.

3.2 INSTALLATION

- A. Install all couplings per manufacturer's recommendations.

END OF SECTION

SECTION 330531

POLYVINYL CHLORIDE (PVC) PIPE

1. GENERAL

1.1 CONTRACT DOCUMENTS

- A. Attention shall be directed to the General Conditions for the definition of the Contract Documents. This division of these Specifications is a part of the Contract Documents as defined in the General Conditions. All applicable parts of the balance of the Contract Documents are equally as binding for this Section as for all other parts of these Specifications.

1.2 WORK INCLUDES

- A. Furnish all labor, materials, equipment, and incidentals required to install all buried polyvinyl chloride (PVC) pipe and fittings as specified herein and as shown on the Contract Drawings.

1.3 RELATED SECTIONS

- A. The following items appurtenant to this work are specified under other sections of these specifications and are mentioned here for cross reference purposes only.
 - 1. Specification Section 014523 – Testing and Results Expected.
 - 2. Specification Section 310000 – Earthwork.
 - 3. Specification Section 312319 – Dewatering.
 - 4. Specification Section 314000 – Shoring and Underpinning.

1.4 SUBMITTALS AND CERTIFICATIONS

- A. Submit Manufacturer's literature, installation of PVC pressure pipe and fittings to be used and recommended installation procedures.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Exercise care in transporting and handling to avoid damage to pipe and fittings.
- B. Store materials onsite in enclosures or under protective coverings.
- C. Reject all damaged materials (dented, split, cracked, flawed, etc.).
- D. Keep inside of pipe and fittings free of dirt and debris.

1.6 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies
 - 1. Install piping to meet the requirements of the State of Vermont, Agency of Natural Resources
- B. Pipe shall meet standards of ASTM D1784 and ASTM D1785/D2665.
- C. Other requirements
 - 1. Install pipe and fittings to meet the requirements of the “10 State Standards” and pipe manufacturer.
 - 2. Reject materials contaminated with gasoline, lubricating oil, liquid or gaseous fuel, aromatic compounds, paint solvent, paint thinner and acid solder.

2. PRODUCTS

2.1 PIPE

- A. PVC (Polyvinyl Chloride) Pressure Pipe
 - 1. PVC pressure pipe shall be Schedule 40 or Schedule 80, as shown on the Contract Drawings.
 - 2. Pressure pipe must conform to ASTM D-1784, ASTM D-1785, ASTM D-2665, and listed by the National Sanitation Foundation (NSF) for potable water applications.

2.2 PIPE BEDDING AND BLANKET

- A. PVC pipe bedding and blanket shall be “Coarse Aggregate for Concrete, 3/8 Inch – VAOT 404.02B” as defined in Specification Section 310000 – Earthwork, or as noted on the Contract Drawings.

2.3 FITTINGS

- A. Fittings are to be manufactured from PVC material which meets or exceeds the requirements of ASTM D-1784, cell classification 12454B, Type 1, Grade 1.
- B. Refer to the Contract Drawings for locations and types of fittings needed.

2.4 JOINTS

- A. Joints for PVC pressure pipe shall be push-on type using PVC pressure rated solvent cement conforming to ASTM D-2564.

2.5 IDENTIFICATION

- A. Each pipe length and fitting shall be clearly marked with:
 - 1. Manufacturer’s name
 - 2. Nominal pipe diameter

3. ASTM designation

2.6 MAGNETIC LOCATING TAPE

- A. Detectable tracer tape shall consist of a continuous aluminum foil core inseparably bonded on both sides with tough high-density cross-laminated plastic films, pigmented in orange, blue or other warning colors. Bond strength of the tracer tape must be such as to prevent pitting or degradation after 300 hours of continuous testing as per ASTM B-117.
- B. Detectable tracer tape shall be the type that can be located by the inductive method and does not require electrical connection to be made to the tape itself.
- C. Magnetic Locating Tape shall be installed on all pipe installed on this project, without exception.
- D. The tape shall be six (6) inches in width and shall have the words "Buried Sewer Line Below" permanently and indelibly printed on it.
- E. Magnetic Locating Tape shall be installed 1'-0" above the top of all mains and service lines.

2.7 INSULATION

- A. All piping, whether under roadways or cross country, with 6'-0" or less soil cover shall be insulated with 2" rigid foam board insulation.

2.8 BACKFILL

- A. Suitable Material
 - 1. Trenches are to be backfilled with suitable material as defined in Specification Section 310000 – Earthwork.

2.9 Concrete

- A. Concrete for thrust blocks shall be Class A concrete conforming to the requirements of the State of Vermont Standard Specifications for Construction, as to materials and methods.

3. EXECUTION

3.1 INSTALLATION

- A. Joining Methods
 - 1. The PVC pipe shall be joined by the use of fittings with a good grade of PVC pressure rated solvent cement, as outline in ASTM D-2564.
 - 2. Prior to installing a fitting or connection, the pipe shall be reamed both externally and internally to remove all burrs or ragged edges.

3. All surfaces that will be joined shall be clean, dry, and free from any debris or dust.
4. The Contractor shall apply a primer to all join surfaces prior to applying a coat of solvent cement.
5. The pipe shall be immediately inserted into the fitting or socket apply a 1/4 turn to ensure the cement has been applied evenly across the entire joining surface.
6. The Contractor shall wait a minimum of 24 hours after making a cement joint before applying pressure to the pipe and fitting.
7. Joints shall be absolutely watertight.

3.2 INSPECTIONS AND TESTS

- A. Testing shall be performed by the Contractor after the pipe has been installed and prior to final acceptance in accordance with Specification Section 014523 - Tests and Results Expected.
 1. Pressure Test.
 2. Leakage Test.
- B. Prior to making the tests, the Contractor shall submit for approval a schedule of their testing procedures indicating the sequence in which pipe sections will be tested and a description of methods and equipment they propose to use.

END OF SECTION

SECTION 330533

HIGH DENSITY POLYETHYLENE (HDPE) PIPE

1. GENERAL

1.1 CONTRACT DOCUMENTS

- A. Attention shall be directed to the General Conditions for the definition of the Contract Documents. This division of these Specifications is a part of the Contract Documents as defined in the General Conditions. All applicable parts of the balance of the Contract Documents are equally as binding for this Section as for all other parts of these Specifications.

1.2 WORK INCLUDES

- A. Furnish all labor, materials, equipment, and incidentals required to install all buried high-density polyethylene (HDPE) pipe and fittings as specified herein and as shown on the Contract Drawings.
- B. HDPE Pipe and fittings shall be used for the following services:
 - 1. Septic Tank Effluent Gravity mains and services.
 - 2. Effluent force mains.

1.3 RELATED SECTIONS

- A. The following items appurtenant to this work are specified under other sections of these specifications and are mentioned here for cross reference purposes only.
 - 1. Specification Section 014523 – Testing and Results Expected.
 - 2. Specification Section 310000 – Earthwork.
 - 3. Specification Section 312319 – Dewatering.
 - 4. Specification Section 314000 – Shoring and Underpinning.

1.4 SUBMITTALS AND CERTIFICATIONS

- A. Shop drawings and manufacturer's Certificates of Compliance shall be furnished for all piping, gaskets, joints, fittings, and insulation, specials, and any other items in this Section of work.
- B. The Contractor shall obtain and submit from the HDPE pipe manufacturer an outline of quality control procedures performed on polyethylene system components.
- C. All installation work shall be supervised by qualified individuals. The Contractor shall submit a statement of qualifications of the HDPE pipe installer, along with the qualifications of the pipe manufacturer to the Engineer for approval. The HDPE pipe installer and pipe manufacturer shall both have a minimum of 5 years of experience in installation of HDPE pipe.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Exercise care in transporting and handling to avoid damage to pipe and fittings.
- B. Store materials onsite in enclosures or under protective coverings.
- C. Reject all damaged materials (dented, split, cracked, flawed, etc.).
- D. Keep inside of pipe and fittings free of dirt and debris.

1.6 QUALITY ASSURANCE

- A. High Density Polyethylene (HDPE) pipe shall conform to the requirements for HDPE listed below.

Property	Unit	Test Procedure	Typical Value
Material Designation	-	PPI/ASTM	PE 3408
PPI Material Listing	-	PPI TR-4	PLEXCO P34CH
Material Classification	-	ASTM D-1248	III C 5 P34
Cell Classification	-	ASTM D-3350	345434C
Density (3)	g/cm ³	ASTM D-1505	0.955
Melt Index (4)	g/10 min	ASTM D-1238	0.1
Flexural Modulus (5)	psi	ASTM D-790	133,000
Tensile Strength (4)	psi	ASTM D-638	3,500
ESCR (3)	fail % hours	ASTM D-1693	f ₀ > 5,000
HDB (4)	psi	ASTM D-2837	1,600
UV Stabilizer (C)	% C Black	ASTM D-1603	2 to 3
Elastic Modulus	psi	ASTM D-638	110,000
Brittleness Temperature	°F	ASTM D-746	<-180
Vicat Softening Temperature	°F	ASTM D-1525	255
Thermal Expansion	in/in/°F	ASTM D-696	8 x 10 ⁻⁵
Hardness	Shore D	ASTM D-2240	64
Molecular Weight Category	-	-	Extra High
HDB @ 73.4°F	psi	ASTM D-2837	1,600
HDB @ 140°F	psi	ASTM D-2837	800

- B. The pipe and fitting manufacturer shall certify that the materials used are in conformance to the standards referenced herein. Certification shall include results of quality assurance testing.
- C. Quality assurance tests for representative pipe and fitting samples shall include:

Test	Standard	Pipe	Fittings
Ring ESCR	ASTM F-1248	Yes	N/A

Sustained Pressure at 176 ⁰ F / 725 psi Hoop Stress	ASTM D-1598	Yes (f0>100h)	Yes (f0>100h)
Sustained Pressure at 73 ⁰ F / 1600 psi Hoop Stress	ASTM D-1598	Yes (f0>1000h)	Yes (f0>1000h)

2. PRODUCTS

2.1 DESIGN REQUIREMENTS

- A. High-Density Polyethylene (HDPE) Striped Pipe: butt-fused joints.
- B. All HDPE pipe shall feature permanent co-extruded color stripes in the pipe OD for instant visual identification of piping service by the Manufacturer.
 - 1. The pipe shall have six (6) permanent same-color stripes extruded into the pipe outside surface. The striping shall consist of the same HDPE compound and shall not negatively impact the pipe's pressure rating.
 - 2. The Contractor shall follow the color guide listed below:
 - a. Green: Effluent Gravity Sewer
 - b. Red: Effluent Force Main
 - c. Purple: Drip Dispersal Force Main
- C. The polyethylene pipe shall be PE3408, or PE3608, or PE4710, and conform to the requirements of ASTM D3350.
- D. Minimum DR requirements shall be the more stringent of the following:
 - 1. For buried piping: minimum DR21
- E. The HDPE pipe manufacturer shall manufacture fittings for HDPE from the identical material as the pipe. Molded fittings shall conform to the requirements of ASTM D-3261. When transitioning from HDPE to some other material, factory manufactured, and field installed butt-fused flanged connectors shall be used. Flange diameters and sizes shall be compatible for use with fittings manufactured to ANSI A.21.10.
- F. HDPE Pipe and Fittings
 - 1. Pipe and fittings shall be produced by the same manufacturer from identical materials meeting the requirements of this specification.
 - 2. Pipe and fittings shall be pressure rated to meet the service pressure requirements specified by the Engineer. Whether molded or fabricated, fittings shall be fully pressure rated to at least the same service pressure rating as the pipe to which joining is intended. All HDPE pipe and fittings for this Contract shall be the dimension rating (DR), pressure rating, and size as depicted on the plans and profile of the project.
 - 3. Molded fittings shall meet the requirements of ASTM D-3261 and this specification. At the point of fusion, the outside diameter and minimum wall thickness of fitting butt fusion outlets shall meet the diameter and wall thickness Specifications of the mating system pipe. Fitting markings shall include a production code from which the

location and date of manufacture can be determined. Upon request, the manufacturer shall provide an explanation of his production code.

4. Fittings shall be manufactured in facilities designed for that purpose. Field fabricated fittings are not allowed, unless approved by the Engineer.
 5. Outside diameter-controlled pipe shall be manufactured in accordance with ASTM F-714 or ASTM D-3035. Inside diameter-controlled pipe shall be manufactured to ASTM F-894 and the Specifications provided by the Manufacturer. Printline markings shall include a production code from which the location and date of manufacture can be identified. Upon request, the Manufacturer shall provide an explanation of their production code.
- G. Flange assemblies: Polyethylene stub end manufactured to match the pipe, with ductile iron slip-on flange (buried service).
1. HDPE pipe shall be connected to valves and flanged fittings using flange adaptors.
 2. For HDPE pipe to stainless steel pipe or ductile iron flanged fittings, flange adapters shall be Victaulic flange adaptor for HDPE-to-Flanged Pipe Style 904 or approved equal.

2.2 MAGNETIC LOCATING TAPE

- A. Detectable tracer tape shall consist of a continuous aluminum foil core inseparably bonded on both sides with tough high-density cross-laminated plastic films, pigmented in orange, blue or other warning colors. Bond strength of the tracer tape must be such as to prevent pitting or degradation after 300 hours of continuous testing as per ASTM B-117.
- B. Detectable tracer tape shall be the type that can be located by the inductive method and does not require electrical connection to be made to the tape itself.
- C. Magnetic Locating Tape shall be installed on all pipe installed on this project, without exception.
- D. The tape shall be six (6) inches in width and shall have the words "Buried Sewer Line Below" permanently and indelibly printed on it.
- E. Magnetic Locating Tape shall be installed 1'-0" above the top of all mains and service lines.

2.3 INSULATION

- A. All piping, whether under roadways or cross country, with 6'-0" or less soil cover shall be insulated with 2" rigid foam board insulation.

