

Project Manual

Intervale Lift Station Rehabilitation

Alleghany County, VA
Final Design Submission

Project number: 60769976

May 2026



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DOCUMENT 001116 - INVITATION TO BID

1.1 PROJECT INFORMATION

- A. Notice to Bidders: Qualified bidders may submit bids for project as described in this Document. Submit bids according to the Instructions to Bidders.
- A. Project Identification: Intervale Lift Station Rehabilitation.
 - 1. Project Location:
Intervale Lift Station
2277 Evergreen Rd, Covington, Virginia 24426
- B. Owner: Alleghany County, Virginia.
 - 1. Owner's Representative: Rob Fridley, County Utility Operations Manager
- C. Architect:
AECOM
10 S. Jefferson St., Suite 1600, Roanoke, Virginia 24011
- D. Project Description: Project consists of demolition of the existing Intervale Lift Station building, demolition and replacement of the stand-by generator and appurtenances; removal and replacement of existing pumps, controls and appurtenances; and construction of a new composite wood-framed platform.
- E. Construction Contract: Bids will be received for the following Work:
 - 1. General Contract (all trades).

1.2 BID SUBMITTAL AND OPENING

- A. Owner will receive sealed lump sum bids until the bid time and date at the location given below. Owner will consider bids prepared in compliance with the Instructions to Bidders issued by Owner, and delivered as follows:
 - 1. Bid Date: June 25, 2026
 - 2. Bid Time: 2:00 p.m. by clock on the wall of the Location.
 - 3. Location: Office of the County Administrator, Suite A, Alleghany County Governmental Complex, 9212 Winterberry Avenue, Covington, Virginia 24426.
 - 4. Bids will also be received electronically online at www.trascoplanroom.com, until 2:00 p.m., local prevailing time, on, and then publicly opened and read aloud virtually. Contact Owner Representative for the link to the virtual bid opening.
- B. Bids will be thereafter publicly opened and read aloud.
- C. BID SECURITY

1. Bid security shall be submitted with each bid in the amount of 10 percent of the bid amount. No bids may be withdrawn for a period of 60 days after opening of bids. Owner reserves the right to reject any and all bids and to waive informalities and irregularities.

1.3 PREBID MEETING

- A. Prebid Meeting: See Document 002513 "Prebid Meetings."
- B. Prebid Meeting: A non-mandatory Prebid meeting will be held at the Project Site on June 2, 2026 at 10:30 AM local time.
 1. Provide responses to bidders' questions received up to 5:00 pm on J u n e 5 ,2026 Bidder questions shall be submitted using the Pre-Bid Question Form attached at the end of this document.

1.4 DOCUMENTS

- A. Viewing Procurement and Contracting Documents: Examine online at the location below:
 1. eVA Virginia's eProcurement Portal.
 2. Alleghany County, Virginia website at www.co.alleghany.va.us.
 3. TRASCO's website at www.trascoplanroom.com.

1.5 TIME OF COMPLETION

- A. Successful bidder shall begin the Work on receipt of the Notice to Proceed and shall complete the Work within 180 days. Work is subject to liquidated damages.

1.6 BIDDER'S QUALIFICATIONS

- A. Bidders must be properly licensed under the laws governing their respective trades and be able to obtain insurance and bonds required for the Work. A Performance Bond in the amount of 100 percent of the contract amount and separate Labor and Material Payment Bond in the amount of 100 percent of the contract amount will be required of the successful Bidder. Insurance in a form acceptable to Owner will be required of the successful Bidder.

1.7 NOTIFICATION

- A. This Invitation to Bid document is issued, Beverly Bowers, Deputy Director Alleghany County, Virginia.

END OF DOCUMENT 001116

PREBID QUESTION FORM

DATE: _____

PROJECT: Intervale Lift Station Rehabilitation, Covington, Virginia

DURING BIDDING, WRITTEN (NOT ORAL) COMMENTS CONCERNING CONFLICTS (ERRORS, INCONSISTENCIES, OR OMISSIONS) IN THE CONTRACT DOCUMENTS SHALL BE SUBMITTED ON THIS FORM. CONFLICTS WILL BE RESOLVED ONLY BY WRITTEN ADDENDA. ARCHITECT-ENGINEER WILL NOT RECEIVE OR RESPOND TO QUESTIONS OTHER THAN WRITTEN COMMENTS CONCERNING CONFLICTS.

THE FOLLOWING CONCERNS DRAWING _____:

THE FOLLOWING CONCERNS PROJECT MANUAL,

SECTION _____, **PARAGRAPH** _____, **PAGE** _____:

SUBMITTED BY: _____

Name

Phone

Organization

ATTENTION: Beverly Bowers, Deputy Director, Alleghany County

EMAIL:

DOCUMENT 002513 - PREBID MEETINGS

1.1 PREBID MEETING

- A. Owner or Architect will conduct a Prebid meeting as indicated below:
 - 1. Meeting Date: June 2, 2026.
 - 2. Meeting Time: 10:30 a.m., local time.
 - 3. Location: Project Site.

- B. Attendance:
 - 1. Prime Bidders: Attendance at Prebid meeting is non-mandatory, but recommended.
 - 2. Subcontractors: Attendance at Prebid meeting is recommended.

- C. Bidder Questions: Owner or Architect will provide responses to bidders' questions received up to 5:00 pm on June 5, 2026.

- D. Agenda: Prebid meeting agenda will include review of topics that may affect proper preparation and submittal of bids, including the following:
 - 1. Procurement and Contracting Requirements:
 - a. Instructions to Bidders.
 - b. Bonding.
 - c. Insurance.
 - d. Bid Security.
 - e. Bid Form and Attachments.
 - f. Unit Prices Form.
 - g. Bid Submittal Requirements.
 - h. Notice of Award.

 - 2. Communication during Bidding Period:
 - a. Bidder's Pre-bid Questions.
 - b. Bidder's Substitution Request/Prior Approval Request.
 - c. Addenda.

 - 3. Contracting Requirements:
 - a. Agreement.
 - b. The General Conditions.
 - c. Other Owner requirements.

 - 4. Construction Documents:
 - a. Scopes of Work.
 - b. Temporary Facilities.
 - c. Use of Site.

- d. No Work Restrictions.
- 5. Schedule:
 - a. Project Schedule.
 - b. Contract Time (180 days).
 - c. Other Bidder Questions.
- 6. Site/facility visit or walkthrough.
- 7. Post-Meeting Addendum.
- E. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes to attendees. Minutes of meeting are issued as Available Information and do not constitute a modification to the Procurement and Contracting Documents. Modifications to the Procurement and Contracting Documents are issued by written Addendum only.
 - 1. Sign-in Sheet: Minutes will include list of meeting attendees.

END OF DOCUMENT 002513

DOCUMENT 003119 - EXISTING CONDITION INFORMATION

1.1 EXISTING CONDITION INFORMATION

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of the Bidders' own investigations. They are made available for Bidders' convenience and information but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.
- B. Existing drawings available for viewing.

END OF DOCUMENT 003119

DOCUMENT 003143 - PERMIT APPLICATION

1.1 PERMIT APPLICATION INFORMATION

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of the Bidders' own investigations. This Document and its attachments are not part of the Contract Documents.
- B. Permit Application: Building demolition permit application and file with authorities having jurisdiction, Alleghany County, within five days of the Notice to Proceed.

END OF DOCUMENT 003143

DOCUMENT 004113 - BID FORM - STIPULATED SUM (SINGLE-PRIME CONTRACT)

1.1 BID INFORMATION

- A. Bidder: _____.
- B. Project Name: Intervale Lift Station Rehabilitation
- C. Project Location: Covington, Virginia.
- D. Owner: Alleghany County, Virginia.
- E. Engineer: AECOM.
- F. Engineer Project Number: 60769976.

1.2 BASE BID

- A. Base Bid, Single-Prime (All Trades) Contract: The undersigned Bidder, having carefully examined the Procurement and Contracting Requirements, Conditions of the Contract, Drawings, Specifications, and all subsequent Addenda, as prepared by AECOM and Engineer’s consultants, having visited the site, and being familiar with all conditions and requirements of the Work, hereby agrees to furnish all material, labor, equipment and services necessary to complete the construction of the above-named project, according to the requirements of the Procurement and Contracting Documents, for the stipulated sum of:

1. _____ Dollars (\$_____).

1.3 BID GUARANTEE

- A. The undersigned Bidder agrees to execute a contract for this Work in the above amount and to furnish surety as specified within 15 days after a written Notice of Award, if offered within 60 days after receipt of bids, and on failure to do so agrees to forfeit to Owner the attached bid bond, as liquidated damages for such failure, in the following amount constituting ten percent (10%) of the Base Bid amount above:

1. _____ Dollars (\$_____).

- B. In the event Owner does not offer Notice of Award within the time limits stated above, Owner will return to the bid bond.

1.4 TIME OF COMPLETION

- A. The undersigned Bidder proposes and agrees hereby to commence the Work of the Contract Documents on a date specified in a written Notice to Proceed to be issued by the Owner or Engineer shall substantially complete the Work within 180 calendar days.

1.5 ACKNOWLEDGMENT OF ADDENDA

- A. The undersigned Bidder acknowledges receipt of and use of the following Addenda in the preparation of this Bid:
 - 1. Addendum No. 1, dated _____.
 - 2. Addendum No. 2, dated _____.
 - 3. Addendum No. 3, dated _____.

1.6 CONTRACTOR'S LICENSE

- A. The undersigned further states that it is a duly licensed contractor, for the type of work proposed, in Alleghany County, Virginia, and that all fees, permits, etc., pursuant to submitting this proposal have been paid in full.

1.7 BID SUPPLEMENTS

- A. The following supplements are a part of this Bid Form and are attached hereto. Document 004322 "Unit Prices Form".

1.8 SUBMISSION OF BID

- A. Respectfully submitted this ____ day of _____, 2025.
- B. Submitted By: _____ (Name of bidding firm or corporation).
- C. Authorized Signature: _____ (Handwritten signature).
- D. Signed By: _____ (Type or print name).
- E. Title: _____ (Owner/Partner/President/Vice President).
- F. Witnessed By: _____ (Handwritten signature).
- G. Attest: _____ (Handwritten signature).
- H. By: _____ (Type or print name).
- I. Title: _____ (Corporate Secretary or Assistant Secretary).
- J. Street Address: _____.
- K. City, State, Zip: _____.
- L. Phone: _____.
- M. License No.: _____.
- N. Federal ID No.: _____ (Affix Corporate Seal Here).

END OF DOCUMENT 004113

DOCUMENT 004322 - UNIT PRICES FORM

1.1 BID INFORMATION

- A. Bidder: _____.
- B. Project Name: Intervale Lift Station Rehabilitation
- C. Project Location: Covington, Virginia
- D. Owner: Alleghany County, Virginia
- E. Engineer: AECOM
- F. Engineer Project Number: 60769976

1.2 BID FORM SUPPLEMENT

- A. This form is required to be attached to the Bid Form.
- B. If the unit price does not affect the Work of this Contract, the Bidder shall indicate "NOT APPLICABLE."

1.3 UNIT PRICES

- A. Unit-Price No. 1: Trench Rock Excavation (notify Owner, or Owner's Agent, to agree upon quantity prior to removal).
 - 1. _____ dollars (\$) per CY.

1.4 SUBMISSION OF BID SUPPLEMENT

- A. Respectfully submitted this ____ day of _____, 2026.
- B. Submitted By: _____ (Insert name of bidding firm or corporation).
- C. Authorized Signature: _____ (Handwritten signature).
- D. Signed By: _____ (Type or print name).
- E. Title: _____ (Owner/Partner/President/Vice President).

END OF DOCUMENT 004322

SECTION 006000 - PROJECT FORMS

1.1 FORM OF CONTRACT AGREEMENT AND GENERAL CONDITIONS

- A. The following form of Owner/Contractor Contract Agreement and form of the General Conditions shall be used for Project:
1. Alleghany County, Virginia County-Contractor Agreement attached to the end of this section.
 2. Alleghany County, Virginia General Conditions attached to the end of this section.
 3. **The Alleghany County, Virginia General Conditions located in the Alleghany County, Virginia County-Contractor Agreement will supersede Division 01 - General Requirements should there be a conflict between the two.**

END OF SECTION 006000



COUNTY-CONTRACTOR AGREEMENT

THIS AGREEMENT for Intervale Lift Station Rehabilitation, herein after referred to as the “Project”, executed in three (3) originals, effective this ____ day of _____, 2026, is made by and between **ALLEGHANY COUNTY, VIRGINIA**, a political subdivision of the Commonwealth of Virginia (hereinafter referred to as the “County”), and _____, (hereinafter referred to as the “Contractor”).

In consideration of the promises made herein and other good and valuable consideration, the following terms and conditions are hereby agreed to between the County and the Contractor.

This Agreement consists of and incorporates by reference the following attachments:

- Attachment 1: The County’s [Invitation to Bid/Request for Proposal] No. _____, dated _____, 2026, including any addenda.
- Attachment 2: The Contract Plans, Specifications and Alleghany County General Conditions for the Construction Contract, including any addenda.
- Attachment 3: The Contractors [bid/proposal], dated _____, 2026.

In the event that Attachment 3 contradicts or limits this Agreement or Attachments 1 and 2, this Agreement and Attachments 1 and 2 shall prevail.

ARTICLE 1 ARCHITECT/ENGINEER

- 1.1 The Architect/Engineer (hereinafter referred to as the “A/E”) shall be AECOM, whose address is 10 S. Jefferson St., Suite 1600, Roanoke, Virginia 24011. Provided, however, that the County may, without liability to the Contractor, unilaterally amend this Article from time to time by designating a different person or organization to act as its A/E and so advising the Contractor in writing, at which time the person or organization so designated shall be the A/E for purposes of this Contract.

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ARTICLE 2

TIME OF COMMENCEMENT AND COMPLETION

- 2.1 The Contractor shall commence the Work upon the date established in the Notice to Proceed. Notice to Proceed will be issued as defined in Article 8.0 of the General Conditions.
- 2.2 Time is of the essence in this Agreement.
- 2.3 The Contractor shall achieve Substantial Completion, as defined in the General Conditions, no later than 180 calendar days after the effective date of the Notice to Proceed. This time period shall be designated the Contract Time.
- 2.4 The Contractor shall also complete the following activities of Work within the interim Milestone dates indicated, as applicable:

ACTIVITY

DATE

Substantial Completion	<u>150</u> Calendar Days after Notice to Proceed
------------------------	---

Completion of all punch list work	30 Calendar Days after Substantial Completion
-----------------------------------	--

- 2.5 The liquidated damages incurred by the County due to the Contractor's failure to complete the Work within the Contract Time, including any extensions thereof, and each Milestone designated in Article 2.4 above, within the applicable interim Milestone date, shall be as hereinafter stated.

MILESTONE

LIQUIDATED DAMAGES

Substantial Completion of Project	\$25.00 per day
-----------------------------------	-----------------

Completion of all punch list work	\$50 for each consecutive calendar day late
-----------------------------------	---

- 2.6 If liquidated damages are assessed, the County will assess the amount of liquidated damages set forth in Article 2.5 above cumulatively. This provision for liquidated damages does not bar the County's right to enforce other rights and remedies against Contractor, which are otherwise legally enforceable, including but not limited to, specific performance or injunctive relief.

- 2.7 The Contractor hereby waives any defense as to the validity of any liquidated damages states in this Agreement as they may appear on grounds that such liquidated damages are void as penalties or are not reasonably related to actual damages.

ARTICLE 3 CONTRACT SUM

- 3.1 Provided that the Contractor shall strictly and completely perform all of its obligations under the Contract Documents, and subject only to additions and deductions by Modification or as otherwise provided in the Contract Documents, the County shall pay the Contractor, in current funds and at the times and in the installments hereinafter specified, the sum of _____ Dollars (\$_____) (hereinafter referred to as the "Contract Sum").

ARTICLE 4 PROGRESS PAYMENTS

- 4.1 The Contractor shall provide a Payment Schedule as referred to in Section 9.6.3 of the General Conditions.
- 4.2 The Contractor hereby agrees that on or about the first day of the month for every month during the performance of the Work he will deliver to the A/E a Pay Request Application in accordance with the provisions of Article 9 of the General Conditions. This date may be changed upon mutual agreement, stated in writing, between the County and Contractor. Payment under this Contract shall be made as provided in the General Conditions.
- 4.3 An acceptable Critical Path Method (CPM) Schedule Update shall be submitted in conjunction with each Progress Payment. Failure to provide an acceptable CPM Schedule Update will result in the rejection of the Progress Payment, and no Payment will be made until such time as an acceptable CPM Schedule Update is received.

ARTICLE 5 OTHER REQUIREMENTS

- 5.1 The Contractor shall submit the Performance Bond, Labor and Material Payment Bond, Guarantee or Warranty Bond (as described in Section 9.8.5.2 of the General Conditions) and Certification of Insurance as required by the Contract Documents.
- 5.2 To the extent required by the Commonwealth of Virginia (*see e.g.* Sec. 54.1-1100 *et seq.* of the Code of Virginia) or Alleghany County, the Contractor shall be duly licensed to perform the services required to be delivered pursuant to this Agreement.
- 5.3 A Contractor organized as a stock or non-stock corporation, limited liability company, business trust, or limited partnership or registered as a registered limited liability partnership shall be authorized to transact business in the Commonwealth as a domestic or foreign business entity if so required by Title 13.1 or Title 50 of the Code of Virginia or as otherwise required by law. Any business entity described herein that enters into an Agreement with the with the County pursuant to the Virginia Public Procurement Act (VA Code §2.2-4300 *et seq.*)

Final document will be reviewed by Alleghany County's attorney

shall not allow its existence to lapse or its certificate of authority or registration to transact business in the Commonwealth, if so required under Title 13.1 or Title 50 of the Code of Virginia, to be revoked or cancelled at any time during the term of the Agreement. The County may void any Agreement with a business entity if the business entity fails to remain in compliance with the provisions of this section.

ARTICLE 6 IMMIGRATION REFORM AND CONTROL ACT OF 1986

- 6.1 By entering this Agreement, the Contractor certifies that it does not and will not during the performance of this Agreement violate the provisions of the Federal Immigration Reform and Control Act of 1986, which prohibits employment of illegal aliens.

ARTICLE 7 ENTIRE AGREEMENT AND SEVERABILITY

- 7.1 This Agreement represents the entire and integrated agreement between the parties hereto and supersedes all prior negotiations, representations, or agreements, either written or oral. The Agreement may be amended or changed only by an Amendment or Modification. Nothing contained in the Contract Documents shall create any Contractual relationship between the County, or any agent, consultant, or independent Contractor employed by the County and any subcontractor, sub-subcontractor, supplier or vendor of the Contractor, but the County shall be entitled to performance of all obligations intended for his benefit, and to enforcement thereof.
- 7.2 In the event that any provision of this Agreement shall be adjudged or decreed to be invalid by a court of competent jurisdiction, such ruling shall not invalidate the entire Agreement, but shall pertain only to the provision in question and the remaining provisions shall continue to be valid, binding, and in full force and effect.

ARTICLE 8 GOVERNING LAW/FORUM

- 8.1 This Agreement shall be governed and construed in all respects by its terms and by the laws of the Commonwealth of Virginia, without giving effect to its conflicts of laws provisions. Any judicial action shall be filed in the Commonwealth of Virginia, Alleghany County. Contractor expressly waives any objection to venue or jurisdiction of the Alleghany County Circuit Court, Alleghany County, Virginia. Contractor expressly consents to waiver of service of process in an action pending in the Alleghany County Circuit Court pursuant to Section 8.01-286.1 of the Code of Virginia (1950, as amended).

ARTICLE 9 COUNTERPARTS

Final document will be reviewed by Alleghany County's attorney

9.1 This Agreement and any amendments or renewals hereto may be executed in a number of counterparts, and each counterpart signature, when taken with the other counterpart signatures, is treated as if executed upon one original of this Agreement or any amendment or renewal. A signature by any party to this Agreement provided by facsimile or electronic mail is binding upon that party as if it were the original.

Witness the following signatures:

ALLEGHANY COUNTY, VIRGINIA

9212 Winterberry Avenue

Covington, VA 24426

Phone: (540) 863-6600

Fax: (540) 863-6606

CONTRACTOR

Phone:

Fax:

By: _____

By: _____

Name: _____

Name: _____

Title: _____

Title: _____

Date: _____

Date: _____

APPROVED AS TO FORM:

County Attorney

**ALLEGHANY COUNTY, VIRGINIA
GENERAL CONDITIONS**

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ARTICLE 1: CONTRACT DOCUMENTS

1.1 DEFINITIONS

1.1.1 CONTRACT DOCUMENTS:

The Contract Documents include the County-Contractor Agreement and its attachments: the County's [Invitation to Bid/Request for Proposal] No. ____, dated _____, 2020, attachments and any addenda, the Contractor's [bid/proposal], dated _____, 2020, the Contract Plans and Specifications and any addenda. Any soils, geotechnical or other reports, surveys and analyses which may be made available to the Contractor for review or information, are not adopted by reference into, nor are they part of the Contract Documents.

1.1.2 MODIFICATION:

A Modification is (a) a written Amendment to the Agreement signed by both parties, (b) a written Change Order signed by both parties, (c) a written Field Order or (d) a Unilateral Change Order issued by the County.

1.1.3 WORK:

The term "Work" as used herein refers to work at the site of the project, is that normally done at the location of the project and includes all plant, labor, materials, supplies, equipment and other facilities and things necessary or proper for or incidental to the carrying out and completion of this Agreement. The term "Work" shall be construed to include material suitably stored and protected.

1.1.4 PROJECT

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part.

1.1.5 FURNISH, INSTALL, PROVIDE:

The terms "Furnish" or "Install" or "Provide", unless specifically limited in context, mean: furnishing and incorporating a specific item, product or material in the work, including all necessary labor, materials, equipment to perform the work required, ready for use.

1.1.6 EXTRA WORK:

The term "Extra Work" as used herein, refers to and includes work required by the County, which, in the judgment of the County involves changes in or additions to that required by the drawings, specifications and addenda in their present form.

1.1.7 NOTICE OF AWARD:

The written notice of the acceptance of the Contractor's [bid/proposal] from the County to the Successful [Bidder/Proposer].

1.1.8 NOTICE:

The term "Notice" as used herein shall mean written notice delivered to:

If to County:

County Administrator
9212 Winterberry Avenue
Covington, Virginia 24426

If to Contractor:

With copy to:

County Attorney
415 S. College Avenue
Salem, Virginia 24153

Delivery shall be deemed to have been given when made in writing and (a) when delivered in person, or (b) on the date delivered by special courier or recognized overnight delivery service, or three (3) business days after being sent by United States mail. Facsimile copies and e-mail shall be acceptable if the original is received by special courier, recognized overnight delivery service, or United States mail within three (3) business days.

1.1.9 MISCELLANEOUS WORDS OR TERMS:

Whenever they refer to the work or its performance, “directed”, “required”, “permitted”, “ordered”, “designated”, “prescribed”, and words of like import shall imply the direction, requirements, permission, order, designation or prescription of the County and “approved”, “acceptable”, “satisfactory”, “in the judgment of” and words of like import shall mean approved by or acceptable to or satisfactory to or in the judgment of the County.

1.2 EXECUTION, CORRELATION AND INTENT OF CONTRACT DOCUMENTS

1.2.1 Three (3) originals of the County-Contractor Agreement shall be executed.

1.2.2 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work. The Contract Documents are complementary, and what is required by any one shall be as binding as if required by all. Words and abbreviations which have well-known technical or trade meanings are used in the Contract Documents in accordance with such recognized meanings.

1.2.3 Anything shown on the drawings and not mentioned in the specifications or mentioned in the specifications and not shown on the drawings shall have the same effect as if shown or mentioned respectively in both. Technical specifications take priority over general specifications and detail drawings take precedence over general drawings. Any conflict or inconsistency in the drawings shall be submitted by the Contractor to the A/E, with a copy to the County. The A/E’s decision thereon shall be final. In case of conflict or inconsistency between the drawings and the specifications, the specifications shall govern.

1.2.4 Should any labor or material be required which is not denoted in the drawings and specifications, but which is, nevertheless, reasonably necessary for the proper carrying out of the intent of the Work, it is agreed that the labor or material is implied and the Contractor shall provide such labor and furnish such materials as fully as if they were completely delineated and prescribed without additional cost to the County.

1.2.5 The Contractor may be furnished instructions and detail drawings to carry out the Work included in the Agreement. The additional drawings and instructions thus supplied to the Contractor will coordinate with the Contract Documents and will be so prepared that they can be reasonably interpreted as a part thereof. The Contractor shall carry out the Work in accordance with the additional detail drawings and instructions.