2.4 BEDDING AND BACKFILL

- A. HDPE Pipe Bedding

1. Bedding material for HDPE pipe shall be "Coarse Aggregate for Concrete, 3/8 Inch – VAOT 704.02B". Refer to Specification Section 310000 – Earthwork for the gradation requirements.

B. Suitable Material

1. Trenches are to be backfilled with suitable material as defined in Specification Section 310000 – Earthwork.

3. EXECUTION

3.1 INSTALLATION

A. Pre-Installation Meeting

1. The Contractor shall meet with the pipe manufacturer and the Engineer to review the Contractor's construction plans for the installation of the force main.
2. The Contractor shall submit a joining and installation plan to the Engineer for review before proceeding with work. The plan shall include a schedule, sequence of work, and equipment needs for installation of the pipe.

B. Joining Methods

1. The HDPE pipe shall be joined by the method of thermal butt fusion, as outline in ASTM D 2657, Heat Joining Polyolefin Pipe and Fittings. Butt fusion joining of pipe and fittings shall be performed in accordance with the procedures recommended by the manufacturer and shall include the removal of the internal weld bead.
2. Quality assurances equipment shall be used to document heater temperature, process time and pressure for every fusion joint. Equipment used shall be a data-logger. Each fusion joint shall be inspected, and a record of each fusion joint shall be made and submitted to the Engineer for review and approval.
3. The polyethylene pipe may be adapted to fittings or other systems by means of an assembly consisting of a polyethylene stub-end, butt fused to the pipe, a back-up flange of ductile iron, made to Class 150, ANSI B16.1/B16.5 dimensional standards with exceptions, bolts of compatible material and a gasket of suitable neoprene to fit in the joint. In all cases the bolts shall be drawn up evenly and in line.
4. The pipe supplier shall be consulted to obtain machinery and expertise for the joining by butt fusion of polyethylene pipe and fittings. No pipe or fittings shall be joined by any contractor unless he is adequately trained and qualified in the techniques involved.
5. Joints to be absolutely watertight.

3.2 INSPECTIONS AND TESTS

- A. Testing shall be performed by the Contractor after the pipe has been installed and prior to final acceptance in accordance with Specification Section 014523 - Tests and Results Expected.

1. Pressure Test.

2. Leakage Test.
 - B. Prior to making the tests, the Contractor shall submit for approval a schedule of their testing procedures indicating the sequence in which pipe sections will be tested and a description of methods and equipment they propose to use.

END OF SECTION

SECTION 333416

EFFLUENT FILTER

1. GENERAL

1.1 CONTRACT DOCUMENTS

- A. Attention shall be directed to the General Conditions for the definition of the Contract Documents. This division of these Specifications is a part of the Contract Documents as defined in the General Conditions. All applicable parts of the balance of the Contract Documents are equally as binding for this Section as for all other parts of these Specifications.

1.2 WORK INCLUDES

- A. Furnish all labor, materials, equipment, and incidentals required to furnish and install all effluent filters as specified herein and as shown on the Contract Drawings.

1.3 RELATED SECTIONS

- A. The following items appurtenant to this work are specified under other sections of these specifications and are mentioned here for cross reference purposes only.
 - 1. Specification Section 014523 – Testing and Results Expected.
 - 2. Specification Section 034100 – Precast Concrete Structures.
 - 3. Specification Section 310000 – Earthwork.
 - 4. Specification Section 330530 – PVC Pipe

1.4 SUBMITTALS AND CERTIFICATIONS

- A. Shop drawings and manufacturer's Certificates of Compliance shall be furnished for all effluent filters and any other items in this Section of work.
- B. Operations and Maintenance Manual: The Manufacturer shall submit five (5) copies and one (1) searchable and bookmarked electronic .pdf copy of O&M manuals for all equipment and systems furnished under this specification. The manuals shall be written specifically for this project and shall include detailed process operating instructions, start-up and shutdown procedures, process control and troubleshooting procedures, emergency procedures and all necessary safety precautions. The O&M manual shall be complete in all respects for all equipment, controls, accessories and associated appurtenances supplied under this Section, but not limited to the following:
 - 1. Diagrams and illustrations.
 - 2. Detailed description of the function of each principal component of the system.
 - 3. Installation instructions.
 - 4. Proper adjustment.
 - 5. Test procedures.

6. Procedure for operating.
7. Emergency operating instructions and troubleshooting guide.
8. Safety precautions.
9. Maintenance and overhaul instructions which shall include detailed assembly drawings with part numbers, parts list, instructions for ordering spare parts, and complete preventive maintenance instructions required to ensure satisfactory performance and longevity of the equipment.
10. All other pertinent data, information and recommendations included in the manufacturer's O&M manuals.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Exercise care in transporting and handling to avoid damage to the effluent filters.
- B. Store materials onsite in enclosures or under protective coverings per Manufacturer's recommendations.

1.6 QUALITY ASSURANCE

- A. All equipment under this Section shall be furnished by a single supplier.

1.7 WARRANTY

- A. The General Contractor shall obtain, from the Manufacturer and furnish to the Owner, a Manufacturer's five (5) year warranty for the effluent filters. The warranty shall cover all necessary labor, equipment and replacement parts resulting from faulty or inadequate design, improper assembly or erection, defective workmanship and materials, leakage, breakage or other failure for all equipment and components furnished by the manufacturer. The warranty period shall commence on the date of the Engineer's Certificate of Substantial Completion. The Owner shall incur no labor or equipment cost during the warranty period.

3. PRODUCTS

2.1 GENERAL

- A. Effluent filters shall be used for all septic tanks as specified herein and shown on the Contract Drawings.
- B. Acceptable products include the Biotube® effluent filter manufactured by Orenco Systems, Inc., Sutherlin, Oregon or approved equal.

2.2 DESIGN STANDARDS

- A. Effluent filters shall prevent particles larger than 1/8-inch diameter from leaving the septic tank.
- B. Effluent filter shall have a solid bottom or deflecting device that prevents vertically rising solids from reaching the filtering surface area.

- C. Filter shall not include flow modulating orifices.
- D. Filter cartridge shall have a handle for ease of maintenance to the filter.

2.3 EFFLUENT FILTER

A. 8-inch Effluent Filter

- 1. 8-inch effluent filter shall be installed as specified herein and on the Contract Drawings.
- 2. Filter shall consist of an 8-inch diameter PVC vault with eight (8) $1\frac{3}{8}$ -inch diameter holes evenly spaced around the perimeter, located appropriately to allow for maximum sludge and scum accumulation before requiring pumping.
- 3. The multitube cartridge shall be made with seventeen (17) 1/8-inch mesh polypropylene tubes with a solid base to prevent solids from entering through the bottom.
- 4. The multitube cartridge shall be housed inside the PVC vault.
- 5. The filter shall have an effective filter area of no less than 14.6 square feet with a flow area of no less than 4.4 square feet.

B. 12-inch Effluent Filter

- 1. 12-inch effluent filter shall be installed as specified herein and on the Contract Drawings.
- 2. Filter shall consist of a 12-inch diameter PVC vault with eight (8) $1\frac{3}{8}$ -inch diameter holes evenly spaced around the perimeter, located appropriately to allow for maximum sludge and scum accumulation before requiring pumping.
- 3. The multitube cartridge shall be made with thirty-five (35) 1/8-inch mesh polypropylene tubes with a solid base to prevent solids from entering through the bottom.
- 4. Each 12" filter shall include a 4-inch diameter support plate bolted to the side of the tank. Bolts shall be 0.25" dia. 1.25" length stainless steel pin drive anchors.
- 5. The filter shall have an effective filter area of no less than 30.0 square feet with a flow area of no less than 9.0 square feet.

2.4 SPARE PARTS

- A. The Manufacturer shall provide two (2) spare replacement cartridges for 8-inch filters and two (2) for 12-inch filters.

2.5 OPERATION AND MAINTENANCE TOOLS

- A. The Manufacturer shall provide one (2) filter cleaning cradle for housing the filter cartridges for cleaning and maintenance.
- B. The Manufacturer shall provide six (6) filter cartridge cleaning brush for cleaning filter cartridges.

3. EXECUTION

3.1 INSTALLATION

- A. Effluent filters shall be installed per the Manufacturer's instructions and as directed herein and on the Contract Drawings.
- B. Effluent filter shall be installed on the outlet of the septic tank and positioned below the riser and access lid opening.
- C. Effluent filter support plate shall be bolted to the side of the tank using 1.25" SS pin drive anchor. Contractor shall drill a hole in the concrete tank to a diameter of 0.25" or the diameter of the SS pin drive anchor to a 2" depth. Hammer shall be used to tap the drive pin until it is flush against the concrete tank wall.

3.2 INSPECTIONS AND TESTS

- A. Inspector shall inspect and certify that initial installation of each effluent filter is in compliance with this Section and the Manufacturer's recommendations and requirements.

3.3 SERVICES OF MANUFACTURER'S REPRESENTATIVE

- A. The Manufacturer or Manufacturer's Representative shall provide the services of a factory-certified representative for training the Owner's service provider and inspecting the effluent filter installation.
- B. The Manufacturer's Representative shall provide the services of a trained representative to instruct the installing Contractor's crew regarding the proper installation and field testing of each component per the Manufacturer's recommendations and requirements for a minimum of four (4) hours at the beginning of construction.
- C. The Manufacturer's Representative shall provide detailed instruction to the Owner's personnel for operation of the specified equipment for a minimum of four (4) hours onsite. The Owner reserves the right to video tape the operator training session for instructional use.
- D. Within 8-10 months after project final completion the Manufacturer or Manufacturer's Representative shall perform a site visit to assess equipment integrity and operational and maintenance processes, and to address issues raised by the Owner specific to the effluent filters and associated piping. The Manufacturer or Manufacturer's Representative shall provide a written report of findings of each installed effluent filter to the Owner noting each effluent filter and associated piping condition and the need for corrective action. The General Contractor shall be responsible for correcting any deficiencies noted by the Manufacturer or Manufacturer's Representative. The General Contractor shall bear all costs for the satisfactory repair and replacement necessary to meet the specified requirements.

END OF SECTION

SECTION 333419

PRECAST CONCRETE TANK ACCESSORIES

1. GENERAL

1.1 CONTRACT DOCUMENTS

- A. Attention shall be directed to the General Conditions for the definition of the Contract Documents. This division of these Specifications is a part of the Contract Documents as defined in the General Conditions. All applicable parts of the balance of the Contract Documents are equally as binding for this Section as for all other parts of these Specifications.

1.2 WORK INCLUDES

- A. Furnish all labor, materials, equipment, and incidentals required to furnish and install all septic tank accessories including but not limited to risers and lids as specified herein and as shown on the Contract Drawings.
- B. Furnish all labor, materials, equipment and incidentals required to furnish and install all equalization tank and wetwell risers and lids as specified herein and as shown on the Contract Drawings.

1.3 RELATED SECTIONS

- A. The following items appurtenant to this work are specified under other sections of these specifications and are mentioned here for cross reference purposes only.
 - 1. Specification Section 034100 – Precast Concrete Structures.
 - 2. Specification Section 333416 – Effluent Filters

1.4 SUBMITTALS AND CERTIFICATIONS

- A. Shop drawings shall be furnished for all septic tank accessories and any other items in this Section of work.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Exercise care in transporting and handling to avoid damage to the septic tank accessories.
- B. Store materials onsite in enclosures or under protective coverings per Manufacturer's recommendations.

1.6 QUALITY ASSURANCE

- A. Acceptable Manufacturers

1. Precast concrete tank accessories including risers and lids shall be manufactured by Orenco Systems, Inc, Sutherlin, Oregon or approved equal.
- B. All equipment under this Section, with the exception of traffic-bearing lids, shall be furnished by a single supplier.
- C. Manufacturer shall provide evidence that lids have been used successfully in continuous field service for a minimum of five years to demonstrate long-term integrity and suitability for the application.

1.7 WARRANTY

- A. The General Contractor shall obtain, from the Manufacturer and furnish to the Owner, a Manufacturer's five (5) year warranty for the septic tank accessories. The warranty shall cover all necessary labor, equipment and replacement parts resulting from faulty or inadequate design, improper assembly or erection, defective workmanship and materials, leakage, breakage or other failure for all equipment and components furnished by the manufacturer. The warranty period shall commence on the date of the Engineer's Certificate of Substantial Completion. The Owner shall incur no labor or equipment cost during the warranty period.

2. PRODUCTS

2.1 GENERAL

- A. Risers and lids shall be provided for all precast concrete tanks as specified herein and shown on the Contract Drawings.

2.2 PVC RISERS

- A. Riser material shall be PVC per ASTM D1784 and tested in accordance with AASHTO M304M-89.
- B. The risers shall be constructed of non-corrosive material and designed to be buried.
- C. Risers shall have a minimum stiffness of 10 psi when tested according to ASTM D2412.
- D. Risers shall be capable of withstanding a truck wheel load (54 square inches) of 2,500 pounds for 60 minutes with a maximum vertical deflection of ½-inch.
- E. Inlet and outlet risers on tanks less than 5,000-Gal and buried less than 36" below ground surface shall be 24" diameter.
- F. Inlet and outlet risers on tanks greater than 5,000-Gal shall be 30" diameter.

- G. Inlet and outlet risers on tanks when the depth of bury is 36" or greater shall be 30" diameter.
- H. Risers shall be minimum of 18" in height and shall be cast into the precast concrete tank. Refer to Specification Section 034100 – Precast Concrete Structures.

2.3 GRADE RING INSERT

- A. If required a grade ring insert shall be used to connect cast-in-place riser to an additional riser.
- B. Grade ring insert shall be PVC.