1.2.6 The drawings and specifications are divided into sections for convenience and clarity only. The Contractor shall not construe this as a division of the Work into various subcontractor units. The Contractor may subcontract the Work in such divisions as he sees fit, but he is ultimately responsible for furnishing all work shown on the drawings and in the specifications.

1.2.7 The provisions of this Agreement cannot be amended, modified, varied or waived in any respect except by a Modification. **The Contractor is hereby given notice that no person has authority to**

orally waive, or to release the Contractor from any of the Contractor's duties or obligations under or arising out of this Contract. Any waiver, approval or consent granted by Modification to the Contractor shall be limited to those matters specifically and expressly stated thereby to be waived, approved or consented to and shall not relieve the Contractor of the obligation to obtain any future waiver, approval or consent.

1.3 COUNTYSHIP AND USE OF DOCUMENTS

- 1.3.1 All drawings, specifications, and memoranda relating to the Work are the property of the County are to be used only for the Project.
- 1.3.2 The Contractor shall be furnished the number of sets of drawings and specifications, as set forth in the Contract Documents, free of charge by the County for use in construction. Additional sets of drawings and specifications may be obtained by paying the County for printing, mailing and handling charges.

ARTICLE 2: ARCHITECT/ENGINEER

2.1 DEFINITIONS

- 2.1.1 The term "Architect/Engineer", hereinafter "A/E" or "Architect" or "Engineer", shall mean the consulting firm or County agency, or their duly authorized representatives, lawfully licensed to practice in the Commonwealth of Virginia that is responsible for designing or engineering the Work, and performing the activities specified herein.
- 2.1.2 The A/E is identified in the County-Contractor Agreement and is referred to throughout the Contract Documents as if singular in number and masculine in gender. The A/E is further described as one of the following:

2.2 ARCHITECT/ENGINEER STATUS

- 2.2.1 The A/E will provide services as described in these General Conditions.
- 2.2.2 The A/E will advise and consult with the County. The County's instructions to the Contractor may be forwarded through the A/E. The A/E will have authority to act on behalf of the County only to the extent provided in the Contract Documents, unless otherwise changed by Modification.
- 2.2.3 The A/E may visit the site at intervals appropriate to the stage of construction to familiarize himself generally with the progress and quality of the Work and to determine in general if the Work is proceeding in accordance with the Contract Documents. The Contractor may not rely on the A/E to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work.
- 2.2.4 The A/E will immediately inform the County and Contractor whenever in the reasonable opinion of the A/E any of the Work is proceeding contrary to the requirements of the Contract Documents and will be unacceptable. Such notification by the A/E will not be a cause for the Contractor to claim either delay of the Work or any increase in the Contract Sum.
- 2.2.5 The A/E, the County and other governmental representatives shall at all times have access to the Work wherever it is in preparation and progress. The Contractor shall provide facilities for such access so that the A/E, the County and other governmental representatives may perform their functions under the Contract Documents.
- 2.2.6 Where applicable, based on the A/E's observations and an evaluation of the Contractor's Applications for Payment, the A/E will recommend the amounts owing to the Contractor and will issue Certificates for Payment in such amounts, as provided in Article 9 Payments and Completion.

- 2.2.7 The A/E will be an interpreter of the requirements of the plans, drawings and specifications. The A/E will render interpretations necessary for the proper execution and progress of the Work, with reasonable promptness and in accordance with any time limit agreed upon. Either party to the Agreement may make written request to the A/E for such interpretations. All interpretations of the A/E shall be consistent with the intent of and reasonably inferable from the plans, drawings and specifications and will be in writing and/or in the form of drawings.
- 2.2.8 The A/E will recommend to the County the rejection of work that does not conform to the plans, drawings and specifications. Whenever, in his opinion, he considers it necessary or advisable for the implementation of the intent of the Contract Documents, he will have authority to require special inspection or testing of the work in accordance with Subparagraph 7.6.2 whether or not such Work be then fabricated, installed or completed.
- 2.2.9 The A/E will review and approve or take other appropriate action upon Contractor's submittals such as Shop Drawings, Product Data, Samples and Manuals, but only for conformance with the design concept of the Work and with the information given in the plans, drawings and specifications. The A/E approval of a specific item shall not indicate approval of an assembly of which the item is a component.
- 2.2.10 The A/E's acceptance of materials or products on behalf of the County shall not bar future rejection of such items if they are substantially found to be defective or inferior in quality or uniformity to the materials or products specified by the Agreement, or if such items are not as represented by the Contractor.
- 2.2.11 As required, the A/E will conduct inspections to assist the County in determining the dates of Substantial Completion and Final Completion, will receive and forward to the County for the County's review written warranties and related documents required by the Agreement and assembled by the Contractor, and will recommend final Certificate for Payment upon compliance with the requirements of Article 9 Payment and Completion.
- 2.2.12 All claims, disputes or other matters or questions between the Contractor and County arising out of or related to the A/E's interpretation of the Contract Documents or any other decisions, communications or actions of the A/E arising out of or relating to the performance of the Work shall be resolved as set forth in Article 12 Changes and Modifications in the Work.
- 2.2.13 In case of the termination of the employment of the A/E, the County shall appoint a new A/E, who shall have the same status under the Contract Documents as the former A/E.

ARTICLE 3: COUNTY

3.1 DEFINITION

- 3.1.1 The County is the Board of Supervisors of Alleghany County, Virginia and is referred to throughout the Contract Documents as if singular in number and masculine in gender. The term County means the County or its authorized representative. The County Administrator is the authorized representative of the Board of Supervisors for this Agreement.
- 3.1.2 The County Administrator will designate a single County's representative, with the title of Construction Manager (CM), who will have the power to act, within the scope of his delegated authority, for and on behalf of the County, in accordance with the terms of the Agreement.

- 3.1.3 For purposes of change in the work, the term “County” or “County’s representative” specifically excludes any and all inspectors having building code or County ordinance responsibilities or jurisdiction under the requirements of the Building Permit.

3.2 INFORMATION POSSESSED BY COUNTY

- 3.2.1 The County, as a courtesy, will make available for the Contractor’s reasonable review, at the County’s offices or together with the Contract Documents, certain boring logs, geotechnical, soils and other reports, surveys and analyses pertaining to the Agreement site of which the County is aware and has in its possession. Any boring logs that are provided to the Contractor, are only intended to reflect conditions at the locations of the borings and do not necessarily reflect site conditions at other locations on the site. Any reports, surveys and analyses provided by County are for the Contractor’s information only, and their accuracy and completeness are not guaranteed or warranted by the County or the A/E, and such reports are not adopted by reference into, nor are they part of, the Contract Documents.
- 3.2.2 Notwithstanding any factual statement, conclusion or any language or recommendations contained in such reports, the Contractor assumes full responsibility for inspection of the site and for the means and methods of construction that he employs when performing the Work. The County shall not be liable for any additional work or costs arising as a result of any conclusions reached or assumptions derived by the Contractor from or based upon any such geotechnical, soils and other reports, surveys and analyses which the County makes available for the Contractor’s information and review.

3.3 COUNTY-PAID PERMITS AND FEES

- 3.3.1 The County will, where applicable, secure and pay for:
- 3.3.1.1 Electrical, natural gas, telephone, and cable TV permanent installation charges.
- 3.3.2 The Contractor’s attention is directed to Article 4.7 Contractor-Paid Taxes, Permits, Fees and Notices describing other permits to be obtained and fees to be paid by the Contractor.
- 3.3.3 The foregoing are in addition to other duties and responsibilities of the County enumerated elsewhere in the Contract Documents.

3.4 COUNTY’S RIGHT TO STOP WORK

- 3.4.1 If the Contractor fails to correct defective Work as required herein or persistently fails to carry out the Work in accordance with the Contract Documents, the County, by a written order, may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of the County to stop the Work shall not give rise to any duty on the part of the County to exercise this right for the benefit of the Contractor or any other person or entity.

3.5 COUNTY’S RIGHT TO CARRY OUT THE WORK

- 3.5.1 If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within seven (7) days after receipt of written Notice from the County to commence and continue correction of such default or neglect with diligence and promptness, the County may, without prejudice to any other remedy he may have, rectify such deficiencies as outlined in Section 6.1 County’s Right to Perform Work and to Award Separate Contracts. In such case, an appropriate Change Order shall be issued deducting from the payments then or thereafter due the Contractor the cost of correcting such deficiencies, including compensation for the A/E’s additional services made necessary by such default, neglect or failure. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the County.

- 3.5.2 Neither the County nor the A/E nor their officers, agents, assigns or employees are in any way liable or accountable to the Contractor or his surety for the method by which the work performed by the County, or at the County's direction, or any portion thereof, is accomplished or for price paid therefor. Notwithstanding the County's right to carry out a portion of the Work, maintenance and protection of the Work remains the Contractor's and Surety's responsibility as provided for in the Performance Bon and Guarantee of Contractor, pursuant, but not limited to, Article 4 Contractor and 13 Uncovering and Correction of Work.

3.6 SUSPENSION OF WORK

- 3.6.1 The County shall have the authority to suspend the Work, in whole or in part, for such periods and such reasons as the County may deem necessary or desirable, in its sole discretion, including without limitation:
- 3.6.1.1 Unsuitable weather;
 - 3.6.1.2 Other conditions considered unfavorable for the suitable prosecution of the Work; and/or
 - 3.6.1.3 Other conditions considered adverse to the best interests of the County.
- 3.6.2 Any such suspension shall be in writing to the Contractor. The Contractor shall obey immediately such orders of the County and shall not resume the Work until so ordered in writing by the County. The Contractor may be entitled to an extension of the Contract Time subject to the provisions of this Section 3.6 and Article 8 Contract Time herein.
- 3.6.3 No such suspension of the Work shall be the basis of a claim by the Contractor for any increase in the Contract Sum or for any other damages, losses, costs or expenses whatsoever provided that the suspension is for a reasonable time under the circumstances then existing or the cause thereof is beyond the control and is without the fault or negligence of the County.
- 3.6.4 In the event of suspension of Work, the Contractor will and will cause his subcontractors to protect carefully his and their materials and work against damage or injury from the weather and maintain completed and uncompleted portions of the work as required by the Contract Documents. If, in the opinion of the County any work or material shall have been damaged or injured by reason of failure on the part of the Contractor or any of his subcontractors to so protect same, such work and materials shall be removed and replaced at the expense of the Contractor.

3.7 USE AND OCCUPANCY PRIOR TO FINAL ACCEPTANCE

- 3.7.1 The County has the right to take possession of and use any completed or partially completed portions of the Work, notwithstanding that the time for completing the entire Work or any portions thereof may, or may not, have expired. The taking of possession and use by the County shall be in accordance with the provisions regarding Substantial Completion in Article 9.8 Substantial Completion and Guarantee Bond. If such prior use delays the Work, the Contractor may submit a request for a time extension in accordance with the requirements of Article 8 Contract Time.

3.8 RIGHT TO AUDIT AND PRESERVATION OF RECORDS

- 3.8.1 The Contractor shall maintain books, records and accounts of all costs in accordance with generally accepted accounting principles and practices. The County or its authorized representative shall have the right to audit the books, records and accounts of the Contractor under any of the following conditions:
- 3.8.1.1 If the Agreement is terminated for any reason in accordance with the provisions of these Contract Documents in order to arrive at equitable termination costs;

- 3.8.1.2 In the event of a disagreement between the Contractor and the County on the amount due the Contractor under the terms of this Agreement;
 - 3.8.1.3 To check or substantiate any amounts invoiced or paid which are required to reflect the costs of the Contractor, or the Contractor's efficiency or effectiveness under this Agreement or in connection with extras, changes, claims, additions, back charges, or other, as may be provided for in this Agreement; and/or
 - 3.8.1.4 If it becomes necessary to determine the County's rights and the Contractor's obligations under the Agreement or to ascertain facts relative to any claim against the Contractor which may result in a charge against the County.
- 3.8.2 These provisions for an audit shall give the County unlimited access during normal working hours to the Contractor's books and records under the conditions stated above.
- 3.8.3 The Contractor shall make all his books, records, documents, and other evidence bearing on his costs and expenses under this Agreement available to the County for a period of three (3) years after final payment or termination hereunder.
- 3.8.4 All payments under this Agreement are subject to audit under the circumstances stated above. Audits may be performed at the County's option, either during the Agreement time period or during the above record retention time period. Regardless of authorization, approval or acceptance, signatures or letters which are given by the County and are part of the County's control systems or are requested by the Contractor, the payments made under this Agreement shall not constitute a waiver of the County's right to audit. Payments shall not constitute a waiver or agreement by the County that it accepts as correct the billings, invoices or other charges on which the payments are based. If the County's audit produces a claim against the Contractor, the County may pursue all its legal remedies even though it has made all or part of the payments required by this Agreement.
- 3.8.5 If any audit by the County or the County's representative discloses an underpayment by the County, the County shall have the duty to pay any amounts found by the audit to be owed to the Contractor. If such audit discloses an overpayment, the Contractor shall have the obligation to reimburse the County for the amount of the overpayment.
- 3.8.6 The County's right to audit and the preservation of records shall terminate at the end of three (3) years as stated herein above. The Contractor shall include this "Right to Audit and Preservation of Records" clause in all subcontracts issued by him and he shall require same to be inserted by all lower tier subcontractors in their subcontracts, for any portion of the Work. Should Contractor fail to include this clause in any such subcontract, or otherwise fail to insure the County's rights hereunder, Contractor shall be liable to County for all costs, expenses and attorney's fees which County may have to incur in order to obtain an audit or inspection of or the restoration of records which would have otherwise been available to County from said persons under this clause. Such audit may be conducted by the County or its authorized representative.

3.9 RIGHT TO REVIEW OTHER DOCUMENTS AND MATERIALS

- 3.9.1 In addition to the rights granted to the County under Article 3.8 Right to Audit and Preservation of Records, the County shall have the right to review and copy any and all of the Contractor's records pertaining to or relating in any way to the Project, including, but not limited to, correspondence, memoranda, minutes, reports, intra- and inter-office communications, work papers, estimating sheets, progress reports, forecasts, audio or video recordings, computer disks, films, or any other materials, regardless of physical form or characteristics, which were prepared by or in the possession of, or obtainable by, the Contractor. The Contractor shall make all such documents and records available to the County upon ten (10) days written Notice to the Contractor of the County's intent to review such documents. The Contractor shall include this "Right to Review Documents and Materials" clause in all subcontracts issued by him and he shall require same to be inserted by all lower-tier subcontractors

in their subcontracts for any portion of the Work. The Contractor hereby waives any right he may have to additional compensation or time extensions in the event he fails or refuses to produce records pertaining to any such claim as requested by the County pursuant to this paragraph. In addition, the County may withhold all or any portion of any progress payments, which may be otherwise due, in the event Contractor refuses to comply with his obligations under this paragraph. The review of documents and other records under this clause may be conducted by the County or its authorized representative.

ARTICLE 4: CONTRACTOR

4.1 DEFINITION

- 4.1.1 The Contractor is the person or entity identified in the County-Contractor Agreement and is referred to throughout the Contract Documents as if singular in number and masculine in gender. The term Contractor means the Contractor or his authorized representative.
- 4.1.2 The entire Agreement is not one of agency by the Contractor for County, but one in which the Contractor is engaged independently in the business of providing the services and performing the Work herein described as an independent Contractor.

4.2 REVIEW OF CONTRACT DOCUMENTS

- 4.2.1 The Contractor shall not perform any portion of the Work at any time without having obtained the Contract Documents or, where required, approved Shop Drawings, Product Data, Samples or Manuals for such portion of the Work.
- 4.2.2 The Contractor and his subcontractors shall keep at the site of the Work at least two (2) copies of the drawings and specifications and shall at all times give the A/E, inspectors, as well as representatives of the County access thereto. Further, said drawings shall be the approved sets issued to the Contractor by the appropriate County Permit agencies.

4.3 CONTRACTOR'S REPRESENTATIONS

By entering into this Agreement with the County, the Contractor represents and warrants the following, together with all other representations and warranties in the Contract Documents.

- 4.3.1 That he is experienced in and competent to perform the type of work required and to furnish the plant, materials, supplies or equipment to be so performed or furnished by him;
- 4.3.2 That he is financially solvent, able to pay his debts as they mature, and possessed of sufficient working capital to initiate and complete the Work required under this Agreement;
- 4.3.3 That he is familiar with all federal, state, and local government laws, ordinances, permits, regulations and resolutions which may in any way affect the Work or those employed therein;
- 4.3.4 That such temporary and permanent work required by the Contract Documents which is to be done by him will be satisfactorily constructed and fit for use for its intended purpose and that such construction will not injure any person, or damage any property;
- 4.3.5 That he has carefully examined the Contract Documents and the site of the Work and that from his own investigations, he has satisfied himself and made himself familiar with: (a) the nature and location of the Work; (b) the character, quality and quantity of materials likely to be encountered, including, but not limited to, all structures and obstructions on or at the project site, both natural and man-made; (c) the character of equipment and other facilities needed for the performance of the Work; (d) the general and local conditions including, without limitation, its climatic conditions, the availability

and cost of labor and the availability and cost of materials, supplies, tools, and equipment; (e) the quality and quantity of all materials, supplies, tools, equipment, labor and professional services necessary to complete the Work in the manner required by the Contract Documents; and (f) all other matters or things which could in any manner affect the performance of the Work;

- 4.3.6 That he will fully comply with all requirements of the Contract Documents;
- 4.3.7 That he will perform the Work consistent with good workmanship, sound business practice, and in the most expeditious and economical manner consistent with the best interests of the County;
- 4.3.8 That he will furnish efficient business administration, an experienced superintendent, and an adequate supply of workmen, equipment, tools and materials at all times.
- 4.3.9 That he will complete the Work within the Contract Time and within Contract Milestones;
- 4.3.10 That his Agreement price is based upon the materials, systems and equipment required by the Contract Documents, without exception; and
- 4.3.11 That he has satisfied himself as to the feasibility and correctness of the Contract Documents for the construction of the Work.

4.4 SUPERVISION AND CONSTRUCTION PROCEDURES

- 4.4.1 The Contractor shall supervise and direct the Work, using his best skill and attention. He shall be solely responsible for all construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Agreement; subject, however, to the County's right to reject means and methods proposed by the Contractor which are unsafe or otherwise not in compliance with the Contract Documents.
- 4.4.2 The Contractor shall be responsible to the County for the acts and omissions of his employees, subcontractors and sub-subcontractor's, suppliers, their agents and employees, and of other persons performing any of the Work and for their compliance with each and every requirement of the Contract Documents, in the same manner as if they were directly employed by the Contractor.
- 4.4.3 The Contractor understands and agrees that he shall not be relieved of his obligations to perform the Work in accordance with the Contract Documents either by the activities or duties of the County or the A/E in their administration of the Agreement or by inspections, tests, or approvals required or performed under Article 7 by persons other than the Contractor.
- 4.4.4 Before starting a section of work, the Contractor shall carefully examine all preparatory work that has been executed by others to receive his work to see that it has been completed. He shall check carefully, by whatever means are required, to ensure that his work and adjacent, related work will finish to proper quality, contours, planes, and levels.
- 4.4.5 The Contractor understands and agrees that the County and A/E will not be responsible for and will not have control or charge of construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, and they will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. The County and the A/E will not be responsible for or have control or charge over the acts or omissions of the Contractor, subcontractors, or any of their agents or employees, or any other person performing any of the Work.
- 4.4.6 The Contractor shall employ no plant, equipment, materials, or persons for this Work to which the County objects.
- 4.4.7 The Contractor shall not remove any portion of the Work or stored materials from the site of the Work.

4.5 LABOR, MATERIALS AND EQUIPMENT

- 4.5.1 The Contractor shall furnish all plant, labor, materials, supplies, equipment and other facilities and things necessary or proper for or incidental to the Work, and will perform all other obligations imposed on him by this Agreement. Final payment will not be made until the Work is so completed.
- 4.5.2 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for the proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.
- 4.5.3 Work and materials which are necessary in the construction but which are not specifically referred to in the specifications or shown in the drawings but implied by the Agreement shall be furnished by the Contractor at his own cost and expense. Such work and materials shall correspond with the general character of the Work as may be determined by the A/E subject to review as provided in Article 2.2.11.
- 4.5.4 The Contractor shall perform at least that percentage of the Work specified in the County-Contractor Agreement, with forces that are in the direct employment of the Contractor's organization. The Contractor shall submit to the County within thirty (30) calendar days after award of the Agreement for the work, a designation of the Work to be performed by the Contractor with his own forces. The percentage of the Work to be performed under subcontract shall be calculated by adding the amounts of all subcontracts and dividing this sum by the total amount of the Agreement.
- 4.5.5 The Contractor shall at all times enforce strict discipline, safety and good order among his employees and shall not employ on the Work any unfit person or anyone not skilled in the task assigned to him. If any person employed on the Work by the Contractor shall appear to the County to be incompetent or to act in a disorderly or improper manner, such person shall be removed immediately at the request of the County, and shall not be reemployed except on written consent of the County.
- 4.5.6 No materials or supplies for the Work shall be purchased by the Contractor or by any subcontractor subject to any chattel mortgage, or under a conditional sale or other agreement by which an interest is retained by the seller. The Contractor warrants that he has good title to all materials and supplies used by him in the Work.
- 4.5.7 The Contractor shall provide approved and adequate sanitary accommodations. All wastes shall be covered, disinfected, incinerated or otherwise disposed of legally.
- 4.5.8 All equipment, apparatus and/or devices of any kind to be incorporated into the Work that are shown or indicated on the drawings or called for in the specifications or required for the completion of the Work shall be entirely satisfactory to the County as regards operations, capacity and/or performance. No approval, either written or verbal, of any drawings, descriptive data or samples of such equipment, apparatus, and/or device shall relieve the Contractor of his responsibility to turn over the same in good working order for its intended purpose at the completion of the Work in complete accordance with the Contract Documents. Any equipment, apparatus and/or device not fulfilling these requirements shall be removed and replaced by proper and acceptable equipment, etc., or put in good working order satisfactory to the County without additional cost to the County.

4.6 WARRANTY

- 4.6.1 The Contractor warrants to the County that all materials and equipment furnished under this Agreement will be new unless otherwise specified, and that all workmanship will be of first class quality, free from faults and defects and in conformance with the Contract Documents and all other warranties and guaranties specified therein. Where no standard is specified for such workmanship or materials, they shall be the best of their respective kinds. All Work not conforming to these

requirements, including substitutions not properly approved and authorized, may be considered defective. If required by the County, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. This warranty is not limited by the provisions of Article 13, Uncovering and Correction of Work.

4.6.2 The Work included in this Agreement is heretofore specified. The Contractor shall be required to complete the Work specified and to provide all items needed for construction of the project, complete and in good order.

4.7 CONTRACTOR-PAID TAXES, PERMITS, FEES AND NOTICES

4.7.1 The Contractor shall pay all sales, consumer, use and other similar taxes for the Work or portions thereof provided by the Contractor which are legally enacted at the time bids are received, whether or not yet effective. Taxes to be paid by the Contractor shall include, but shall not be limited to, the Alleghany County Business, Professional and Occupational License Tax (a gross receipt tax).

4.7.2 Except as provided in Article 3.3, County-Paid Permits and Fees, and Article 4.7.3, the Contractor will be responsible for obtaining and paying for all other fees, permits and licenses necessary for the proper execution of the Work, including, but not limited to:

4.7.2.1 Building Permit and inspections (County fees waived);

4.7.2.2 Plumbing, Electrical, Mechanical Permits and inspections (County fees waived);

4.7.2.3 Temporary water meter, temporary electrical and temporary telecommunication installations and temporary utility usage;

4.7.2.4 Temporary security lighting;

4.7.2.5 All other permits necessary in order to perform the Work shall be secured by the Contractor and fees necessary in order to perform the Work shall be paid by him as part of this Agreement at no additional cost to the County.

4.7.3 The Contractor shall give all notices and comply with all laws, ordinances, rules, regulations, permits, resolutions and lawful orders of any public authority bearing on the performance of the Work; including, but not limited to, OSHA, Title 40.1 Labor and Employment, Chapter 3 of the Code of Virginia, and Title VII of the Civil Rights Act of 1964, as amended. All safety violations shall be corrected immediately upon receipt of notice of violation.

4.8 COMPLIANCE

4.8.1 All demolition and excavation shall comply with the rules and regulations for the prevention of accidents as issued by the Department of Labor and Industry of the Commonwealth of Virginia.