2.4 LIDS

- A. One lid shall be furnished with each access riser.
- B. Lids shall be waterproof, corrosion resistant, and UV resistant. Lids shall be flat, with no noticeable upward dome; a crown or dome of no more than 1/8-inch is allowable.
- C. Lids shall not allow water to pond on them.
- D. Lids shall have a green non-skid finish.
 - a. Self-lubricating plastics, such as polyethylene, shall not be considered non-skid without addition of a non-skid coating.
- E. Lids shall be designed to form a watertight seal with the top of riser.
- F. Lids shall be capable of withstanding a truck wheel load (81 square inches) of 2,500 pounds for 60 minutes with a maximum vertical deflection of 3/4-inch.
- G. Lids shall be provided with tamper-resistant stainless-steel fasteners and a tool for fastener removal. Tamper-resistant fasteners include recessed drives, such as hex, Torx, and square. Fasteners that can be removed with common screwdrivers, such as slotted and Phillips, or fasteners that can be removed with standard tools, such as pliers or crescent wrenches, are not considered tamper-resistant. To prevent a tripping hazard, fasteners shall not extend above the surface of the lid.
- H. For tanks located in pavement or trafficked areas as indicated on the plans, traffic-bearing lid shall be used.
 - a. The traffic-bearing lid shall be a cast iron frame and cover (part number 6024, 3060, 4036), as manufactured by Sather Manufacturing Co., Inc., or approved equal, which will fit over a standard lid. The cover shall have the word "SEWER" cast into it.

- I. Foam-insulated lid: Rigid closed-cell foam insulation of 2-inch or 4-inch thickness shall be attached to the underside of the lid. Any fasteners shall be made of corrosion-resistant stainless steel. The insulation shall have an R-value of no less than 10 per 2-inch increment.

3. EXECUTION

3.1 INSTALLATION

- A. Install products in strict accordance with manufacturer's instructions.
- B. Lids shall be installed over inlet and outlet risers and as specified on the Contract Drawings.
- C. PVC Risers
 1. Risers shall be cast into precast concrete tank
 2. For installations where 18" risers extend above finish grade, riser shall be cut to grade in the field.
 3. For installations where additional riser height above 18" is required a grade ring insert internal coupling shall be used. See Section 3.1.C Grade Ring Insert.
- D. Grade Ring Insert
 1. For installations where additional riser height above the 18" cast-in-place riser is required a grade ring insert shall and additional riser section shall be used.
 2. No additional riser section shall be less than 9" height. If required, Contractor shall cut cast-in-place riser to within 9" of finish grade and install a grade ring insert and additional riser.
 3. Contractor shall apply MA320, ADH200, or approved equal adhesive to bond grade ring insert to cast-in-place riser.
 4. Contractor shall apply adhesive to bond a new riser section to grade ring insert.

3.2 PROTECTION

3.3 INSPECTIONS AND TESTS

- A. Inspector shall inspect and certify that initial installation of each tank accessory is in compliance with this Section and the Manufacturer's recommendations and requirements.
- B. Risers and lids shall be watertight.

END OF SECTION

SECTION 333456

FLOATING OUTLET DOSING DEVICE

1. GENERAL

1.1. CONTRACT DOCUMENTS

- A. Attention shall be directed to the General Conditions for the definition of the Contract Documents. This division of these Specifications is a part of the Contract Documents as defined in the General Conditions. All applicable parts of the balance of the Contract Documents are equally as binding for this Section as for all other parts of these Specifications.

1.2. WORK INCLUDES

- A. Furnish all labor, materials, equipment, and incidentals required to furnish and install floating outlet dosing devices as specified herein and as shown on the Contract Drawings.

1.3. RELATED SECTIONS

- A. The following items appurtenant to this work are specified under other sections of these specifications and are mentioned here for cross reference purposes only.
 - 1. Specification 034100 – Precast Concrete Structures
 - 2. Specification 330509 – Flexible Connections
 - 3. Specification 330531 – PVC Pipe
 - 4. Specification 333419 – Precast Concrete Tank Accessories

1.4. SUBMITTALS AND CERTIFICATIONS

- A. Shop drawings and manufacturer's Certificates of Compliance shall be furnished for all effluent filters and any other items in this Section of work.
- B. Operations and Maintenance Manual: The Manufacturer shall submit five (5) copies and one (1) searchable and bookmarked electronic .pdf copy of O&M manuals for all equipment and systems furnished under this specification. The manuals shall be written specifically for this project and shall include detailed process operating instructions, start-up and shutdown procedures, process control and troubleshooting procedures, emergency procedures and all necessary safety precautions. The O&M manual shall be complete in all respects for all equipment, controls, accessories and associated appurtenances supplied under this Section, but not limited to the following:
 - 1. Diagrams and illustrations.
 - 2. Detailed description of the function of each principal component of the system.
 - 3. Installation instructions.
 - 4. Proper adjustment.
 - 5. Test procedures.

6. Procedure for operating.
7. Emergency operating instructions and troubleshooting guide.
8. Safety precautions.
9. Maintenance and overhaul instructions which shall include detailed assembly drawings with part numbers, parts list, instructions for ordering spare parts, and complete preventive maintenance instructions required to ensure satisfactory performance and longevity of the equipment.
10. All other pertinent data, information and recommendations included in the manufacturer's O&M manuals.

1.5. PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Exercise care in transporting and handling to avoid damage to the floating outlet dosing devices.
- B. Store materials onsite in enclosures or under protective coverings per Manufacturer's recommendations.

1.6. QUALITY ASSURANCE

- A. The floating outlet dosing devices shall be furnished by Rissy Plastics, or approved equal, and comply with the requirements set forth in this specification.

1.7. SHOP TESTING

- A. Each floating outlet dosing device must hold at least a 15" Hg vacuum test.

1.8. WARRANTY

- A. The General Contractor shall obtain, from the Manufacturer and furnish to the Owner, a Manufacturer's five (5) year warranty for the effluent filters. The warranty shall cover all necessary labor, equipment and replacement parts resulting from faulty or inadequate design, improper assembly or erection, defective workmanship and materials, leakage, breakage or other failure for all equipment and components furnished by the manufacturer. The warranty period shall commence on the date of the Engineer's Certificate of Substantial Completion. The Owner shall incur no labor or equipment cost during the warranty period.

2. **PRODUCTS**

2.1. GENERAL

- A. Furnish all labor, materials, equipment, and incidentals required to provide two (2) new 4" floating outlet dosing devices as specified herein and as shown on the Contract Drawings. The floating outlet dosing device is a gravity/buoyancy driven dosing valve used to repeatedly dose batches of septic tank effluent through the sewer system.
- B. The floating outlet dosing device to serve Flush Tank #1 shall be Model FL-1631 Flout as manufactured by Rissy Plastics, LLC, Torrington, CT or approved equal.

- C. The floating outlet dosing device to serve Flush Tank #2 shall be Model FL-3831 Flout as manufactured by Rissy Plastics, LLC, Torrington, CT or approved equal.

2.2. DESIGN STANDARDS

- A. Floating outlet dosing devices shall be located inside flush tanks. The floating outlet dosing device is a floating box with an attached weight and an opening on the top. A swing pipe traverses the bottom of the box and exits the rear. The outlet end of the swing pipe shall enter a flexible pipe elbow, which serves as a conduit and a hinge. As the tank fills, the body floats, keeping liquid away from the outlet and tilting to a final upright position. When the body can float no higher, liquid shall spill into the vessel, forcing it to sink to the floor and allowing liquid to flow through the outlet to the sewer system. When the liquid level drops to the top of the vessel, flow shall stop when the vessel drains and shall refloat in the remaining liquid.

B. Materials

1. The body shall be rigid PVC square extrusion, cellular or solid PVC end walls or caps.
2. The swing pipe shall be 4" SDR35 PVC pipe, depending on the model and size.
3. The flex connector shall be corrugated and cuffed EPDM rubber. There shall be a 0.125" diameter 316 stainless steel wire spring for additional support.
4. The clamps to secure the flex connector to the swing pipe and outlet shall be worm drive type 316 stainless steel with ½" wide band.
5. The ballast shall be steel bars or equal encapsulated in PVC pipe and caps. Additional ballast may be placed at the swing pipe/flex connector area for stability of deep drawdown arrangements.
6. The ballast attachment shall be bonded for the flush tank #1 floating outlet dosing device and strapped for the flush tank #2 floating outlet dosing device. Fasteners shall be 316 stainless steel. Straps shall be corrosion proof plastic.

C. Flush Tank #1 Floating Outlet Dosing Device

1. The floating outlet dosing device shall have a 4" diameter outlet pipe.
2. The floating outlet dosing device shall have a drawdown of 16 inches (length of the swing pipe) with a starting flowrate of 108 gpm and an average flowrate of 76 gpm.
3. The floating outlet dosing device shall have one (1) outlet.
4. The floating outlet dosing device shall be hinged on a flexible connector.
5. The floating outlet dosing device shall be installed as specified herein and on the Contract Drawings.

D. Flush Tank #2 Floating Outlet Dosing Device

1. The floating outlet dosing device shall have a 4" diameter outlet pipe.
2. The floating outlet dosing device shall have a drawdown of 38 inches (length of the swing pipe) with a starting flowrate of 108 gpm and an average flowrate of 76 gpm.
3. The floating outlet dosing device shall have one (1) outlet.
4. The floating outlet dosing device shall be hinged on a flexible connector.
5. The floating outlet dosing device shall be installed as specified herein and on the Contract Drawings.

3. **EXECUTION**

3.1. INSTALLATION

- A. The floating outlet dosing device shall be installed in accordance with the Manufacturer's recommendations and instructions, the Contract Drawings, and all State and local regulations.
- B. The floating outlet dosing device shall be installed so that the floating outlet dosing device rises until the tank reaches a maximum water level and then drains down and out of the tank.
- C. Floating outlet dosing devices shall not drop lower than the outlet. Excessive drop will result in slow or no shut-off of flow. If the outlet is higher than the floor, a suitable shim pad or built-on shim must be provided for the floating outlet dosing device to land on. The shim pad must be solid, not perforated, so the liquid can cushion the floating outlet dosing device when it lands.
- D. Inlet flow to the flush tank shall be kept away from the floating outlet dosing device and shall not interfere with the floating outlet dosing device or enter it directly.
- E. Access covers are required. Openings must be large enough to observe, install, and service floating outlet dosing devices.

3.2. TESTING

- A. Each flush tank floating outlet dosing device shall be field tested after installation to ensure that the floating outlet dosing device functions properly. The flush tank shall be filled with water up to the maximum water level. The floating outlet dosing device shall rise with the water level. When the maximum water level is reached, flow should enter the floating outlet dosing device, allowing water to exit the outlet, and the floating outlet dosing device shall fall with the decreasing water level until the tank is drained and the floating outlet dosing device rests on the shim.

END OF SECTION

SECTION 413600

ASSEMBLY AND TESTING EQUIPMENT

1. GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

- A. The Contractor shall be responsible for the testing, adjusting and balancing of all systems prior to placing them in service.
- B. The operation, testing, adjustment, and balancing shall be required to prove that the materials and equipment are left in proper condition for satisfactory operation under the conditions specified.

1.2 TESTING PRIOR TO SHIPMENT

- A. Where individual sections require certain items of materials or equipment to be tested prior to shipment from the Manufacturer's plant, these items shall be operated to the extent necessary to generate certified performance data over the entire operating range of the equipment. The testing shall be conducted on the materials or equipment which will be shipped to and installed at the construction site.

1.3 SERVICES OF MANUFACTURER'S REPRESENTATIVE

- A. The Contractor shall arrange for a qualified Manufacturer's Service Representative from each company manufacturing or supplying certain equipment, as listed on the Drawings, or in the specific Specifications, to perform the duties described.
- B. After installation of the listed equipment has been completed and the equipment is presumably ready for operation, but before others operate it, the Manufacturer's Representative shall inspect, operate, test, adjust and balance the equipment. The inspection shall include, but shall not be limited to, the following points as applicable:
 - 1. Soundness: without cracked or otherwise damaged parts.
 - 2. Completeness in all details, as specified.
 - 3. Correctness of setting, alignment, and relative arrangement of various parts.
 - 4. Adequacy and correctness of packing, sealing, and lubricants.
- C. On completion of their work, the Manufacturer's or Supplier's Representative shall submit to the Engineer a complete signed report of the result of their inspection, operation, adjustments, and tests. The report shall include detailed descriptions of the points inspected, tests and adjustments made, quantitative results obtained if such are specified, and suggestions for precautions to be taken to ensure proper maintenance. The report also shall include a certificate that the equipment conforms to the requirements of the Contract and is ready for permanent operation and that nothing in the installation will render the manufacturer's warranty null and void.

- D. After the Engineer has reviewed the reports from the Manufacturer's Representatives, the Contractor shall make arrangements to have the Manufacturer's Representatives present when the field acceptance tests are made.
- E. The Manufacturer's Representative shall remain on the job to instruct the Owner's personnel in proper operation and maintenance and shall remain until the equipment is operating in a satisfactory manner.

2. PRODUCTS

- 2.1 None used.

3. EXECUTION

3.1 ENGINEER'S RIGHT TO RETESTING

- A. Should the Contractor refuse or neglect to make any tests necessary to demonstrate the integrity of the completed system, the Engineer may retain the services of an outside consultant to make all such tests and their resulting adjustments and balance.
- B. The costs for such tests shall be deducted from amounts owing to the Contractor and shall not be borne by the Owner.

END OF SECTION

SECTION 443116

ODOR CONTROL

1. GENERAL

1.1. CONTRACT DOCUMENTS

- A. Attention shall be directed to the General Conditions for the definition of the Contract Documents. This division of these Specifications is a part of the Contract Documents as defined in the General Conditions. All applicable parts of the balance of the Contract Documents are equally as binding for this Section as for all other parts of these Specifications.

1.2. WORK INCLUDES

- A. Furnish all labor, materials, equipment, and incidentals required to furnish and install the activated carbon adsorption odor control system as specified herein and as shown on the Contract Drawings.