4.8.2 To the extent of the work indicated in the Contract Documents, the Contractor shall comply and the construction shall conform with all applicable and current editions or revisions of the following codes, specifications and standards. In case of conflict, the order of precedence shall be as hereinafter listed:

4.8.2.1 Contract Documents;

4.8.2.2 Alleghany County Purchasing Policy, as amended;

4.8.2.3 The Virginia Uniform Statewide Building Code, as amended (BOCA and NEC);

4.8.3 If the Contractor (or any person in contract with the Contractor relating to the subject project) finds an error, inconsistency, omission, ambiguity, discrepancy, conflict or variance in the Contract Documents, or between the Contract Documents and any of the codes, specifications and standards

set forth in 4.8.2 herein, the Contractor has the obligation to seek a clarification thereof from the A/E, with a copy to the County, prior to the time the Work is performed which is affected by such error, inconsistency, omission, ambiguity, discrepancy, conflict or variance. The County will welcome such a clarification request and, if deemed necessary by the County, the County will issue a written instruction clarifying the matter in question. If the Contractor feels that the written clarification requires additional work, the Contractor shall follow the change process in Article 12, Changes and Modifications in the Work. Should the Contractor fail to seek such a clarification thereof immediately upon the discovery of the need therefor, prior to the time the said Work is performed, the Contractor thereby assumes all risk of loss related to such error, inconsistency, ambiguity, discrepancy, conflict or variance which the Contractor (and any person in contract with Contractor relating to the subject project) know or should have known, using a normal, professional standard of care, existed prior to the time the Work was performed.

- 4.8.4 Any material or operation specified by reference to publications, published specifications of a Manufacturer, a Society, an Association, a Code, or other published Standard, shall comply with the requirements of the referenced document which is current on the date of receipt of bids. If the Contractor observes that any of the Contract Documents are at variance therewith in any respect, he shall promptly notify the A/E in writing, with a copy to the County. The A/E will make such judgments as are necessary and notify the Contractor prior to the performance of the Work.
- 4.8.5 If the Contractor performs any Work contrary to such laws, ordinances, permits, rules, regulations and resolutions, he shall assume full responsibility therefor and shall bear all costs attributable thereto.
- 4.8.6 The Contractor will be held responsible for locating all underground structures such as water, oil and gas mains, water and gas services, storm and sanitary sewers and telephone and electric conduits which may be encountered during the construction operation. The Contractor shall have Miss Utility locate all utilities on the site which are within the area of the Work and shall dig test holes to determine the position of the underground structures. The Contractor shall pay the cost of digging test holes and likewise he shall pay the cost of the services of the representatives of the Owner of such utilities for locating the said utilities. The cost of determining the location of any and all utilities is to be included in the bid price. The County shall pay the Owners of such utilities for fees or charges for relocation of gas, electric, telephone, cable or other lines and/or services indicated to be relocated by others.
- 4.8.7 If utilities are marked which are not shown on the plans, the Contractor shall immediately notify the County and the A/E of such findings. The County and A/E shall provide a direction to the Contractor within a reasonable period of time if additional work is required as a result of the finding. If the Contractor believes that it requires additional Work, the Contractor shall follow the change process in Article 12, Changes and Modifications in the Work.

4.9 ALLOWANCES

- 4.9.1 The Invitation to Bid/Request for Proposal and Specifications will contain provisions for allowances, if such is applicable to this Agreement.

4.10 SUPERINTENDENT

- 4.10.1 The Contractor shall employ a competent Superintendent with experience constructing the Work and any necessary assistants to ensure supervisory attendance at the Project site during the progress of the Work. The Superintendent shall be directly employed by the Contractor's organization, have full authority to represent the Contractor, and all communications given to the Superintendent shall be as binding as if given to the Contractor.

- 4.10.2 The Superintendent shall be the individual whose resume was provided in the Contractor's bid/proposal. If the County judges the proposed Superintendent to not be qualified, the County may reject the proposed Superintendent and request another individual of satisfactory qualifications be supplied. This process shall be repeated until a qualified Superintendent is provided.
- 4.10.3 It is understood that such Superintendent shall be acceptable to the County and shall be one who will be continued in that capacity for the duration of this project, unless he ceases to be on the Contractor's payroll. The Superintendent shall not be employed on any other project during the performance of this Agreement.

4.11 CONSTRUCTION SCHEDULE

- 4.11.1 The Contractor shall within twenty (20) days after the effective date of the County-Contractor Agreement, prepare and submit to the A/E and County for review, a reasonably practicable and feasible Construction Schedule showing the method by which the Contractor will comply with Agreement Milestone and Completion date requirements as set forth in the County-Contractor Agreement. The schedule shall show in detail how the Contractor plans to execute and coordinate the Work. The Contractor shall use this schedule in the planning, scheduling, direction, coordination and execution of the Work. The Construction Schedule shall encompass all of the Work of all trades necessary for construction of the project and shall be sufficiently complete and comprehensive to enable progress to be monitored on a day-to-day basis. The County and A/E shall each be provided with a copy of all schedules, update reports and other documentation required herein, which shall be suitable for reproduction by the County.
- 4.11.2 It is the sole responsibility of the Contractor to prepare, maintain, update, revise and utilize the Construction Schedule as outlines in 4.11, Construction Schedule. The schedule shall be the sole overall Construction Schedule utilized by the Contractor in managing this project, provided, however, that Contractor may, at its option, employ and utilize other schedules based upon and consistent with the Construction Schedule. In general, it is the intent of this paragraph to allow the Contractor to choose its own means, methods and construction procedures consistent with good practice and the Contract Documents.
- 4.11.3 If the Contractor should submit a schedule or express an intention to complete the Work earlier than any required Milestone or Completion date, the County shall not be liable to the Contractor for any costs or delay should the Contractor be unable to complete the Work before such earlier Milestone or Completion date. The duties, obligations and warranties of the County to the Contractor shall be consistent with and applicable only to the completion of the Work on the Milestone and Completion dates required in the County-Contractor Agreement.
- 4.11.4 Submission to the County of the Construction Schedule is advisory only and shall not relieve the Contractor of the responsibility for accomplishing the Work within each and every required Milestone and Completion date. Omissions and errors in the approved Construction Schedule shall not excuse performance that is not in compliance with the Contract Documents. Submission to the County in no way makes the County an insurer of the Construction Schedule's success or liable for time or cost overruns flowing from its shortcomings. The County hereby disclaims any obligation or liability by reason of County approval or failure to object to the Construction Schedule.
- 4.11.5 Contractor shall consult with and obtain information from principal subcontractors necessary in preparation of the schedules, updates and revisions required herein. Contractor shall provide each principal subcontractor with copies of the Construction Schedule and any revisions or updates affecting a subcontractor's work. Contractor shall hold appropriate progress meetings with subcontractors and shall direct and coordinate the work of subcontractors consistent with and as required herein. County shall have the right to attend subcontractor progress meetings but shall not be required to participate in such meetings or provide information to subcontractors, except through the Contractor. Contractor shall keep up-to-date minutes of subcontractor progress meetings and shall provide same to County. The Contractor shall ensure that each subcontractor, sub-

subcontractor or supplier acknowledges and accepts the requirements of the Construction Schedule relating to their part of the Work.

- 4.11.6 If Contractor's Construction Schedule indicates that County or a separate Contractor is to perform an activity by a specific date, or within a certain duration, County or any separate Contractor shall not be bound to said date or duration unless County expressly and specifically agrees in writing to same; the County's overall review of the schedule does not constitute an agreement to specific dates or durations for activities of the County or any separate contractor.
- 4.11.7 The Contractor's Superintendent shall maintain at the job site, a current Construction Schedule, indicating actual monthly progress for those portions of the project on which work has been or is being performed.
- 4.11.8 If an extension or contraction of any Milestone or Completion Date is authorized by any Change Order, the Contractor shall revise his Construction Schedule, Milestone and Completion Dates accordingly.
- 4.11.9 If, in the opinion of the County, the Construction Schedule does not accurately reflect the actual progress and sequence of the Contractor's performance of the Work, the Contractor shall revise the Construction Schedule, upon the County's request, and submit a revised Construction Schedule that accurately represents the progress and sequence of the Contractor's performance of the Work.
- 4.11.10 Contractor shall submit to the County the name of any scheduling consultant that Contractor may select or retain. Contractor shall not utilize any particular scheduling consultant over the reasonable objection of the County to that consultant.
- 4.11.11 Contractor covenants and guarantees that Contractor will not:
 - 4.11.11.1 Misrepresent to County its planning and scheduling of the Work;
 - 4.11.11.2 Utilize schedules materially different from those made available to the County or any subcontractors for the direction, execution and coordination of the Work, or which are not feasible or realistic;
 - 4.11.11.3 Prepare schedules, updates, revisions or reports which do not accurately reflect Contractor's actual intent or Contractor's reasonable and actual expectations as to:
 - a. The sequence of activities;
 - b. The duration of activities;
 - c. The responsibility for activities;
 - d. Resource availability;
 - e. Labor availability or efficiency;
 - f. Expected weather conditions;
 - g. The value associated with the activity;
 - h. The percentage complete of any activity;
 - i. Completion of any item of work or activity;
 - j. Project completion;

- k. Delays, slippages, or problems encountered or expected;
- l. Subcontractor requests for time extension, or delay claims of subcontractors; and
- m. If applicable, the float time available.

4.11.12 Contractor's failure to substantially comply with the foregoing covenant and guarantee of Paragraph 4.11.11 shall be a substantial and material breach of contract which will permit County to terminate Contractor for default, or withhold payments under the Contract Documents, and shall entitle County to the damages afforded for misrepresentation or fraud by these Contract Documents or applicable law.

4.11.13 Should Contractor fail to substantially comply with the provisions of the Contract Documents relating to scheduling and execution of the Work by the overall project schedule, County shall have the right, at its option, to retain the services of scheduling consultants or experts (including attorneys if necessary in the opinion of the County) to prepare schedules, reports, updates and revisions of the schedule in accordance with the Contract Documents and to review and analyze same, in order to allow County and A/E to evaluate the program of the Work by Contractor, as permitted by the Contract Documents, as required to ensure, under the County's schedule prepared hereunder, that Contractor will complete the Work within the Contract Time. All costs and expenses and fees incurred by County in preparing the schedule hereunder shall be charged to Contractor's account. If Contractor fails to substantially comply with the scheduling and execution of the work requirements of the Contract Documents, Contractor hereby agrees, in such instance, to comply with such County-prepared schedules, if any, or directions, and activity sequences and durations as County may reasonably require, without additional cost to the County (subject only to cost adjustments for such changes in the Work as County may direct), to ensure completion within the Contract Time.

4.11.14 The Construction Schedule shall be utilized by County, A/E and Contractor for submission, review and approval of monthly Payment Request. The schedule must be updated by Contractor monthly with each progress payment application and submitted to the County and A/E for review with the progress payment application. County shall not be required to process and review Contractor's Application for Payment if Contractor has failed or refused to provide the scheduling update information required herein.

4.12 RESPONSIBILITY FOR COMPLETION

4.12.1 The Contractor shall furnish such manpower, materials, facilities and equipment and shall work such hours, including night shifts, overtime operations and Sundays and holidays, as may be necessary to ensure the performance of the Work within the Milestone and Completion dates specified in the County-Contractor Agreement. If the County notifies the Contractor that it has become apparent that the Work will not be completed within required Milestone or Completion dates, the Contractor agrees that it will assume full responsibility to take some or all of the following actions, at no additional cost to the County (except for circumstances beyond Contractor's control), in order to ensure, in the opinion of the County, that the Contractor will comply with all Milestone and Completion date requirements:

- 4.12.1.1 Increase manpower, materials, crafts, equipment and facilities;
- 4.12.1.2 Increase the number of working hours per shift, shifts per working day, working days per week, or any combination of the foregoing; and
- 4.12.1.3 Reschedule activities to achieve maximum practical concurrency of accomplishment of activities.

Failure of the County to notify the Contractor of the apparent delay shall not relieve Contractor of the obligation to finish the project within the required Milestone or Completion date.

- 4.12.2 If the actions taken by the Contractor are not satisfactory, the County may direct the Contractor to take any and all actions necessary to ensure completion within the required Milestone and Completion dates, without additional cost to the County (except for circumstances beyond the Contractor's control). In such event, the Contractor shall continue to assume responsibility for his performance and for completion within the required dates.
- 4.12.3 If, in the opinion of the County, the actions taken by the Contractor pursuant to this Article or the progress or sequence of the Work are not accurately reflected on the Construction Schedule, the Contractor shall revise such schedule to accurately reflect the actual progress and sequence of the Work.
- 4.12.4 Failure of the Contractor to substantially comply with the requirements of this Article is grounds for a determination by the County, pursuant to Article 14, Termination of the Agreement, that the Contractor is failing to prosecute the Work with such diligence as will ensure its completion within the time specified.
- 4.12.5 The County may, at its sole discretion and for any reason, including when it is apparent to the A/E or County that the Work will not be completed within the required Milestone or Completion dates, require the Contractor to accelerate the Schedule of Performance by providing overtime, Saturday, Sunday and/or holiday work and/or by having all or any subcontractors designated by the County to provide overtime, Saturday, Sunday and/or holiday work. In the event that the County requires overtime, Saturday, Sunday or holiday work by the Contractor's or his subcontractor's own forces, and such requirement is not related in any way to the Contractor's apparent inability to comply with Milestone and Completion date requirements, the County shall reimburse the Contractor for the direct cost to the Contractor of the premium time for all labor utilized by the Contractor in such overtime, Saturday, Sunday or holiday work (but not for the straight time costs of such labor), together with any Social Security and State or Federal unemployment insurance taxes in connection with such premium time. However, no overhead supervision costs, commissions, profit or other costs and expenses shall be payable in connection therewith.
- 4.12.6 This provision does not eliminate the Contractor's responsibility to comply with the County noise ordinances, all other permit requirements and all other applicable laws, regulations, rules, ordinances, and resolutions.

4.13 DOCUMENTS AND SAMPLES AT THE SITE

- 4.13.1 The Contractor shall, at the County's direction, maintain at the site for the County one record copy of all Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to record all changes made during construction, and approved Shop Drawings, Product Data, Samples and Manuals. These shall be available to the A/E. These shall be delivered to the County upon completion of the Work.

4.14 SHOP DRAWINGS, PRODUCT DATA, SAMPLES AND MANUALS

- 4.14.1 SHOP DRAWINGS are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or any subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.
- 4.14.2 PRODUCT DATA are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate a material, product or system for some portion of the Work.
- 4.14.3 SAMPLES are physical examples that illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.
- 4.14.4 MANUALS are manufacturer's installation, start-up, operating, maintenance and repair instructions,

together with parts lists, pictures, sketches and diagrams that set forth the manufacturer's requirements, for the benefit of the Contractor and the County.

- 4.14.5 The Contractor shall review, approve and submit, with reasonable promptness and in such sequence as to cause no delay in the Work or in the Work of the County or any separate Contractor, all Shop Drawings, Product Data, Samples and Manuals required by the Contract Documents.
- 4.14.6 By approving and submitting Shop Drawings, Product Data, Samples and Manuals, the Contractor represents that he has determined and verified all materials, field measurements, and field construction criteria related thereto, and that he has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents. Parts and details not fully indicated on the Contract drawings shall be detailed by the Contractor in accordance with standard engineering practice. Dimensions on the Contract drawings, as well as detailed drawings themselves are subject in every case to measurements of existing, adjacent, incorporated and completed work, which shall be taken by the Contractor before undertaking any work dependent on such data.
- 4.14.7 The Contractor shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the County or A/E's approval of Shop Drawings, Product Data, Samples or Manuals under Article 2 Architect/Engineer unless the Contractor has specifically informed the County and A/E in writing of such deviation at the time of submission and the County has given written approval to the specific deviation. The Contractor shall not be relieved from responsibility for errors or omissions in the Shop Drawings, Product Data, Samples or Manuals by the A/E's approval thereof.
- 4.14.8 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data or Samples, to revisions other than those requested by the County or A/E on previous submittals. No portion of the Work requiring submission of Shop Drawings, Product Data, or Samples shall commence until the submittal has been approved by the County and A/E as provided in Article 2 Architect/Engineer. All such portions of the Work shall be in accordance with approved submittals.
- 4.14.9 For substances that are proposed for use in the project that may be hazardous to human health, the Contractor shall submit to the A/E, for information only, information on precautions for safely using these substances, including certification of registration by the Contractor with authorities under the respective Virginia and Federal Toxic Substances Control Acts.
- 4.14.10 Unless otherwise modified by the County in writing, the Contractor shall label or stamp and number all Shop Drawings, Product Data, Samples or Manuals as prescribed in the Specifications.
- 4.14.11 The Contractor shall submit electronically each submittal, including the transmittal sheet (for shop drawings, product data, samples or manuals) to the A/E. The A/E will forward applicable drawings, data, samples, or manual packages to the County.

4.15 EQUAL PRODUCTS

- 4.15.1 The term "Product" as used herein refers to materials, equipment, supplies, articles, fixtures, devices, types of construction, or products, as appropriate.
- 4.15.2 All products furnished shall, whenever specified and otherwise wherever practicable, be the standard products of recognized, reputable manufacturers. If the manufacturer cannot make scheduled delivery of an approved item, the Contractor may request approval of the County to use another brand, make, manufacturer, article, device, product, material, fixture, form or type of construction which the Contractor judges to be equal to that specified. An item shall not be considered by the County for approval as equal to the item so named or described unless it (a) it is at least equal in quality, durability, appearance, strength, and design; (b) it will perform at least equally the specific function imposed by the general design for the work being contracted for or the material being purchased; and

(c) it conforms substantially, even with deviations, to the detailed requirements for the item in the specifications. Approval shall be at the sole discretion of the County and will be based upon considerations of quality, workmanship, economy of operation, suitability for the purpose intended, and acceptability for use on the project. Any such approval must be in writing to be effective and the decision of the County shall be final.

4.15.3 To obtain such approval of equal products other than those specified in Contract Documents, the Contractor's request for approval, submitted after contract award, of any equal product shall include the following:

4.15.3.1 Complete data substantiating compliance of the proposed equal product with the Contract Documents;

4.15.3.2 Accurate cost data on proposed equal product in comparison with product or method specified;

4.15.3.3 Product identification including manufacturer's name, address, and phone number;

4.15.3.4 Manufacturer's literature showing complete product description, performance and test data, and all reference standards;

4.15.3.5 Samples and colors in the case of articles or products;

4.15.3.6 Name and address of similar projects on which the product was used and date of installation;

4.15.3.7 All directions, specifications, and recommendations by manufacturers for installation, handling, storing, adjustment, and operation.

4.15.4 The Contractor shall also submit with his request for approval a statement which shall include all of the following representations by the Contractor, namely that:

4.15.4.1 He has investigated the proposed equal product and determined that it is equal or better in all respects to that specified and that it fully complies with all requirements of the Contract Documents;

4.15.4.2 He will meet all Contract obligations with regard to this substitution;

4.15.4.3 He will coordinate installation of acceptable equal products into the Work, making all such changes and any required schedule adjustments, at no additional cost to the County, as may be required for the Work to be complete in all respects;

4.15.4.4 He waives all claims for additional costs and additional time related to equal products. He also agrees to hold the County harmless from claims for extra costs and time incurred by subcontractors and suppliers, or additional services which may have to be performed by the A/E, for changes or extra work that may, at some later date, be determined to be necessary in order for the Work to function in the manner intended in the Contract Documents;

4.15.4.5 He will provide the same warranty and guarantee, and perform any work required in accordance therewith, for the equal product that is applicable to the specified item for which the equal product is requested;

4.15.4.6 Material will be installed, handled, stored, adjusted, tested, and operated in accordance with the manufacturers' recommendation and as specified in the Contract Documents;

- 4.15.4.7 In all cases new materials will be used unless this provision is waived by notice from the County or unless otherwise specified in the Contract Documents;
- 4.15.4.8 All material and workmanship will be in every respect, in accordance with that which in the opinion of the County, is in conformity with approved modern practice; and
- 4.15.4.9 He has provided accurate cost data on the proposed equal product in comparison with the product or method specified, if applicable.
- 4.15.5 The County may require tests of all products proposed as equal products so submitted to establish quality standards, at the Contractor's expense. After approval of an equal product, if it is determined that the Contractor submitted defective information or data regarding the equal product upon which County's approval was based, and that unexpected or unanticipated redesign or rework of the project will be required in order to accommodate the equal product, or that the item will not perform or function as well as the specified item for which equal product was requested, the Contractor will be required to furnish the original specified item or request approval to use another equal product. The Contractor shall pay all costs, expenses or damages associated with or related to the unacceptability of such an equal product and the resultant utilization of another item and no time extension shall be granted for any delays associated with or related to such an equal product.
- 4.15.6 Equal products will not be considered for approval by the County if:
- 4.15.6.1 The proposed equal product is indicated or implied on the Contractor's shop drawing or product data submittals and has not been formally submitted for approval by the Contractor in accordance with the above-stated requirements; or
- 4.15.6.2 Acceptance of the proposed equal product will require substantial design revisions to the Contract Documents or is otherwise not acceptable to the County.
- 4.15.7 Except as otherwise provided for by the provisions of any applicable laws, the Contractor shall not have any right of appeal from the decision of the County disapproving any products submitted if the Contractor fails to obtain the approval for an equal product under this Article.
- 4.15.8 If the Contractor proposes a product which the County determines is not equal to the product named in Contract Documents but which the County nevertheless is willing to accept, Contractor shall provide upon request by the County an itemized comparison of the proposed substitution with the product specified and the cost differential which shall be credited to the County in a Change Order issued in accordance with Article 12 Changes and Modifications in the Work.

4.16 USE OF SITE

- 4.16.1 The Contractor shall confine his operations at the site to areas permitted by law, ordinances, permits, easements, right-of-way agreements and the Contract Documents. The Contractor shall not unreasonably encumber the site, in the opinion of the County, with any materials, equipment or trailers nor shall he block the entrances or otherwise prevent reasonable access to the site, other working and parking areas, completed portions of the Work and/or properties, storage areas, areas of other facilities that are adjacent to the worksite. If the Contractor fails or refuses to move said material, equipment or trailers within twenty-four (24) hours of notice by the County to so do, the County shall have the right, without further Notice, to remove, at the Contractor's expense, any material, equipment and/or trailers which the County deems are in violation of this paragraph.

4.17 CUTTING AND PATCHING OF WORK

- 4.17.1 The Contractor shall be responsible for all cutting, fitting or patching that may be required to complete the Work and to make its several parts fit properly and in accordance with the Contract Documents.

4.17.2 The Contractor shall not damage or endanger any portion of the Work or the work of the County or any separate contractors by cutting, patching or otherwise altering any work, or by excavation. The Contractor shall not cut or otherwise alter the work of the County or any separate contractor except with the written consent of the County and of such separate contractor. The Contractor shall not unreasonably withhold from the County or any separate contractor his consent to cutting or otherwise altering the Work. The County shall not be required to accept Work with a cut, splice, or patch when such cut, splice or patch is not generally accepted practice for the particular work involved or is otherwise unworkmanlike in the opinion of the County.

4.18 RIGHT TO PUBLISH

4.18.1 The Contractor agrees that he will not publish, cause to be published, or otherwise disseminate any information of whatever nature relating to the Work being performed under this Contract, except as may be approved by the County in writing.

4.19 SITE CLEAN UP

4.19.1 The Contractor at all times shall keep the Project site and adjacent areas free from accumulation of waste materials or rubbish caused by his operations. Before final payment is made, the Contractor shall remove all of his waste materials, rubbish, scrap materials, debris, tools, construction equipment, machinery, surplus materials, false work, temporary structures, including foundations thereof and plant of any description, from the Project site and put the site in a neat, orderly condition.

4.19.2 If the Contractor fails to clean up as required herein at any time during the performance of the Work or at the completion of the Work, the County may, upon twenty-four (24) hours notification, clean up the site at the Contractor's expense.

4.19.3 Any sediment runoff beyond perimeter controls shall be cleaned up according to the Virginia Erosion and Sediment Control Handbook, and Erosion and Sediment Control inspector's direction, whichever is most stringent.

4.20 PATENTS, ROYALTIES, ETC.

4.20.1 The Contractor guarantees to save harmless the County, its officers, agents, servants and employees from liability of any kind or nature, including cost, expense and attorney's fees on account of suits and claims of any kind for violation or infringement of any patents or patent rights by the Contractor, or by anyone directly or indirectly employed by him, or by reason of the use of any art, process, method, machine, manufacture, or composition of matter patented or unpatented in the performance of this Contract in violation or infringement of any letter or rights. The Contractor agrees to pay all royalties, fees, licenses, etc., required in respect of the work or any part thereof as part of his obligations hereunder without any additional compensation.

4.21 INDEMNIFICATION

4.21.1 It is hereby mutually covenanted and agreed that the relation of the Contractor to the work to be performed by him under this Contract shall be that of an independent contractor and that as such he will be responsible for all damages, loss or injury, including death, to persons or property that may arise or be incurred in or during the conduct and progress of said work as the result of any action, omission or operation under the Contract or in connection with the Work, whether such action, omission or operation is attributable to the Contractor, subcontractor, any material supplier, or anyone directly or indirectly employed by any of them. The Contractor shall make good any damages that may occur in consequence of the Work or any part of it. The Contractor shall assume all liability, loss and responsibility of whatsoever nature by reason of his neglect or violation of any Federal, State, County or local laws, regulations or ordinances.