1.3. RELATED SECTIONS

- A. The following items appurtenant to this work are specified under other sections of these specifications and are mentioned here for cross reference purposes only.
 - 1. Specification Section 330509 – Flexible Connections
 - 2. Specification Section 330531 – PVC Pipe

1.4. SUBMITTALS AND CERTIFICATIONS

- A. Shop drawings and manufacturer's Certificates of Compliance shall be furnished for odor control equipment and any other items in this Section of work.
- B. Operations and Maintenance Manual: The Manufacturer shall submit five (5) copies and one (1) searchable and bookmarked electronic .pdf copy of O&M manuals for all equipment and systems furnished under this specification. The manuals shall be written specifically for this project and shall include detailed process operating instructions, start-up and shutdown procedures, process control and troubleshooting procedures, emergency procedures and all necessary safety precautions. The O&M manual shall be complete in all respects for all equipment, controls, accessories and associated appurtenances supplied under this Section, but not limited to the following:
 - 1. Diagrams and illustrations.
 - 2. Detailed description of the function of each principal component of the system.
 - 3. Installation instructions.
 - 4. Proper adjustment.
 - 5. Test procedures.
 - 6. Procedure for operating.

7. Emergency operating instructions and troubleshooting guide.
8. Safety precautions.
9. Maintenance and overhaul instructions which shall include detailed assembly drawings with part numbers, parts list, instructions for ordering spare parts, and complete preventive maintenance instructions required to ensure satisfactory performance and longevity of the equipment.
10. All other pertinent data, information and recommendations included in the manufacturer's O&M manuals.

1.5. PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store equipment components in accordance with shop drawings and manufacturer's written instructions.

1.6. QUALITY ASSURANCE

A. Acceptable Manufacturers

1. The odor control device shall be manufactured by Wolverine, Simple Solutions Distributing LLC or approved equal, and comply with the requirements set forth in this specification.

1.7. WARRANTY

- A. The General Contractor shall obtain, from the Manufacturer and furnish to the Owner, a Manufacturer's five (5) year warranty for the odor control barrel. The warranty shall cover all necessary labor, equipment and replacement parts resulting from faulty or inadequate design, improper assembly or erection, defective workmanship and materials, leakage, breakage or other failure for all equipment and components furnished by the manufacturer. The warranty period shall commence on the date of the Engineer's Certificate of Substantial Completion. The Owner shall incur no labor or equipment cost during the warranty period.

2. **PRODUCTS**

2.1. GENERAL

- A. One (1) activated carbon adsorption odor control barrel shall be provided. The odor control barrel shall be the 20lb Mega Pollution Control Barrel Activated Carbon Filter (Part #MB-20) as manufactured by Wolverine, or approved equal.
- B. The barrel unit shall mount on top of sewer vent piping.

2.2. DESIGN STANDARDS

- A. The odor control barrel shall come with Sulfursorb Catalytic Activated Carbon.
- B. The filter shall accommodate a 6" inch Schedule 40 PVC vent pipe.

- C. The overall diameter shall be 12 inches.
- D. The overall height shall be 19.5 inches, and the installed height shall be 15 inches.
- E. The inlet shall be a 4" socket in accordance with ASTM D 2661.
- F. The carbon capacity shall be 20 lbs.
- G. The H₂S breakthrough capacity shall be 0.15 (min) g H₂S/cc carbon in accordance with ASTM D 6646.

3. **EXECUTION**

3.1. INSTALLATION

- A. The odor control device shall be installed in accordance with the Manufacturer's recommendations and instructions, the Contract Drawings, and all State and local regulations.

3.2. INSPECTIONS AND TESTS

- A. Inspector shall inspect and certify that initial installation of the odor control barrel is in compliance with this Section and the Manufacturer's recommendations and requirements.

END OF SECTION

SECTION 465000

SECONDARY+ WASTEWATER TREATMENT SYSTEM

1. GENERAL

1.1 GENERAL

- A. The equipment described in this specification section shall provide a secondary plus (Secondary+) level of wastewater treatment using recirculating sand/textile filters as described in the effective Environmental Protection Rules Chapter 14 Indirect Discharge Rules of the State of Vermont, Agency of Natural Resources, Department of Environmental Conservation, Drinking Water and Groundwater Protection Division.
- B. The Secondary+ treatment system equipment shall be sufficient to construct a complete system designed to treat septic tank effluent meeting the General Performance Standards described herein (the Treatment System).
- C. The equipment shall be delivered FOB at the Water Resource Recovery Facility (WRRF) site at 428 Mountain Rd., Montgomery Center, VT 05471 for off-loading and installation by the Town's selected General Contractor (GC).
- D. The equipment shall include, at a minimum:
 - 1. Two submersible treatment system feed pumps and level control floats or sensors to be installed in the equalization wetwell
 - 2. Prefabricated and pre-piped tankage designed for partially buried installation integral to the treatment system
 - 3. Level control floats to be installed in the receiving, treated water tank
 - 4. System controls, panel and pump motor starters to be installed within the proposed WRRF control building
 - 5. Appurtenant equipment, devices and specialized hardware necessary to construct an operational system in accordance with this specification
- E. The pre-selected Secondary+ Equipment is the AdvanTex® Treatment System manufactured by Orenco Systems, Inc., Sutherlin, Oregon.

1.2 GENERAL PERFORMANCE STANDARDS

- A. The Treatment System shall have capacity to produce the specified effluent water quality with an influent Maximum Day Flow (MDF) of up to 40,000 gpd and Peak Hourly Flow of up to 28 gpm.
- B. The Treatment System effluent water quality shall not exceed a monthly average effluent quality of 15 mg/L BOD₅, 15 mg/L TSS treating typical residential and commercial septic tank effluent. The expected Treatment System average influent water quality is 150 mg/L BOD₅ and 40 mg/L TSS. No chemical addition should be needed to meet these criteria.

- C. The Treatment System shall consist of pre-manufactured treatment units (tanks) with weatherproof covers designed to be partially buried. No other tankage to be provided by others shall be required. No building or structure shall be required to house the treatment units.
- D. The Treatment System shall be capable of meeting the general performance standards in a cold weather climate with extended periods of minimum winter ambient air temperatures of -25° F.
- E. The Treatment System controls shall operate the entire treatment system including influent pumps to be located in the equalization wetwell. Refer to the P&ID diagram in Section 2.4 of this specification.
- F. System design in accordance with applicable portions of TR-16 – Guides for the Design of Wastewater Treatment Works, 1998 Edition.

1.3 SUBMITTALS (TO BE PROVIDED BY THE PRE-SELECTED EQUIPMENT MANUFACTURER)

- A. Submit to the Engineer copies of all materials required to establish compliance with this Section.
- B. Shop drawing submittal shall include the following:
 - 1. Complete descriptive information and shop drawings for all equipment, material and devices furnished. A complete bill of materials listing all items to be supplied shall be included with the submittal.
 - 2. Shop drawings including all dimensions, size, and location of connections to other work, critical clearance requirements, interconnections and interface requirements and weight of equipment or component.
 - 3. Catalog information and cuts for all manufactured items, including control system components, highlighted to show actual items proposed to be provided.
 - 4. Equipment electrical requirements and schematic diagrams.
- C. Operations and Maintenance Manual: The Manufacturer shall submit five (5) copies and one (1) searchable and bookmarked electronic .pdf copy of O&M manuals for all equipment and systems furnished under this specification. The manuals shall be written specifically for this project and shall include detailed process operating instructions, start-up and shutdown procedures, process control and troubleshooting procedures, emergency procedures and all necessary safety precautions. The O&M manual shall be complete in all respects for all equipment, controls, accessories and associated appurtenances supplied under this Section, but not limited to the following:
 - 1. Diagrams and illustrations.
 - 2. Detailed description of the function of each principal component of the system.
 - 3. Installation instructions.
 - 4. Procedure for starting.
 - 5. Proper adjustment.
 - 6. Test procedures.

7. Procedure for operating.
8. Shutdown instructions.
9. Emergency operating instructions and troubleshooting guide.
10. Safety precautions.
11. Maintenance and overhaul instructions which shall include detailed assembly drawings with part numbers, parts list, instructions for ordering spare parts, and complete preventive maintenance instructions required to ensure satisfactory performance and longevity of the equipment.
12. List of electrical relay settings and controls and alarm contact settings.
13. Electrical interconnection wiring diagram for equipment furnished, including all control and lighting systems.
14. All other pertinent data, information and recommendations included in the manufacturer's O&M manuals.

1.4 QUALITY ASSURANCE

- A. All equipment under this section shall be furnished by a single treatment system vendor (the Treatment System "Vendor" or "Manufacturer").
- B. The Treatment System equipment shall be of the Manufacturer's standard design comparable to the Manufacturer's previous installations. A system designed specifically for the Town of Montgomery application that has not been used before shall not be acceptable.
- C. Comply with Services of Manufacturer's Representative requirements set forth in Specification Section 3.3.

1.5 WARRANTY

- A. The General Contractor shall obtain, from the Manufacturer and furnish to the Owner, a Manufacturer's five (5) year warranty for the entire treatment system, including, but not limited to the pump, pump vault, float switch assembly, discharge assembly, control panel, splice box, and ventilation fan. The guarantee shall cover all necessary labor, equipment and replacement parts resulting from faulty or inadequate design, improper assembly or erection, defective workmanship and materials, leakage, breakage or other failure for all equipment and components furnished by the manufacturer. The guarantee period shall commence on the date of the Engineer's Certificate of Substantial Completion. The Owner shall incur no labor or equipment cost during the guarantee period.

1.6 PERFORMANCE GUARANTEE

- A. Upon the issuance of the Engineer's Certificate of Substantial Completion for the General Contract, the Treatment System Manufacturer shall provide to the Owner a written Performance Guarantee that the completed Treatment System will meet the General Performance Standards contained in Section 1.2.A and B for a period of five (5) years.

- B. If the Treatment System is not capable of meeting the General Performance Standards, the Manufacturer shall, at no additional cost to the Owner, review operating data and perform field inspections and/or testing to determine the reason(s) for the deficient performance. The Manufacturer shall submit a written report to the Owner with findings and recommendations of the investigation to remedy the operational issues. Should the recommended remedy be capital system improvements and/or improved, expanded or substitutions of system equipment, the Manufacturer shall make those changes at no additional cost to the Owner.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Exercise care in transporting and handling to avoid damage to Secondary + Treatment equipment per Manufacturer's recommendations.
- B. Store materials onsite in enclosures or under protective coverings per Manufacturer's recommendations.

2. PRODUCTS – Refer to Figure 1 – Treatment System P&ID in Section 2.4

2.1 EQUALIZATION WETWELL (EQ-WW) EQUIPMENT

- A. Electrical Splice Box
 - 1. Three external splice boxes shall be provided.
 - 2. UL approved for wet locations
 - 3. Supply UL-listed waterproof splice connectors.
 - 4. The use of a UL-approved conduit seal kit accessible above ground shall be required to prevent the passage of gases, vapors, or flames through the conduit to the control panel.
 - 5. An additional UL-classified sealant shall be added to the splice box coupling to prevent condensation accumulation in the splice box.
- B. Equalization Wetwell (EQ-WW) Structure
 - 1. The equalization wetwell (EQ-WW) structure shall be a pre-cast concrete structure to be furnished and installed by the General Contractor.
- C. Pumps (2) (EQ-PMP-1 and EQ-PMP-2)
 - 1. Submersible, 230VAC, single phase, 60Hz, two-wire motor, with a 20ft long, extra-heavy-duty SOOW electrical cord with ground.
 - 2. Pumps shall be UL and CSA listed as an effluent pump.
- D. Pump Vault
 - 1. A pump vault of the manufacturer's standard design shall be provided to be set within the equalization wetwell by the General Contractor
 - 2. The pump vault shall be a complete, integrated package to filter and pump the influent wastewater to the treatment process unit(s)
 - 3. The pump vault shall house and support the float switch assembly, filter, pumps and pump discharge unit

4. The filter shall be changeable without having to remove the pump vault or pumps
 5. The pump vault body shall be polyethylene or stainless steel
- E. Float Switch Assembly (FS-1,2,3,4)
1. Float switches shall be mercury free with four normally open mechanical float switches mounted on a PVC stem
 2. The float switches must be adjustable and preset as shown on the Contract Drawings.
 3. Each float switch lead shall be secured with a nylon strain relief bushing at the splice box.
 4. The float switches shall be UL or CSA listed.
- 2.2 DRIP DISPERSAL WET WELL (WW-TNK-1) EQUIPMENT
- A. The drip dispersal wet well shall be a buried, pre-cast concrete tank to be furnished and installed by the General Contractor.
- B. Float Switch Assembly (FS-5,6,7,8)
1. Float switches shall be mercury free with four normally open mechanical float switches mounted on a PVC stem
 2. The float switches must be adjustable and preset as shown on the Contract Drawings
 3. Each float switch lead shall be secured with a nylon strain relief bushing at the splice box
 4. The float switches shall be UL or CSA listed.
- 2.3 SECONDARY+ TREATMENT SYSTEM EQUIPMENT
- A. General
1. The Treatment System equipment shall be a complete, wastewater treatment system for receiving and processing septic tank effluent.
 2. The Treatment System shall be modular utilizing factory-prepared tankage of the Manufacturer's standard design.
 3. All process equipment including but not limited to pumps, valves, blowers, ventilation shall be pre-piped and pre-wired at the factory and installed within the treatment tanks for installation at the WRRF.
 4. The treatment tank(s) shall be designed for partially buried service without the need for a building or roof structure. The treatment tank(s) shall be covered and insulated and be designed for partial bury.
 5. Electrical and controls panels furnished by the Manufacturer shall be installed in the WRRF control building by the General Contractor.
- B. Treatment Tank(s)
1. The Manufacturer shall provide the structural design and certification for review. The design shall be in accordance with accepted engineering practice. Precast concrete or fiberglass tanks shall have been designed by a registered engineer and approved by state or local regulatory agencies or authorities.
 2. Loading Criteria: 140lbs per cubic foot for minimum weight of saturated backfill, or 127lbs per cubic foot for unsaturated backfill (500lbs per square foot). Minimum lateral loading shall be 62.4lbs per cubic foot. Lateral loading shall be determined

from the ground surface. The tank shall also support a concentrated wheel load of 2500lbs.