- 4.21.2 The Contractor shall indemnify, hold harmless and defend the County, its employees, agents, servants and representatives from and against any and all claims, suits, demands, actions (regardless of the merits thereof) and damages of whatever nature arising out of or resulting from the performance of the Work or the failure to perform the Work, including jurisdictional labor disputes or other labor troubles that may occur during the performance of the Work.
- 4.21.3 The indemnification obligations under this Article shall not be affected in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any subcontractor under worker's or workman's compensation acts, disability benefit acts or other employee benefit acts.
- 4.21.4 The obligations of the Contractor under this Article 4.21 shall not extend to the actions or omissions of the A/E, his agents or employees, arising out of (a) the preparation or approval of maps, drawings, opinions, reports, surveys, change orders, designs or specifications, or (b) the giving of or the failure to give directions or instructions by the A/E, his agents or employees provided such giving or failure to give is the primary cause of the injury or damage.
- 4.21.5 The obligations of the Contractor under this Article 4.21 shall not extend to the proportion of damages, loss or injury, including death, to persons or property that may arise or be incurred as the result of any action, omission or operation of the County, or County's Separate Contractor(s), and their employees, agents, servants, and/or representatives.
- 4.21.6 This section shall survive the Agreement.
- 4.21.7 The County is prohibited from indemnifying Contractor and/or any other third parties.

4.22 NON-DISCRIMINATION IN EMPLOYMENT

- 4.22.1 During the performance of this Agreement, the Contractor agrees as follows:
- 4.22.1.1 The Contractor will not discriminate against any employee or applicant for employment because of race, religion, color, sex, national origin, age, disability, or status as a disabled veteran, or any other basis prohibited by state law relating to discrimination in employment, except where there is a bona fide occupational qualification reasonably necessary to the normal operation of the Contractor. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause;
- 4.22.1.2 The Contractor, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, will state that such Contractor is an equal opportunity employer;
- 4.22.1.3 Notices, advertisements and solicitations placed in accordance with Federal Law, rule or regulation, shall be deemed sufficient for the purpose of meeting the requirements of this provision; and
- 4.22.1.4 The Contractor will include the provisions of paragraphs .1, .2 and .3 above in every subcontract or purchase order of over \$10,000 so that the provisions will be binding upon every subcontractor or vendor.

4.23 CONTRACT SECURITY

- 4.23.1 The Contractor shall deliver to the County, within fifteen (15) calendar days from date of the County-Contractor Agreement, two (2) originals of a Performance Bond and a separate Labor and Material Payment Bond in a form acceptable to the County and each in an amount required by the Contract Documents as security for the faithful performance of the Contract, and the payment of all persons

performing labor and furnishing materials in connection with this Agreement. The County will not issue a Notice to Proceed until the bonds are received. The amount of the Performance and Payment Bonds shall be increased to the same extent the Contract Sum is increased due to modifications. The form of bonds shall be acceptable to the County and the surety shall be such surety company or companies as are acceptable to the County and as are authorized to transact business in the Commonwealth of Virginia. The cost of such bonds shall be included in the Contractor's proposal amount.

- 4.23.2 The Contractor shall require that all sureties providing bonds for the Project will give written Notice to the County, at least thirty (30) days prior to the expiration or termination of the bond(s).
- 4.23.3 If, at any time, any surety or sureties becomes insolvent or is determined by the County to be unable to adequately secure the interest of the County, the Contractor shall within (30) days after Notice from the County to do so, substitute an acceptable bond(s) in such form and sum and signed by such other sureties as may be satisfactory to the County. The premiums on such bond(s) shall be paid by the Contractor.

ARTICLE 5: SUBCONTRACTORS

5.1 DEFINITIONS

- 5.1.1 A subcontractor is a person or entity who has a direct contract with the Contractor to perform or supply any of the Work at the site. The term subcontractor is referred to throughout the Contract Documents as if singular in number and masculine in gender and means a subcontractor or his authorized representative. The term subcontractor does not include any separate contractor or his subcontractors.
- 5.1.2 A sub-subcontractor is a person or entity who has a direct or indirect contract with a subcontractor to perform or supply any of the Work at the site. The term sub-subcontractor is referred to throughout the Contractor Documents as if singular in number and masculine in gender and means a sub-subcontractor or an authorized representative thereof.
- 5.1.3 The A/E will not deal directly with any subcontractor or sub-subcontractor or materials supplier. Subcontractor, sub-subcontractors or material suppliers shall route requests for information or clarification through the Contractor to the A/E, with a copy to the County.

5.2 AWARD OF SUBCONTRACT AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

- 5.2.1 The Contractor shall submit to the County with a copy to the A/E prior to the award of any subcontract for work under this Contract and thirty (30) calendar days after the award of this Contract, the names of the suppliers of principal items, systems, materials, and equipment proposed for the Work; the names and addresses, business and emergency phones of the subcontractors which he proposes to employ under this Contract, as well as such other information as may be requested by the County. The County will review each subcontractor and supplier based upon his apparent financial soundness and responsibility, his known or reported performance on previous similar work, and his available plant, equipment and personnel to perform the Work. The Contractor shall not employ a subcontractor or supplier to whom the County reasonably objects. The County's objection to a proposed subcontractor or supplier shall not affect the Contract price.
- 5.2.2 The Contractor shall make no substitutions for any subcontractor, person or entity previously selected unless first submitted to the County for review.

5.3 SUBCONTRACTUAL RELATIONS

- 5.3.1 By an appropriate written agreement, the Contractor shall require each subcontractor, to the extent of

the Work to be performed by the subcontractor, to be bound to the Contractor by the terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities which the Contractor, by these Documents assumes toward the County and the A/E. Said agreement shall preserve and protect the rights of the County and the A/E under the Contract Documents with respect to the Work to be performed by the subcontractor so that the subcontracting thereof will not prejudice such rights, and shall allow to the subcontractor, unless specifically provided otherwise in the Contractor-subcontractor agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by these Documents, has against the County. Where appropriate, the Contractor shall require each subcontractor to enter into similar agreements with his sub-subcontractor's. The Contractor shall make available to each proposed subcontractor, prior to the execution of the subcontract, copies of all of the Contract Documents, and identify to the subcontractor any terms and conditions of the proposed subcontract which may be at variance with the Contract Documents. Each subcontractor shall similarly make copies of such Documents available to his sub-subcontractor's. Each subcontract agreement shall insure that all appropriate provisions of the Contract Documents are complied with by the subcontractor.

- 5.3.2 The provisions herein regarding the County's reasonable objection to any subcontractor shall in no way affect the liability of the Contractor to County regarding performance of all obligations by or payment of subcontractors. The County's failure to object to any given subcontractor shall not relieve the Contractor of his obligation to perform or have performed to the full satisfaction of the County all of the work required by this Contract.
- 5.3.3 Neither this Article nor any other provision of the Contract documents shall be deemed to make the County a joint venturer or partner with the Contractor or to place the subcontractor and materialmen in privity of Contract with the County.

5.4 QUALIFICATION SUBMITTALS

- 5.4.1 Specific qualification submittals may be required of subcontractors, installers and suppliers for certain critical items of the Work. Required qualification submittals are set forth in detail in the Technical Specifications and shall be collected and submitted by the Contractor to the A/E with copies to the County. All information required of a single subcontractor, installer or supplier shall be contained in a single, complete submittal. The Contractor shall submit the required qualification information within ten (10) days after receipt of the County's request.
- 5.4.2 The County shall reject any proposed subcontractor, installer or supplier, or any qualification submittals related thereto, for the following reasons:
 - 5.4.2.1 The Contractor's failure to submit requested information within the specified time; or
 - 5.4.2.2 The Contractor's failure to provide all of the requested information; or
 - 5.4.2.3 The Contractor's submission of a subcontractor, installer or supplier, or qualifications thereof, which are unacceptable in the judgment of the County.
- 5.4.3 Should the County have reasonable objection to any proposed subcontractor, installer or supplier, the Contractor shall submit another firm for approval by the County at no additional cost to the County.

ARTICLE 6: WORK BY COUNTY OR BY SEPARATE CONTRACTORS

6.1 COUNTY'S RIGHT TO PERFORM WORK AND TO AWARD SEPARATE CONTRACTS

- 6.1.1 The County reserves the right to perform work related to the Project with his own forces, and to award separate contracts in connection with other portions of the Project or other work on the site.

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

6.2 MUTUAL RESPONSIBILITY

- 6.2.1 The Contractor shall afford other contractors and the County reasonable opportunity for the introduction and storage of their materials and equipment and the execution of their work and shall properly connect and coordinate the Work with such other work. The Contractor shall coordinate his Work with the County and other contractors to store his apparatus, materials, supplies and equipment in such orderly fashion at the site of the Work as will not unduly interfere with the progress of the Work or the work of any other contractors.

6.2.1.1 If the execution or result of any part of the Work depends upon any work of the County or of any separate contractor, the Contractor shall, prior to proceeding with the Work, inspect and promptly report to the County in writing any apparent discrepancies or defects in such work of the County or of any separate contractor that render it unsuitable for the proper execution or result of any part of the Work.

6.2.1.2 Failure of the Contractor to so inspect and report shall constitute an acceptance of the County's or separate contractor's work as fit and proper to receive the Work, except as to defects which may develop in the County's or separate contractor's work after completion of the Work and which the Contractor could not have discovered by its inspection prior to completion of the Work.

- 6.2.2 Should the Contractor cause damage to the work or property of the County or of any separate contractor on the Project, or to other work on the Site, or delay or interfere with the County's work on ongoing operations or facilities or adjacent facilities or said separate contractor's work, the Contractor shall be liable for the same; and, in the case of another contractor, the Contractor shall attempt to settle said claim with such other contractor prior to such other contractor's institution of litigation or other proceedings against the Contractor.

If such separate contractor sues the County on account of any damage, delay or interference caused or alleged to have been so caused by the Contractor, the County shall notify the Contractor, who shall defend the County in such proceedings at the Contractor's expense. If any judgment or award is entered against the County, the Contractor shall satisfy the same and shall reimburse the County for all damages, expenses, and other costs that the County incurs as a result thereof.

- 6.2.3 Should Contractor have a dispute with a separate contractor with whom the County has contracted regarding damage to the Work or the property of Contractor or to the Work or property of said separate contractor or with regard to any delays or interferences which either Contractor or said separate contractor has caused to the performance of the other's Work, Contractor agrees to attempt to settle such dispute directly with said separate contractor. Contractor agrees that it will not seek to recover from the County any damages, costs, expenses (including, but not limited to, attorney's fees) or losses of profit incurred by the Contractor as a result of any damage to the Work or property of the Contractor or for any delay or interference caused or allegedly caused by any separate contractor.

6.3 COUNTY'S RIGHT TO CLEAN UP

- 6.3.1 If a dispute arises between the Contractor and separate contractors as to their responsibility for cleaning up as required by Article 4 Contractor, the County may clean up and charge the cost thereof to the Contractor responsible therefore as the County shall determine to be just.

ARTICLE 7: MISCELLANEOUS PROVISIONS

7.1 APPLICABLE LAWS/FORUM

This Agreement shall be governed and construed in all respects by its terms and by the laws of the Commonwealth of Virginia, without giving effect to its conflicts of laws provisions. Any judicial action shall be filed in the Commonwealth of Virginia, County of Alleghany. Contractor expressly waives any objection to venue or jurisdiction of the Alleghany County Circuit Court, Alleghany County, Virginia. Contractor expressly consents to waiver of service of process in an action pending in the Alleghany County Circuit Court pursuant to Virginia Code Section 8.01-286.1.

7.2 PROVISIONS REQUIRED BY LAW DEEMED INSERTED

Each and every provision of law and clause required by law to be inserted in this Contract shall be deemed to be inserted herein and the Contract shall be read and enforced as though it were included herein and if through mistake or otherwise, any such provision is not inserted or is not correctly inserted, then upon the application of either party, the Contract shall forthwith be physically amended to make such insertion.

7.3 SUCCESSORS AND ASSIGNS

The County and the Contractor each binds himself, his partners, successors, assigns and legal representatives to the other party hereto and to the partners, successors, assigns and legal representatives of such other party in respect to all covenants, agreements and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract or sublet it as a whole without the written consent of the other, nor shall the Contractor assign any monies due or to become due to him hereunder, without the previous written consent of the County and the Contractor's Surety.