3. Tank(s) shall be structurally sound and watertight and guaranteed in writing by the Manufacturer for a period of two years from the date of final acceptance. The tank guarantee/warranty shall be furnished at the time of submittal. The tank warranty shall not be limited liability to replacement cost of the tanks. The septic tank shall be capable of withstanding long-term hydrostatic loading, in addition to soil loading, due to a water table maintained at ground surface.
4. Tank(s) shall be furnished with appropriate access covers and/or openings for operation and maintenance purposes including removal and replacement of all internal equipment. Connections for buried yard or interconnecting piping or plumbing, ventilation and electrical connection points shall be provided. Tank(s) shall be furnished complete and shall not require field modification by the General Contractor.
5. Tank(s) shall be capable of withstanding an above-ground static hydraulic test and shall be individually tested.

C. Process Pumps

1. Pumps shall be:

- a. Approved for use for the specific application by the pump manufacturer
- b. Duplex pumps
- c. 230VAC, single phase, 60Hz
- d. UL and CSA listed as an effluent pump.
- e. Rated for continuous use and frequent cycling, at least 100 cycles per day
- f. Lightweight for easy removal, maintenance and replacement
- g. Equipped with internal thermal overload protection and internal lightning protection

D. Ventilation System

1. Closed vessel ventilation system shall meet the following requirements:
 - a. The vent fan(s) shall be UL recognized, 115v, 1.4A, single phase

E. Controls

1. Controls and alarms shall be listed per UL 508. Panels shall be repairable in the field without the use of soldering irons or need for substantial disassembly.
2. Control panel shall have SCADA capabilities which requires an Ethernet connection or cellular access with static IP addressing. Panel is required to allow real-time connectivity with the control panel web page and alarm communications.
3. Panel shall be covered by a 5-year warranty.
4. Panel shall be capable of the following:
 - a. Data collection and utilization: logs data for system conditions and events such as daily flows, pump run time, pump cycles, and alarm conditions. Logs shall store data for at least a year.
 - b. Downloadable logs: download logs into a *.dif or ASCII format for simple conversion to common spreadsheet or word processor programs.
 - c. Multi-level password security: only qualified personnel can remotely access site.

- d. Programmed logic to meet the required functionality for a fully operational system and remote capable for changes and updates to firmware or programming.
 - e. Program rules to be written based on several operands, including the following:
 - i. Input/output status
 - ii. Point status
 - iii. Date: mm/dd/yy format
 - iv. Time of day: 24-hour clock
 - v. Timers
 - vi. Historical data (allows for control optimization or detection of trends)
 - f. Scheduling functions to control digital “points” based on date or day of week/time.
 - g. Automatic daylight savings time adjustment.
 - h. Email function with automatic call-out to at least 16 unique mailboxes.
 - i. Collecting data and detecting trends that could lead to system failure.
5. The unit shall have the capability of real-time direct connection to the panel via laptop serial port, to allow the operator real-time access to detailed logged data and the ability to change point values.
- a. Standard components must include at a minimum:
 - i. Motor-start contactor: 18A, 3-pole, 1-1.5hp (0.75-1.1kW), 50/60Hz; 2.5 million cycles at FLA (5 million at 50% of FLA for 230VAC).
 - ii. HOA 3-way toggle switches: single-pole switch, Hand (manual) Off, Auto (on).
 - iii. Controls circuit breaker: 10A, OFF/ON switch. Single-pole 120VAC. DIN rail mounting with thermal magnetic tripping characteristics.
 - iv. Pump circuit breaker: 20A, OFF/ON switch. Single-pole for 120VAC or double-pole for 230VAC. DIN rail mounting with thermal magnetic tripping characteristics.
 - v. Audio alarm: 95dB at 24in (610mm), warble-tone sound.
 - vi. Ground fault interrupter (GFI): 120VAC, 15A.
 - vii. Current sensor: 24VDC, 4-20mA with adjustable high and low alarm set points.
 - viii. Visual alarm: 22mm pushbutton with red lens, “push-to-silence.” Must maintain UL Type 4X rating, LED bulb, 115VAC.
 - ix. Panel enclosure: UL Type 4X rated (NEMA rating not acceptable) constructed of UV-resistant fiberglass or UL Type 4 rated (NEMA rating not acceptable), constructed of steel; hinges and latch must be stainless steel.
 - x. Remote telemetry unit: TCOM or TCOM-XL telemetry controller; required for system input/output (I/O) to be fully supported plus 10% spare; self, 24VDC power supply for all calculated needs plus 25%; 16 digital I/O expandable as necessary; minimum 16 analog inputs expandable as necessary. On-board Ethernet port (10 base T, RJ45jack) and Modbus port (RS485/485 terminals). Non-volatile memory backup

- of programming, lithium battery backup of data and program settings for a minimum of 1 year without power.
 - xi. Local touchscreen display: must connect to the controller via Ethernet, bright 16-bit colors, high definition TFT analog resistance touchscreen, 32-bit RISC CPU, 400MHz with 128M Flash DRAM, 10.1in (257mm); or Pre-approved equal.
 - xii. Industrial Ethernet switch: managed with at least 5 ports, 10/100 Base-T, 10-30VDC power input.
 - xiii. Surge arrester: Type 1 surge protective device, rated for 36kA per phase, UL listed.
 - xiv. Anti-condensation heater: Must be self-adjusting or thermostat controlled, wattage as required to maintain minimum temperature inside the panel to prevent condensation.
 - xv. 500VA Uninterruptible Power Supply for telemetry board, ethernet switch, cell router, and touchscreen display.
 - xvi. 2" Flow Meter with panel mount signal convertor mounted in control panel
- b. Standard components listed do not preclude any other necessary items. At a minimum, all components required to maintain system operation must be provided for a fully functional control panel.

2.4 FUNCTIONAL DESCRIPTION – Refer to Figure 1 in this section

- A. All system functions shall be controlled by the Treatment System controls described in section 2.2.3
- B. Normal Operational Mode
 - 1. System ON at low water level setting in tank DD-WW AND water level above low water setting in tank EQ-WW
 - 2. System OFF at high water level setting in tank DD-WW OR low water setting in tank EQ-WW
- C. Fault Conditions
 - 1. The following fault conditions shall generate a fault alarm:
 - a. High-High water level in tank EQ-WW
 - b. Low-Low water level in tank DD-WW
 - 2. The following fault conditions shall shut down the treatment system and generate a fault alarm:
 - a. Internal Treatment System equipment failure
 - gh-High water level in tank DD-WW

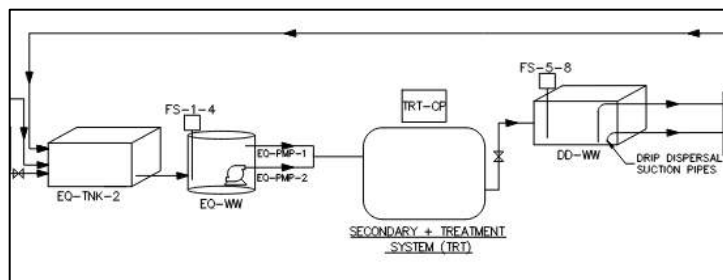


Figure 1: Treatment System P&ID

2.5 SPARE PARTS

- A. The Manufacturer shall provide six (6) spare float switches.

2.6 OPERATION AND MAINTENANCE TOOLS

- A. The Manufacturer shall supply any specialized tools and cleaning systems and devices necessary or recommended for the normal operation and maintenance of the treatment system. This would include items not typically available in local hardware and construction materials retail stores.

3. EXECUTION

3.1 PRECONSTRUCTION CONFERENCE

- A. A conference attended by the Owner, General Contractor, Engineer, Manufacturer's Representative, Operator, and others, as appropriate, shall be held to review the integration and installation requirements of the equipment after the Submittal documentation has been approved and prior to construction.

3.2 INSTALLATION

- A. All treatment, pumping system, and electrical components shall be installed in accordance with the Manufacturer's recommendations and instructions, the Contract Drawings, and all State and local regulations.

3.3 TESTING

- A. All tanks shall undergo a factory static hydraulic test and shall be tested individually. Results from the testing shall be submitted to the Engineer for approval prior to installation.
- B. Prior to acceptance by Owner, an operational performance test of all pumps and control systems shall be conducted by the Contractor with the Manufacturer's Representative, Electrical/Instrumentation Subcontractor, and the Engineer present to observe the pump performance and to determine if the installed equipment meets the purpose and intent of the specifications. Tests shall demonstrate that all equipment is electrically, mechanically, structurally, and otherwise acceptable; it is safe and optimum working condition; and confirms to the specified operating characteristics. The results from the Operational Performance Test shall be submitted to the Engineer for approval before operation.

3.4 SERVICES OF MANUFACTURER'S REPRESENTATIVE

- A. The Manufacturer or Manufacturer's Representative shall provide the services of a factory-certified representative for training the Owner's service provider and inspecting the Secondary + Treatment System installation. The inspection will include items covered from the installation training.

- B. The Manufacturer's Representative shall provide the services of a trained representative to instruct the installing Contractor's crew regarding the proper installation and field testing of each component per the Manufacturer's recommendations and requirements for a minimum of one (1) eight-hour day at the beginning of construction.
- C. The Manufacturer's Representative shall inspect and the initial installation of the Treatment System and shall perform or direct the General Contractor to perform any required adjustments to the equipment required to place it into operation. A written, signed inspection report shall be furnished prior to system commissioning.
- D. Failure of Functional or Performance Test: In the event the equipment specified herein proves to be in noncompliance with the functional or performance requirements specified, the General Contractor shall bear all costs for the satisfactory repair, replacement, and additional testing necessary to meet the specified requirements.
- E. The Manufacturer's Representative shall provide the services of a trained representative for a minimum of one (1) eight-hour day for the purpose of system commissioning.
- F. Upon system commissioning, the Manufacturer's or Manufacturer's Representative's trained representative shall provide the Engineer a written report of findings. The Engineer shall then perform or direct the General Contractor to perform any required adjustments to the equipment and place it into operation. All equipment and materials required to perform additional testing shall be the responsibility of the General Contractor. The Manufacturer shall submit to the Engineer and Owner a detailed start-up checklist according to the Manufacturer's inspection and start-up procedures.
- G. The Manufacturer's Representative shall provide detailed instruction to the Owner's personnel for operation of the specified equipment for a minimum of one (1) 8-hour day onsite. These training services shall include pre-startup and onsite equipment instruction and/or post-startup and onsite equipment instruction. The Owner reserves the right to video tape the operator training session for instructional use.
- H. During the first full year of operation, the Owner shall provide all testing results and a list of maintenance activities to the Manufacturer each month. The Manufacturer shall review results and provide feedback on operating parameters, equipment performance, and maintenance activities.
- I. At the end of the first year of operation, if requested by the Owner, the Manufacturer or Manufacturer's Representative shall commit to a site visit to assess equipment integrity and operational and maintenance processes, and to address issues raised by the Owner specific to the Treatment System.

END OF SECTION

SECTION 466100

DRIP DISPERSAL SYSTEM

1. GENERAL

1.1 GENERAL

- A. This Section applies to the drip dispersal system (the “Drip Dispersal System”). The Drip Dispersal System shall be designed and constructed to disperse filtrate from the Secondary+ Treatment System effluent into soil to meet these technical specifications.
- B. The Drip Dispersal System shall consist of equipment including, but not necessarily limited to, all valves, piping, filters, flow meter, controls, electrical supply & components, header piping, pressure compensating drip tubing, air release/vacuum breaker valves, fittings, pumps, hydraulic equipment protection, supports and appurtenances, as further described in this specification section, necessary for a complete working system.
- C. The Drip Dispersal System including the proposed discharge operational scenario must be consistent with the Environmental Protection Rules Chapter 14 Indirect Discharge Rules of the State of Vermont, Agency of Natural Resources, Department of Environmental Conservation, Drinking Water and Groundwater Protection Division and approvable by that agency.
- D. The Drip Dispersal System equipment shall be provided by the pre-selected Drip Dispersal System vendor (“Vendor”) and delivered, FOB, for off-loading by the General Contractor at the Water Resource Recovery Facility (WRRF) site at 428 Mountain Rd., Montgomery Center, VT 05471. The Vendor shall also provide drip disposal field installation services as further described in this specification section.
- E. The Pre-selected Vendor is Oakson Inc., Gloucester, MA.

1.2 GENERAL PERFORMANCE STANDARDS

- A. The Drip Disposal System shall be designed for a 24-hour flow rate of up to 40,000 gpd filtrate.
 - 1. The drip disposal field (also referred to as the “242” site) shall be designed and constructed to receive up to 40,000 gpd to be distributed over 22,300 sf (square feet) with 150% redundancy (60,000 gpd) at a daily loading rate not to exceed 2.7 gpd/sf.
- B. The disposal field shall utilize multiple zones with a rotational operation.
- C. The Drip Disposal System controls shall operate the system including alternating flow to the zones.

- D. The Drip Disposal System shall be capable of meeting the general performance standards in a cold weather climate with extended periods of minimum winter ambient air temperatures of -25° F.
- E. System design in accordance with applicable portions of TR-16 – Guides for the Design of Wastewater Treatment Works, 1998 Edition.

1.3 SUBMITTALS TO BE PROVIDED BY THE PRE-SELECTED VENDOR

- A. Submit to the Engineer copies of all materials required to establish compliance with this Section.
- B. Shop drawing submittal shall include the following:
 - 1. Complete descriptive information and shop drawings for all equipment, material and devices furnished. A complete bill of materials listing all items to be supplied shall be included with the submittal.
 - 2. Shop drawings including all dimensions, size, and location of connections to other work, critical clearance requirements, interconnections and interface requirements and weight of equipment or component.
 - 3. Catalog information and cuts for all manufactured items, including control system components, highlighted to show actual items proposed to be provided.
 - 4. Equipment electrical requirements and schematic diagrams.
 - 5. Drip dispersal piping plans and details
- C. Operations and Maintenance Manual: The Vendor shall submit five (5) copies and one (1) searchable electronic copy of O&M manuals for the equipment and systems furnished under this specification. The manuals shall be written specifically for this project and shall include detailed process operating instructions, start-up and shutdown procedures, process control and troubleshooting procedures, emergency procedures and all necessary safety precautions. The O&M manual shall be complete in all respects for all equipment, controls, accessories and associated appurtenances supplied under this Section, but not limited to the following:
 - 1. Diagrams and illustrations.
 - 2. Detailed description of the function of each principal component of the system.
 - 3. Installation instructions.
 - 4. Procedure for starting.
 - 5. Proper adjustment.
 - 6. Test procedures.
 - 7. Procedure for operating.
 - 8. Shutdown instructions.
 - 9. Emergency operating instructions and troubleshooting guide.
 - 10. Safety precautions.
 - 11. Maintenance and overhaul instructions which shall include detailed assembly drawings with part numbers, parts list, instructions for ordering spare parts, and complete preventive maintenance instructions required to ensure satisfactory performance and longevity of the equipment.

12. List of electrical relay settings and controls and alarm contact settings.
13. Electrical interconnection wiring diagram for equipment furnished, including all control and lighting systems.
14. All other pertinent data, information and recommendations included in the manufacturer's O&M manuals.

1.4 SUBMITTALS

- A. The Contractor shall submit the following to the Engineer for approval:
 1. Electronic set of shop drawings and equipment compatibility.
 2. Operations and Maintenance Manual: All equipment furnished under this Section, the Contractor shall submit five (5) copies and one (1) searchable electronic copy of O&M manuals. The manuals shall be written specifically for this project and shall include detailed process operating instructions, start-up and shutdown procedures, process control and troubleshooting procedures, emergency procedures and all necessary safety precautions. The O&M manual shall be complete in all respects for all equipment, controls, accessories and associated appurtenances supplied under this Section.

1.5 QUALITY ASSURANCE

- A. The Drip Dispersal System Vendor shall coordinate with the General Contractor during system delivery and installation as required by Section 3.3 of this Specification.

1.6 WARRANTY

- A. The General Contractor shall obtain, from the Vendor and furnish to the Owner, a written one (1) year system performance guarantee. The guarantee shall cover all necessary labor, equipment and replacement parts resulting from faulty or inadequate design, improper installation, defective workmanship and materials, leakage, breakage or other failure for all equipment and components furnished and installed by the Vendor as described herein. The guarantee period shall commence on the date of the Engineer's certificate of completion. The Owner shall incur no warranty labor or equipment cost during the guarantee period.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Exercise care in transporting and handling to avoid damage to drip dispersal equipment per Vendor's recommendations.
- B. Store materials onsite in enclosures or under protective coverings per Vendor's recommendations.

2. PRODUCTS

2.1 CONTROLS

- A. Vendor shall provide a complete pump, filter control and operating system consisting of system control panel, processor/control panel with operator interface, flow meter and field control devices.

- B. The Control Panel Enclosure(s) shall house the following:
 - 1. Circuit Breakers
 - 2. Motor Protector (3-phase pumps)
 - 3. Motor Contactors
 - 4. Current Sensor
 - 5. Control Transformer
 - 6. DC Power Supply
 - 7. Programmable Logic Controller (PLC)
 - 8. Human Machine Interface (HMI)
 - 9. Control Relays
 - 10. Alarm Light, Horn and Dry Contacts
 - 11. "Hand-Off-Auto" selector switches and run indicating lights for each pump and solenoid valve.
 - 12. Terminal blocks for field wiring
 - 13. Copper grounding plate or bar inside the control panel for terminating all ground wires.
 - 14. Components shall be UL Listed
 - 15. Schematic and manual to be provided with control.
 - 16. Installation to be according to all local codes.
 - 17. All electrical control equipment shall be mounted within a NEMA 4X rated enclosure provided with a rigid latching door.
 - 18. All switches shall be clearly identified, and all internal wiring shall be factory installed. The exterior color of the panel shall be gray.
 - 19. All control panel components shall be properly identified with a visible label mounted on the component mounting stand or on the component where necessary inside the panel.
 - 20. All components not mounted on the front of the panel shall be mounted on a removable back panel secured to the enclosure with collar studs.
 - 21. All wiring shall be installed in a neat, workmanlike manner and shall be grouped, bundled, supported or routed horizontally and vertically to provide a neat appearance.
 - 22. All wires leaving the panel shall be terminated at the terminal strips inside the enclosure.
 - 23. Terminal wires shall be identified in accordance with the Vendor's panel wiring diagrams.

- C. Circuit Breakers
 - 1. Circuit Breakers shall be Schneider Electric or approved equal.
 - 2. Thermal-magnetic type breakers shall be individually mounted and identified.

3. A circuit breaker shall be provided for:
 - a. Control power circuit
 - b. Alarm power circuit
 - c. Each single phase pump

- D. Motor Protectors:
 1. Motor Protectors shall be Schneider Electric or approved equal.
 2. Motor Protectors shall be individually mounted and identified.
 3. A Motor Protector shall be provided for each 3-phase pump.

- E. Motor Contactors:
 1. Motor Contactors shall be Schneider Electric or approved equal.
 2. Motor Contactors shall be properly sized non-reversing, magnetic contactors.
 3. A Motor Contactor shall be supplied for each pump.

- F. Current Sensor:
 1. A current sensor shall be provided to indicate a motor is not drawing sufficient current.
 2. Upon detection of an undercurrent, the PLC shall stop and lockout the affected motor until the circuit is manually reset.

- G. Control Transformers:
 1. A properly sized control transformer shall be installed in the panel to provide necessary 24VAC power for control circuits.
 2. The transformer shall be furnished with its own circuit fusing consisting of one primary fuse and one secondary fuse.
 3. The transformer shall be sized for multiple simultaneous solenoid activation.

- H. DC Power Supply:
 1. A DC power supply shall be provided to power all DC components.

- I. PLC:
 1. The PLC shall be a Siemens S7-1200 or pre-approved equal.
 2. The PLC and all input/output cards shall be housed inside a single NEMA rated enclosure.
 3. The PLC shall include logic to do the following:
 - a. Alternate pumps following each dose.
 - b. Dose drip zones either individually or two at a time.
 - c. Dose drip zones based on time or volume.
 - d. Back flush filters every dose cycle and in response to a pressure differential signal
 - e. Forward Field Flush each zone based on completed dose cycles.
 - f. Provided "variance" and "catastrophic" flow monitoring of each zones dose rate. These conditions shall be adjustable by the operator.
 - g. Dosing to be controlled by a float switch enabled time dosing system.
 - h. The system controller shall provide for a zone to be "rested" or taken "out of service". The controller shall have the capability to bypass the zone(s) that have

been taken out of service and dose the next available zone with normal sequence continuation.

- i. The controller shall log daily flows for each zone and maintain the last 30 days for each.
- J. Control Relays:
1. Relays shall be Schneider Electric, Finder, or approved equal.
 2. Relays shall be DIN rail mount type.
 3. Relays shall have an indicator light to indicate the relay coil is energized.
- K. Alarm Circuit:
1. Top mounted red alarm light shall be provided.
 2. 95db alarm horn shall be provided.
 3. Test-Normal-Silence switch shall be provided to test the operation of the light and horn and to silence the audible alarm.
 4. Dry Alarm Contacts shall be provided for all required alarm events.
- L. H.O.A Selector Switches:
1. All pumps, zones, zone master, zone return and filters to have Hand-Off-Auto switch.
 2. When the HOA switches are in the "auto" position, the pumps shall be automatically controlled by the PLC.
- M. Pilot Lights:
1. All pumps, zones, zone master, zone return, and filter to have an Amber Pilot Light indicating it is in the run state.
- N. Terminal Blocks:
1. Terminal blocks shall be provided in the control panel for all field wiring.
 2. Terminal blocks shall be rated for full voltage.
 3. Terminal blocks connected to field wiring such as the zone valves shall have integral varistors sized for 24 VAC operation.
- O. Wiring:
1. All wiring, workmanship, and schematic wiring diagrams shall be in compliance with applicable standards and specifications set forth by the National Electrical Code (NEC).
 2. All wiring and terminal blocks shall be isolated by voltage levels to the greatest extent possible.
 3. All wiring in control panel shall be stranded copper, rated 600 volts.
 4. All control wiring shall be color-coded or tagged at each end in the control panel with a legible permanent coded wire-marking tape. Tape shall be white with machine printed black marking. Markings shall be in accordance with the wire numbers shown on the control wiring diagrams.

- P. Nameplates:
1. Laminated nameplates shall be provided on the front of the inner door of pump control panel.
 2. Nameplates shall be black with white engraved letters.

2.2 PUMP AND HYDRAULIC UNIT FILTRATION RACK SKID

- A. The following equipment shall furnished by the Vendor and mounted on an aluminum equipment skid for off-loading and setting within the treatment building by the General Contractor.
1. The equipment shall be pre-piped, pre-wired and tested at the factory prior to shipment to the WRRF site.
 2. The equipment skid shall be the standard design of the Vendor based on prior installations
 3. All piping, valves, instrumentation and controls necessary for a complete working pump and filter skid shall be provided.
 4. The equipment skid shall be installed on the floor of the WRRF properly secured and leveled.
- B. FLOW METER
1. The effluent flow meter shall be 2-inch diameter Multi-Jet Model # MJ13-1CH-AAA-1 AWWA Standard C with flange connections manufactured by Master Meter or approved equal.
 2. The meter shall give the flow rate and flow rate into totalized flow.
 3. Meter is to have a drive with integrated contact closure(s) per gallon(s).
 4. Transmitter shall be two-wire with pulse output proportional to flow.
 5. Provide and install a data logger to store long term flow meter data for easy retrieval and transfer to a remotely located PC.
- C. PUMPS
1. Vendor shall furnish the required pumps and motors.
 2. Pumps shall be duplex skid mounted, flooded suction, self-priming centrifugal and able to satisfy all normal operating conditions such as: multiple zone dose, individual zone forward flush, and filter backwash.
 3. Pumps shall be UL Listed and hardwired in a watertight junction box per local code.
 4. Each pump to have individual breaker, contactor and capacitor (if required).
 5. Pumps to have check valve, disconnect and a shut-off valve on supply pipe prior to hydraulic unit.
 6. Suction line to have a foot-strainer located a minimum of 6 inches off of the bottom of the drip dispersal wet well.
- D. HYDRAULIC UNIT FILTRATION RACK
1. Automatic filter battery shall be be Arkal/Netafim Disc-Clean Batter units or approved equal
 2. Performance Requirements and Design Criteria:
 - a. The automatic filter shall be a package assembly filter battery consisting of two - 2-inch single filters.

- b. Filters shall be controlled from the computer controller by electrically activated valves.
 - c. Filter battery shall have the following:
 - 2.2.D.2.c.1 Inlet/outlet diameter: 2-inch groove
 - 2.2.D.2.c.2 Backwash connection: 2-inch thread
 - 2.2.D.2.c.3 Minimum backflush pressure: 50 psi
 - 2.2.D.2.c.4 Maximum working pressure: 140 psi
 - 2.2.D.2.c.5 Maximum recommended flow rate: 60 gpm
 - 2.2.D.2.c.6 Battery filter surface area: 292 sq. in.
 - 2.2.D.2.c.7 Battery filtering volume: 150 cu. in.
 - 2.2.D.2.c.8 Length of flushing period: 10-15 seconds/filter
 - 2.2.D.2.c.9 Amount of water used for flushing: 40 gallons
 - 2.2.D.2.c.10 Filter rings: 140 mesh - 115 micron
 - 2.2.D.2.c.11 Head loss: 5.0 psi at 40 gpm
 - 3. Secondary Filter
 - a. The secondary filter shall be a 2-inch diameter filter assembly installed in-line on the downstream side of the automatic filter assembly
 - 2.2.D.3.a.1 Secondary filter shall have the following characteristics
 - 2.2.D.3.a.2 Inlet-outlet diameter: 2-inch
 - 2.2.D.3.a.3 Maximum pressure rating: 140 psi
 - 2.2.D.3.a.4 Maximum flow rate rating: 110 gpm
 - 2.2.D.3.a.5 Secondary filter shall be Arkal/Netafim 2-inch Super Filter or approved equal
 - 4. Backflush procedure to operate as follows:
 - 2.2.D.4.a.1 Computer/control calls for backflush to start.
 - 2.2.D.4.a.2 Backflush initiated by either a pressure differential across filters or a set volume amount through unit.
 - 2.2.D.4.a.3 Filtration rings separate on filter element
 - 2.2.D.4.a.4 Hydraulic valves close discharge and open backflush outlet on one bank at a time which takes that filter out of service.
 - 2.2.D.4.a.5 Water supply for backflush is provided through the filters in service.
 - 2.2.D.4.a.6 Backflushing takes place for 10-15 seconds per filter; discharge of flush water is to equalization tank 2 (furnished by the General Contractor)
 - 2.2.D.4.a.7 Remaining filters are sequentially backflushed until entire battery has been cleaned.
 - 2.2.D.4.a.8 Automatic Filter battery shall be Arkal/Netafim 2" Disc-Kleen Battery units or pre-approved equal.
- E. Pump Master Control Valve
- 1. Valve body and cover shall be 2-inch diameter reinforced nylon.
 - 2. Valve shall be DOROT "Gal" valve 2-inch diameter plastic valve or pre-approved equal.
 - 3. Pump master control valve shall be hydraulic valve with integral diaphragm operated by hydraulic pressure to control the pump discharge.
 - 4. Springs shall be stainless steel.

5. Inlet pressure range shall be 15-140 psi.
6. Valve shall be operated electrically from the computer controller.

2.3 DISPOSAL FIELD ZONE CONTROL VALVE MANIFOLD SKID

- A. The following equipment shall be furnished by the Vendor and mounted on an aluminum equipment skid for off-loading and setting within the treatment building by the General Contractor.
 1. The equipment shall be pre-piped, pre-wired and tested at the factory prior to shipment to the treatment building site.
 2. The equipment skid shall be the standard design of the Vendor based on prior installations equipment skid shall be the standard design of the Vendor based on prior installations
 3. All piping, valves, instrumentation and controls necessary for a complete working field control valve skid shall be provided.
 4. The equipment skid shall be installed on the floor horizontally or along a wall vertically in the WRRF properly secured, leveled and plumb.
- B. Field Zone Control Valves
 1. Valve body shall be 1.5 inch diameter plastic .
 2. Valve shall be Dorot "Gal" valve 1.5 inch diameter plastic valve or pre-approved equal.
 3. Zone Control shall be by hydraulic valve, solenoid activate diaphragm valve with the integral diaphragm operated by water pressure to open and close the drip system discharge in both the dispersal mode and forward field flush mode.
 4. Springs shall be stainless steel.
 5. Inlet pressure range shall be 15-140 psi.
 6. Valve control shall be operated electrically from the computer controller.
 7. If pressure regulation is required valves shall be equipped with a pilot control pressure sustaining feature.
 8. Zone return valve shall not require any pilot control pressure sustaining feature.
 9. All electrical wiring from the computer/controller to the field control valves shall be furnished and installed by the General Contractor.
 10. All electrical cables shall be U.L. Listed suitable for direct burial.
 11. Field Valve installation shall be provided with TVSS (Transient Voltage Surge Suppression) protection.
- C. Shut-Off Valves
 1. Shall be iron, brass, bronze or pressure rated PVC.
 2. Shall have IPS, flanged or solvent weld connections.
 3. Shall be Standard ASTM approved or equivalent in wastewater applications.
- D. Air Release Valves
 1. Shall be placed on high point of each sub-zone supply and return manifolds and at high point on common supply and return manifolds as per design.
 2. Shall be 2-inch diameter (or greater where required) combined air release and vacuum breaker valve.

3. Shall operate to release or admit air from or into the line.
4. Shall be suitable for the designed working pressures in the line.
5. Valve body shall be high strength fiberglass reinforced plastic with operating parts of non-corrosive materials or other appropriate materials as required.
6. Valves shall be A.R.I (kinetic) Combined Air Release & Vacuum valve or Guardian dual function kinetic Air Release & Vacuum Valve or pre-approved equal.

2.4 PUMP SUCTION FOOT VALVES

- A. Vendor shall furnish two foot valves and strainers to be installed by the General Contractor on the pump suction drop pipes in the drip disposal wetwell
 1. Pump suction drop pipe foot valves shall have a cast iron or brass body, IPS or standard 125-pound flange connection, rubber flapper seats or a machined surface with a tight seal by Flomatic or equivalent
 2. Pump suction foot valves shall be equipped with strainers

2.5 PIPING

- A. The following piping shall be furnished and installed by the Drip Dispersal System Vendor:
 1. All piping internal to the pump/filter skid and the field control valve manifold skid
 2. Piping at the discharge fields to provide a closed network of header lines and laterals including discharge tubing, emitters, ball valves, check valves, air valves, pressure sustaining valves as required and associated valve pits and appurtenances
- B. The following piping shall be furnished and installed by the General Contractor:
 1. All process piping within the treatment building for connecting to and from the pump/filter skid and the field control valve manifold skid
 2. Pump suction piping between the pumps in the WRRF and the drip dispersal wet well including installation of the foot valves furnished by Vendor
 3. All buried connecting piping to and from the WRRF and the drip disposal fields
 4. All other miscellaneous piping not provided by the Vendor necessary to complete the drip disposal system
- C. Process and Buried Connecting Piping
 1. Shall be schedule 40 PVC
 2. Fittings shall be schedule 40 PVC suitable for underground installation.
 3. All joints shall be solvent welded with the use of purple primer and PVC glue.
- D. Drip Tubing
 1. Drip dispersal tubing shall be Netafim Irrigation, Inc. BIOLINE pressure compensating dripperline, Perc-Rite for wastewater as distributed by American Manufacturing Company, Inc. or approved equal.
 2. All dripper tubing shall have the following characteristics:
 - a. Dripperline shall be ½ inch diameter nominal O.D. Polyethylene tubing with a pressure compensating mechanism allowing a constant discharge rate from

- each dripper opening. Inside diameter shall be a nominal dimension of 0.57 inch.
 - b. Dripperline discharge rate per orifice shall be 0.61 gallons per hour. Orifice spacing shall be 2 foot on center.
 - c. Dripper pressure compensating mechanism shall maintain a uniform dripper flow rate over a pressure range of 5-60 psi. Dripper mechanism shall be activated at 5 psi.
 - d. Dripper diaphragm shall be constructed of synthetic elastomer to withstand effects of chemicals, fertilizers and acids (to a pH of 2).
 - e. Diaphragm shall have a continuous self-cleaning feature which continuously measures the actual flow rate. Particle that could clog the dripper create back pressure and push back the diaphragm to continuously clean and flush particles from the regulating chamber of the diaphragm.
3. The dripper lines are to be automatically scoured (forward flushed) at a minimum of one time per month or once every prescribed number of cycles with a minimum scouring velocity of 2 feet per second at the distal end of each lateral.
 4. The drip tubing manufacturer shall provide a head loss chart for various drip tubing lateral lengths to provide for a minimum scouring velocity of 2 feet per second at the distal end of each lateral.
 5. Dripperline shall be installed along contour and in accordance to manufacturer's requirements.
 6. Drip tubing shall be connected to header lines with special connectors provided by manufacturer to provided water tight connection.
 7. Drip tubing is to be connected to PVC with appropriate fittings

2.8 SYSTEM OPERATION

- A. Time Dosing
 1. The System shall utilize a time dosing technique via the automatic controller.
 2. The System shall utilize level sensing devices (standard mechanical differential float switches) located in a dosing tank downstream from the pretreatment process.
 3. When activated by the rising level of effluent in the dosing tank, the controller shall enable the disposal cycle, and as dictated by the controller, pump the effluent through 115 micron disc filters and then to final drip dispersal.
 4. The pump control panel shall be equipped with four float switches to control the timed doses to be discharged.
 5. The four float switches, "Redundant Off", "Standard Dose Enable", "Peak/Level Indicator" and "High Level" shall function as follows:
 - a. Redundant Off - The water level must be high enough to overcome the "Redundant Off" (first & bottom) float in order for the pump to be permitted to run in automatic mode.
 - b. Standard Dose Enable - When the water level rises high enough to overcome the "Standard Dose Enable" (second) float and the time clock has timed out the preset time delay (rest time between dosing cycles), the pump will activate and the lead zone(s) is dosed. The pump will continue to run for the length of time required to disperse of the specified dose volume and then shut off. The pump will remain off until the internal time clock again times out the preset time delay

which the pump will activate (as long as the "Standard Dose Enable" float is still up) and will run again until the specified volume is pumped. This process will repeat until the water level drops below the "Standard Dose Enable" float and the pump run timer has timed out.

- c. Peak / Level Indicator - Used to decrease rest time between doses.
 - d. High Level - If the water level rises enough to overcome the "High Level" (fourth) float, the audiovisual alarm will activate (if applicable). The audio portion of the alarm may be silenced by pressing the Test-Normal-Silence switch to the silence position.
- B. Automatic Disc Filtration and Backflush
1. Suction pumps (duplex) shall deliver unfiltered effluent to each of the disc filters during the normal forward filtration process.
 2. Each filter shall automatically go through a backflush cycle to clean all of the disc filters based on:
 - a. Start of each scheduled zone dose cycle and at pre set intervals time intervals.
 - b. A specified differential pressure reading between upstream and downstream of the disc filters is detected.
 3. Backflushing shall proceed as follows:
 - a. One filter valve shall close, thus blocking the flow of unfiltered effluent to that filter.
 - b. After a short delay, the other flushing valves shall open.
 - c. The clean effluent from the forward filtration filters shall be directed to the outlet manifold.
 - d. Filtered effluent from the outlet manifold shall then flow in reverse direction (in through the spine) of the filter to be backflushed and into the backflush nozzles, spinning the loosened discs and flushing the captured debris out the drain manifold.
 - e. The accumulated impurities shall discharge back into the pretreatment unit.
 - f. The backflush procedure shall last approximately fifteen to thirty seconds (or longer if necessary) then the back flushing valve shall close.
 - g. Only after the first filter has completed its backflushing cycle, will the next filter begin its cycle of backflushing in the same manner as the first until all the filters have been backflushed.
 - h. Effluent shall then be pumped through clean disc filters, then through the flow meter and finally through the outlet manifold to the drip field supply line.
- C. Forward Field Flush
1. Each drip zone shall automatically undergo a periodic "Forward Field Flush" every 15 cycles (adjustable) to scour the inside of the dripper tubing.
 2. Forward Field Flush to be accomplished by automatically opening a Zone Return valve to allow effluent to return to the head of the system after passing through the drip field.
 3. 1.6 gpm per distal lateral connection shall be provided to maintain minimum scouring velocity of 2 feet per second at the distal end of each lateral.
 4. Zones shall Forward Field Flush individually.
 5. Flushing volume to be a minimum of three times the volume of the drip tubing.

3. EXECUTION

4.1 PRECONSTRUCTION CONFERENCE

- A. A conference attended by the Owner, General Contractor, Engineer, Vendor's Representative, Operator, and others, as appropriate, shall be held to review the integration and installation requirements of the Drip Disposal System after the Submittal documentation has been approved and prior to construction.

4.2 INSTALLATION

- A. Pump/Filter and Disposal Field Zone Control Valve Manifold Equipment Skids
 1. Install according to the Contract Drawings
 2. Equipment skids shall be properly secured, leveled and plumbed
- B. System Installation
 1. Pumps, filtration rack, hydraulic unit, controls, computer, floats and valves shall be installed according to Contract Drawings and in accordance with appropriate regulations.
 2. Non-dripper piping and electrical connections shall be made in accordance with all appropriate codes and regulations.
 3. Hydraulic unit/control building shall be heated and lighted with concrete slab type floor and with a corner floor drain.
- C. Drip Tubing Installation:
 1. No wet weather installation.
 2. Prepare field location for installation.
 3. Dig header ditch for field manifold.
 4. Install all drip tubing along contour.
 5. Install at depth specified on Contract Drawings.
 6. Install drip tubing with vibratory plow.
 7. See construction notes for addition installation techniques.
 8. Install loops (flex tubing).
 9. Dig ditches for conveyance lines.
 10. Dry fit pressure lines and field manifolds.
 11. Glue all fittings and place valve boxes.
 12. Check power supply and power up unit.
 13. Provide one day volume of clean water for startup.
 14. Pressure check all fittings and lines
 15. Inspection of field and loops.
 16. Flush all fields through the air release valves.
 17. Set run time for Central Unit.
 18. Check setup values against calculated values.
 19. Find leaks and repair.
 20. Backfill once lines and fields are determined to have no leaks. Back filling is to be controlled to prevent the damaging of pipes or fittings

21. Grade and seed site.

4.3 DRIP DISPERSAL FIELD CONSTRUCTION NOTES

- A. All installation and construction techniques shall conform to the State of Vermont Indirect Discharge Rule requirements and the Indirect Discharge Permit.
- B. The installation of this system shall be in accordance with specifications and procedures as supplied by Vendor.
- C. The drip tubing shall be installed using a vibratory plow, trencher, or by hand.
- D. All PVC pipe and fittings shall be PVC SCH 40 Type 1 rated for pressure applications. All glued joints shall be cleaned and primed with purple (dyed) PVC primer prior to being glued.
- E. All cutting of PVC pipe, flexible PVC and dripper tubing of size 1 1/2" or smaller shall be accomplished with pipe cutters. No sawing of PVC, flexible PVC or dripper tubing of size 1 1/2" or smaller allowed.
- F. All PVC pipe, flexible PVC and dripper tubing in the work area shall have the ends covered with duct tape to prevent construction debris from entering the pipe. Prior to gluing, all joints shall be inspected for and cleared of any construction debris.
- G. Manual field valves (zone valves & field flush return valves) shall be installed with valve boxes for at-grade access.
- H. Drainfield supply and return lines and manifolds to be installed at adequate depth to prevent freezing. Horizontal spacing between the dripper lines and the installation depth to be as specified.
- I. No activity on drainfield area other than minimum required to install system. Do not park equipment, drive large equipment over or store materials on drain field area.
- J. No wet weather installation is permitted.
- K. All force mains shall be tested for leaks prior to drip tubing installation and prior to system startup. Uncovered force mains shall be visibly inspected for leaks. If a leak is suspected in covered force mains then the force main shall be re-tested at a minimum pressure of at least 125 percent above the design operating pressure, for at least 30 minutes. There shall be no discernible leakage.

4.4 SERVICES OF A VENDOR'S REPRESENTATIVE

- A. The equipment to be furnished and installed under this section shall require the services of competent and experienced technical representatives of the Vendor.
- B. The Vendor shall review the Contract Documents (plans and specifications), including structural and mechanical portions as well as mechanical details. All modifications must be clearly indicated on the shop drawings and shall be at Vendor's expense.
- C. The General Contractor shall arrange for the Vendor to furnish the services of a qualified representative as necessary to check and supervise the installation during construction, and to perform the initial operation and acceptance tests for not less than two (2) 8-hour days onsite. A written report covering the representative's findings and installation approval shall be provided directly to the General Contractor and the Engineer covering all inspections and outlining in detail and deficiencies noted.

- D. Failure of Functional or Performance Test: In the event the equipment specified herein proved to be in noncompliance with the functional or performance requirements specified, the Vendor shall bear all costs for the satisfactory repair, replacement, and additional testing necessary to meet the specified requirements.
- E. Services During Performance Testing and Plant Startup: Plant startup services are required for all equipment specified under this section. Also, when technical assistance is necessary due to any malfunction of the equipment furnished, the Vendor's representative shall provide such services. The Vendor's representative shall also conduct and/or assist the final performance and demonstration testing. These services shall continue until such times as the applicable equipment has been successfully performance tested and has been accepted by the Owner for full-time operations.
- F. Training of Owner's Personnel: The Vendor's representative shall provide detailed instruction to the Owner's personnel for operation of the specified equipment for a minimum of one (1) 8-hour day onsite and (1) 8-hr day three months after substantial completion. These training services shall include pre-startup and onsite equipment instruction and/or post-startup and onsite equipment instruction. The Owner reserves the right to video tape the operator training session for instructional use.

END OF SECTION

SECTION 468000

PUMPS

1. GENERAL

1.1 CONTRACT DOCUMENTS

- A. Attention shall be directed to the General Conditions for the definition of the Contract Documents. This division of these Specifications is a part of the Contract Documents as defined in the General Conditions. All applicable parts of the balance of the Contract Documents are equally as binding for this Section as for all other parts of these Specifications.

1.2 WORK INCLUDES

- A. Furnish all labor, materials, equipment, and incidentals required to furnish and install all effluent pumps as specified herein and as shown on the Contract Drawings.
- B. Effluent pumps shall be used for the following services:
 - 1. Pump station effluent pumps.

1.3 RELATED SECTIONS

- A. The following items appurtenant to this work are specified under other sections of these specifications and are mentioned here for cross reference purposes only.
 - 1. Specification Section 014523 – Testing and Results Expected.
 - 2. Specification Section 034100 – Precast Concrete Structures.
 - 3. Specification Section 310000 – Earthwork.

1.4 SUBMITTALS AND CERTIFICATIONS

- A. Shop drawings and manufacturer's Certificates of Compliance shall be furnished for all effluent pumps and any other items in this Section of work.
- B. Operations and Maintenance Manual: The Manufacturer shall submit five (5) copies and one (1) searchable and bookmarked electronic .pdf copy of O&M manuals for all equipment and systems furnished under this specification. The manuals shall be written specifically for this project and shall include detailed process operating instructions, start-up and shutdown procedures, process control and troubleshooting procedures, emergency procedures and all necessary safety precautions. The O&M manual shall be complete in all respects for all equipment, controls, accessories and associated appurtenances supplied under this Section, but not limited to the following:
 - 1. Diagrams and illustrations.
 - 2. Detailed description of the function of each principal component of the system.
 - 3. Installation instructions.

4. Procedure for starting.
5. Proper adjustment.
6. Test procedures.
7. Procedure for operating.
8. Shutdown instructions.
9. Electrical.
10. Emergency operating instructions and troubleshooting guide.
11. Safety precautions.
12. Maintenance and overhaul instructions which shall include detailed assembly drawings with part numbers, parts list, instructions for ordering spare parts, and complete preventive maintenance instructions required to ensure satisfactory performance and longevity of the equipment.
13. All other pertinent data, information and recommendations included in the manufacturer's O&M manuals.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Exercise care in transporting and handling to avoid damage to the effluent pumps.
- B. Store materials onsite in enclosures or under protective coverings per Manufacturer's recommendations.

1.6 QUALITY ASSURANCE

- A. All equipment under this Section shall be furnished by a single supplier.

1.7 WARRANTY

- A. The General Contractor shall obtain, from the Manufacturer and furnish to the Owner, a Manufacturer's five (5) year warranty for the effluent pumps. The warranty shall cover all necessary labor, equipment and replacement parts resulting from faulty or inadequate design, improper assembly or erection, defective workmanship and materials, leakage, breakage or other failure for all equipment and components furnished by the manufacturer. The warranty period shall commence on the date of the Engineer's Certificate of Substantial Completion. The Owner shall incur no labor or equipment cost during the warranty period.

3. PRODUCTS

2.1 GENERAL

- A. Filtered pumping system shall be an integrated packaged design for use in concrete pump stations.
- B. Each pump station shall have a filtered pumping system including a filter, duplex pumps, discharge assembly, float switches, and a splice box.
- C. All pump stations shall use duplex (2-pump) pumping systems for redundancy.

- D. The pump(s) shall be designed for removal without removing the filter and float switches.
- E. The pump(s) must consist of a motor, a liquid end, and an electrical cable and must be repairable (by replacing impellers and/or diffusers), serviceable, and cleanable.
- F. The pump(s) shall be lightweight for easy removal and maintenance without removing the filter or float switches.
- G. Effluent filters shall be Biotube® Effluent Filter as manufactured by Orenco Systems, Inc., Sutherlin, Oregon or approved equal.

2.2 FILTERED PUMPING SYSTEM

- A. Filter:
 - 1. General:
 - a. A flow inducer attached to the vault shall accept one or two high-head effluent pumps.
 - b. A multitube filter cartridge, consisting of thirty-five (35) 1/8inch mesh polypropylene tubes, shall be housed inside the polyethylene vault.
 - c. The filter shall have a minimum effective screen area of no less than 19.7ft² and a filter flow area of no less than 5.9ft².
 - 2. Pump Station 1 (PS-1)
 - a. Filter shall consist of a 12-inch diameter Polyethylene vault 156-inches tall with eight (8) 2-inch inlet holes evenly spaced around the perimeter located at a distance of 25-inches from bottom of vault to invert of inlet holes.
 - 3. Pump Station 2 (PS-2)
 - a. Filter shall consist of a 12-inch diameter Polyethylene vault 132-inches tall with eight (8) 2-inch inlet holes evenly spaced around the perimeter located at a distance of 25-inches from bottom of vault to invert of inlet holes.
- B. Effluent Pumps:
 - 1. General:
 - a. Pumps shall be UL and CSA listed for use with effluent.
 - b. The pump intake screen shall be 1/8in (3.2mm) mesh polypropylene.
 - c. The pump shall have a 1/8in (3.2mm) bypass orifice to ensure flow circulation for motor cooling and to prevent air bind.
 - d. The pump shall have internal thermal overload protection and internal lightning protection.
 - e. The pump shall be lightweight for easy removal and maintenance.
 - f. The pump must have a minimum 24hr run-dry capability without water lubrication while submerged in water.
 - g. The pump shall have a floating impeller design to protect against upthrust and to increase pump life.

- a. Splice box shall be UL approved for wet locations, equipped with up to four (4) electrical cord grips and two (2) 3/4in (19mm) outlet fittings.
- b. UL-listed, waterproof butt-splice connectors shall be used.
- c. The use of a UL-approved conduit seal kit, accessible above ground, shall be required to prevent the passage of gases, vapors, or flames through the conduit to the control panel.
- d. An additional UL-classified sealant shall be added to the splice box coupling to prevent condensation accumulation in the splice box. The following UL-approved sealants shall be used:
 - i. UL-classified moisture-cure polyurethane quick-drying foam or Engineer-approved equal with an R-value of 5 (RSI 0.88) rating per inch (25mm) of foam.
 - ii. UL-classified silicone sealant or Engineer-approved equal consisting of a neutral-cure, non-acetic, noncorrosive silicone capable of withstanding temperatures to 450°F (232°C).

2.3 CONTROL PANEL

- A. Controls and alarms shall be listed per UL 508. Panels shall be repairable in the field without the use of soldering irons or need for substantial disassembly.
- B. Control panel shall have SCADA capabilities which requires cellular access with static IP addressing. Panel is required to allow real-time connectivity with the control panel web page and alarm communications. Phone dialers shall not be considered as an equivalent.
- C. Panel shall be a telemetry control panel or Engineer-approved equal, and shall be capable of the following:
 1. Data collection and utilization: logs data for system conditions and events such as daily flows, pump run time, pump cycles, and alarm conditions. Logs shall store data for at least a year.
 2. Downloadable logs: download logs into a *.dif or ASCII format for simple conversion to common spreadsheet or word processor programs.
 3. Multi-level password security: only qualified personnel can remotely access site.
 4. Programmed logic to meet the required functionality for a fully operational system and remote capable for changes and updates to firmware or programming.
 5. Program rules to be written based on several operands, including the following:
 - a. Input/output status
 - b. Point status
 - c. Date: mm/dd/yy format
 - d. Time of day: 24-hour clock
 - e. Timers
 - f. Historical data (allows for control optimization or detection of trends)
 6. Scheduling functions to control digital "points" based on date or day of week/time.
 7. Automatic daylight savings time adjustment.
 8. Email function with automatic call-out to at least 16 unique mailboxes.
 9. Collecting data and detecting trends that could lead to system failure.

- D. In addition, the unit shall have the capability of real-time direct connection to the panel via laptop serial port, to allow the operator real-time access to detailed logged data and the ability to change point values.
1. Standard components must include at a minimum:
 - a. Motor-start contactor: 18A, 3-phase, 1-1.5hp (0.75-1.1kW), 50/60Hz; 2.5 million cycles at FLA (5 million at 50% of FLA for 230VAC).
 - b. HOA 3-way toggle switches: single-pole switch, Hand (manual) Off, Auto (on).
 - c. Controls circuit breaker: 10A, OFF/ON switch. Single-pole 120VAC. DIN rail mounting with thermal magnetic tripping characteristics.
 - d. Pump circuit breaker: 20A, OFF/ON switch. Single-pole for 120VAC or double-pole for 230VAC. DIN rail mounting with thermal magnetic tripping characteristics.
 - e. Audio alarm: 95dB at 24in (610mm), warble-tone sound.
 - f. Ground fault interrupter (GFI): 120VAC, 15A.
 - g. Current sensor: 24VDC, 4-20mA with adjustable high and low alarm set points.
 - h. Visual alarm: 22mm pushbutton with red lens, "push-to-silence." Must maintain UL Type 4X rating, LED bulb, 115VAC.
 - i. Panel enclosure: UL Type 4X rated (NEMA rating not acceptable) constructed of UV-resistant fiberglass or UL Type 4 rated (NEMA rating not acceptable), constructed of steel; hinges and latch must be stainless steel.
 - j. Remote telemetry unit: telemetry controller; required for system input/output (I/O) to be fully supported plus 10% spare; self, 24VDC power supply for all calculated needs plus 25%; 16 digital I/O expandable as necessary; minimum 16 analog inputs expandable as necessary. On-board Ethernet port (10 base T, RJ45jack) and Modbus port (RS422/485 terminals). Non-volatile memory backup of programming, lithium battery backup of data and program settings for a minimum of 1 year without power.
 - k. Industrial 4B Cellular Router
 - l. Omni Directional LTE/4G High Gain Cell Antenna
 - m. Local touchscreen display: must connect to the controller via Ethernet, bright 16-bit colors, high definition TFT analog resistance touchscreen, 32-bit RISC CPU, 400MHz with 128M Flash DRAM, 10.1in (257mm); or Engineer-approved equal.
 - n. Industrial Ethernet switch: managed with at least 5 ports, 10/100 Base-T, 10-30VDC power input.
 - o. Surge arrestor: Type 1 surge protective device, rated for 36kA per phase, UL listed.
 - p. Anti-condensation heater: Must be self-adjusting or thermostat controlled, wattage as required to maintain minimum temperature inside the panel to prevent condensation.
 - q. 500VA Uninterruptible Power Supply

3. EXECUTION

3.1 INSTALLATION

- A. Filtered pump system and pump station control panels shall be installed per Manufacturer's instructions and as directed herein and on the Contract Drawings.

- B. Pump station control panels shall be installed per Manufacturer's instructions and as directed herein and on the Contract Drawings.

3.2 INSPECTIONS AND TESTS

- A. Inspector shall inspect and certify that installation of each filtered pump system is in compliance with this Section and the Manufacturer's recommendations and requirements.
- B. All pumps shall undergo 3-point (dead head, design flow, and design flow + 50%) wet testing at the factory to confirm performance.

3.3 SERVICES OF MANUFACTURER'S REPRESENTATIVE

- A. The Manufacturer or Manufacturer's Representative shall provide the services of a factory-certified representative for training the Owner's service provider and inspecting the effluent filter installation.
- B. The Manufacturer's Representative shall provide the services of a trained representative to instruct the installing Contractor's crew regarding the proper installation and field testing of each component per the Manufacturer's recommendations and requirements for a minimum of one (1) eight-hour day at the beginning of construction.
- C. The Manufacturer's Representative shall inspect and the initial installation of the pumps and shall perform or direct the General Contractor to perform any required adjustments to the equipment required to place it into operation. A written, signed inspection report shall be furnished prior to system commissioning.
- D. Failure of Functional or Performance Test: In the event the equipment specified herein proves to be in noncompliance with the functional or performance requirements specified, the General Contractor shall bear all costs for the satisfactory repair, replacement, and additional testing necessary to meet the specified requirements.
- E. The Manufacturer's Representative shall provide the services of a trained representative for a minimum of one (1) eight-hour day for the purpose of system commissioning.
- F. Upon system commissioning, the Manufacturer's or Manufacturer's Representative's trained representative shall provide the Engineer a written report of findings. The Engineer shall then perform or direct the General Contractor to perform any required adjustments to the equipment and place it into operation. All equipment and materials required to perform additional testing shall be the responsibility of the General Contractor. The Manufacturer shall submit to the Engineer and Owner a detailed start-up checklist according to the Manufacturer's inspection and start-up procedures.
- G. The Manufacturer's Representative shall provide detailed instruction to the Owner's personnel for operation of the specified equipment for a minimum of one (1) 8-hour day

onsite. These training services shall include pre-startup and onsite equipment instruction and/or post-startup and onsite equipment instruction. The Owner reserves the right to video tape the operator training session for instructional use.

- H. During the first full year of operation, the Owner shall provide all testing results and a list of maintenance activities to the Manufacturer each month. The Manufacturer shall review results and provide feedback on operating parameters, equipment performance, and maintenance activities.
- I. At the end of the first year of operation, if requested by the Owner, the Manufacturer or Manufacturer's Representative shall commit to a site visit to assess equipment integrity and operational and maintenance processes, and to address issues raised by the Owner specific to the filtered pump systems.

END OF SECTION