In the event the Contractor desires to make an assignment of all or part of the Contract or any monies due or to become due hereunder, the Contractor shall file a copy of consent of surety, together with a copy of the assignment to the County and A/E. In the event the Contractor assigns all or any part of the monies due or to become due under this Contract, the instrument of assignment shall state that the right of assignees in and to any monies due to or to become due to Contractor shall be subject to prior liens and claims of all persons, firms and corporations that provided labor services or furnished material and equipment during the performance of the Work. The rights of assignees shall further be subject to the payment of any liens, claims, or amounts due to Federal, State, or Local governments.

7.4 RIGHTS AND REMEDIES

7.4.1 The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder shall be in addition to and not a limitation of any duties, obligations, rights and remedies otherwise imposed or available by law, not inconsistent with the Contract Documents. No time limitations described in this Contract shall be construed to alter the applicable statutory period of limitations with regard to the enforcement of the obligations of the parties.

7.4.2 No action or failure to act by the County, A/E or Contractor shall constitute a waiver of any right or duty afforded any of them under the Contract, nor shall any such action or failure to act constitute an approval of or acquiescence in any breach thereunder, except as may be specifically agreed in writing.

7.4.3 Contractor agrees that he can be adequately compensated by money damages for any breach of this Contract which may be committed by the County and hereby agrees that, no default, act, or omission of the County or the Architect, except for failure to make payments as required by the Contract Documents, shall constitute a material breach of the Contract entitling Contractor to cancel or rescind the provisions of this Contract or (unless the County shall so consent or direct in writing) to suspend or abandon performance of all or any part of the Work. Contractor hereby waives any and all rights and remedies to which he might otherwise be or become entitled, saving only its right to money damages.

7.5 SEVERABILITY

In the event that any provision of this Agreement shall be adjudged or decreed to be invalid, by a court of competent jurisdiction such ruling shall not invalidate the entire agreement but shall pertain only to the provision in question and the remaining provisions shall continue to be valid, binding, and in full force and effect.

7.6 TESTS

7.6.1 If the Contract Documents, laws, ordinances, rules, regulations, permits, resolutions or orders of any public authority having jurisdiction require any portion of the Work to be inspected, tested or approved, the Contractor shall give the County at least twenty-four (24) hours notice of its readiness so that the County or the A/E or other representatives of the County may observe such inspection, testing or approval. The Contractor shall bear all costs of such inspections, tests or approvals conducted by public authorities. Site inspections, tests conducted on site or tests of materials gathered on site, which the Contract requires to be performed by independent testing entities, shall be contracted and paid for by the County. Examples include, but are not limited to, the testing of cast-in-place concrete, foundation materials, soil compaction, pile installations, caisson bearings, and steel framing connections.

7.6.2 All materials and workmanship (if not otherwise designated by the specifications) shall be subject to inspection, examination or test by the County, A/E, and other representatives of the County, at any and all times during the manufacture and/or construction and at any and all places where such manufacture and/or construction are carried on. Special, full-sized and performance tests shall be as described in the specifications. Without additional charge, the Contractor shall furnish promptly all reasonable facilities, labor and materials necessary to make tests safe and convenient.

7.6.3 The selection of bureaus, laboratories and/or agencies for the inspection and tests of supplies, materials or equipment shall be subject to the approval of the County. Satisfactory documentary evidence, including but not limited to certificates of inspection and certified test reports, that the material has passed the required inspection and tests must be furnished to the County, with a copy to the A/E, by the Contractor prior to the incorporation of the materials in the Work or at such times as to allow for appropriate action by the County.

7.6.4 Inspection or testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor. Tests required by Contractor's or subcontractor's error, omission or non-compliance with the Contract Documents, shall be paid for by the Contractor.

7.6.5 It is specifically understood and agreed that an inspection and approval of the materials by the County shall not in any way subject the County to pay for the said materials or any portion thereof, even though incorporated in the Work, if said materials shall in fact turn out to be unfit to be used in the Work, nor shall such inspection be considered as any waiver of objection to the Work on account of the unsoundness or imperfection of the material used.

ARTICLE 8: CONTRACT TIME

8.1 DEFINITION

8.1.1 Unless otherwise provided, the Contract Time is the period of time specified in the County-Contractor Agreement for Substantial Completion of the Work as defined herein, including authorized adjustments thereto. The Contractor shall complete his Work within the Contract Time.

8.1.2 The date of commencement of the Work is the date established in the Notice to Proceed. It is the intent of the County to issue a Notice to Proceed within thirty (30) calendar days after the execution of the County -Contractor Agreement. The intent of the thirty (30) day period between execution of

the County-Contractor Agreement and the Notice to Proceed is to provide a reasonable time for the Contractor to complete E-Builder training (if required), submission and final approval of all preconstruction submittals to include the payment and performance bonds as required by the specifications, and to hold the Preconstruction meeting. Failure to complete these preconstruction requirements will delay the issuance of the Notice to Proceed. Delays to the issuance of the Notice to Proceed will not result in the adjustment of the completion date, nor will they be considered as a basis for claim for additional contract time and may result in the termination of the contract. The Contractor shall not commence work or store materials or equipment on site until written Notice to Proceed is issued or until the Contractor otherwise receives the County's written consent. The Contractor shall commence work no later than ten (10) days after the date established in the Notice to Proceed.

- 8.1.3 In the event the Contractor, for matters of his convenience, wishes to begin work later than 10 days from the date of Notice to Proceed. The Contractor shall promptly make such a request in writing to the Construction Manager. If the Contractor's requested start date is acceptable to the Construction Manager, the Contractor will be notified in writing; however, the Contract fixed completion date will not be adjusted but will remain binding. The Contractor's request to adjust the start date for the work on the Contract will not be considered as a basis for claim that the time resulting from Contractor's requested start date, if accepted by the Construction Manager, is insufficient to accomplish the work nor shall it relieve the Contractor of his responsibility to perform the work in accordance with the Scope of Work and requirements of the Contract. In no case shall work begin before the County executes the Contract. The Contractor shall notify the Construction Manager at least 48 hours prior to the date on which he plans to begin the work.
- 8.1.4 The date of Substantial Completion of the Work or designated portion thereof is the date determined by County when: (a) construction is sufficiently complete, in accordance with the Contract Documents, so the County can occupy or utilize the Work or designated portion thereof for the use for which it is intended; and (b) the Contractor has satisfied all other requirements for Substantial Completion which may be set forth in the Contract Documents.
- 8.1.5 The date of Final Completion of the Work is the date determined by the County when the Work is totally complete, to include punch list work and closure in accordance with the Contract Documents and the County may fully occupy and utilize the Work for the use for which it is intended.
- 8.1.6 The term "day" as used in the Contract Documents shall mean calendar days unless otherwise specifically designated.

8.2 PROGRESS AND COMPLETION

- 8.2.1 All time limits stated in the Contract Documents are of the essence of the Agreement.
- 8.2.2 The Contractor shall begin the Work on the date of commencement as defined herein. He shall carry the Work forward expeditiously with adequate forces and shall achieve Substantial and Final Completion as required by the Contract Documents.

8.3 CLAIMS FOR TIME EXTENSIONS

- 8.3.1 The time during which the Contractor is delayed in the performance of the Work by the acts or omissions of the County, the A/E or their employees or agents, acts of God, unusually severe and abnormal climatic conditions, fires, floods, epidemics, quarantine restrictions, strikes (not to exceed the actual duration of the strike), riots, civil commotion or freight embargoes, or other conditions beyond the Contractor's control and which the Contractor could not reasonably have foreseen and provided against, shall be added to the time for completion of the Work (i.e., the Contract Time) stated in the Agreement; however, no claim by the Contractor for an extension of time for delays will be considered unless made in compliance with the requirements of this Article and other provisions of the Contract Documents.

- 8.3.2 The County shall not be obligated or liable to the Contractor for, and the Contractor hereby expressly waives any claims against the County on account of any indirect or direct damages, costs or expenses of any nature which the Contractor, its subcontractors, or sub-subcontractor's or any other person may incur as a result of (a) any delays, reasonable or unreasonable, foreseeable or unforeseeable which are either not caused by the acts or omissions of the County, its agents or employees or which arise from or out of (or due to) causes not within the control of the County, its agents or employees, or (b) any reasonable delay regardless of its cause, it being understood and agreed that the Contractor's sole and exclusive remedy in any such events shall be an extension of the Contract Time, but only as determined in accordance with the provisions of the Contract Documents.
- 8.3.3 The burden of proof to substantiate a claim for an extension of the Contract Time shall rest with the Contractor, including evidence that the cause was beyond his control. It shall be deemed that the Contractor has control over the supply of labor, materials, equipment, methods and techniques of construction and over the subcontractors and suppliers, unless otherwise specified in the Contract Documents.
- 8.3.4 In the event of Changes in the Work, the Contractor must identify any additional time required in the Proposed Change Order. The County need not consider any time extensions for Changes in the Work not included in the Proposed Change Order.
- 8.3.5 No time extensions will be granted as a result of the Contractor's improper or unreasonable scheduling or for the Contractor's failure to have Shop Drawings, Product Data, Samples or Manuals submitted in ample time for review under a reasonable and agreed upon schedule.
- 8.3.6 Delays by subcontractors or suppliers will not be considered justification for a time extension, except for the same valid reasons and conditions enumerated herein.
- 8.3.7 The Contractor acknowledges and agrees that actual delays due to changes, suspension of work or excusable delays, in activities which according to the schedule do not affect the Contract Time will not be considered to have any effect upon the Contract Time and therefore will not be the basis for a time extension.
- 8.3.8 The Contractor acknowledges and agrees that time extensions will be granted only to the extent that: (a) excusable delays exceed the available flexibility in the Contractor's schedule; and (b) Contractor can demonstrate that such excusable delay actually caused, or will cause, delay to the Contractor's schedule that will extend the Contract Time.
- 8.3.9 With respect to Suspensions of Work under Paragraph 3.6 Suspension of Work herein, the Contractor may be entitled to an extension of the Contract Time not to exceed the length of time that the Work was suspended (unless as determined under this Article and the other requirements of the Contract Documents that a further extension is justified and warranted) if the claim is submitted in accordance with the requirements of this Article, and if the suspension is not due to any act or omission of the Contractor, any subcontractor or sub-subcontractor or any other person or organization for whose acts or omission the Contractor may be liable. The Contractor's claim will be evaluated in accordance with the terms of this Article.
- 8.3.10 The Contractor shall not be entitled to any extension of time for delays resulting from any conditions or other causes unless it shall have given written Notice to the County, within seven (7) calendar days following the commencement of each such condition or cause, describing the occurrence, the activities impacted and the probable duration of the delay. The Contractor's complete claim submittal for a time extension shall be submitted no later than twenty (20) calendar days after cessation of the delay or within such other longer period as the County may agree in writing to allow.
- 8.3.11 No such extension of time shall be deemed a waiver by the County of his right to terminate the Contract for abandonment or delay by the Contractor as herein provided or to relieve the Contractor from full responsibility for performance of his obligations hereunder.

8.4 CHANGE ORDER WORK

8.4.1 The Contractor shall make every reasonable effort to perform Change Order work within the Contract Time and in such manner as to have minimum delaying effects on all remaining work to be performed under the Contract. If, however, the Change Order work results in an unavoidable increase in the time required to complete the project, an extension of the Contract Time may be granted to the Contractor for the Change Order work. The Contractor's request therefor shall be determined in accordance with the provisions of Article 8.3 Claims for Time Extensions herein and as follows:

8.4.1.1 If the time required for performance of the Change Order work has an unavoidable direct delaying effect on the primary sequence of work activities remaining after rescheduling (e.g., the critical path in CPM type scheduling), the overall Contract time may be extended by the minimum number of days required for the Change Order work as mutually agreed upon by the County and the Contractor;

8.4.1.2 If the time required for performance of the Change Order work does not have an unavoidable direct delaying effect on the primary sequence of work activities but is ordered by the County at a time such that insufficient Contract Time remains for completion of the Change Order work (and any limited number of contingent work activities), the Contract Time may be extended by the minimum number of days required for the Change Order work as mutually agreed upon by the County and the Contractor but only for the Change Order work and contingent activities, all other unaffected work shall be performed within the Contract Time;

8.4.1.3 Failure of the County and the Contractor to agree on a Contract Time extension as specified in .1 and .2 above shall not relieve the Contractor from proceeding with and performing the Change Order work promptly, as well as in such manner as to have minimal delaying effects on all remaining work to be performed under the Agreement. Such disagreement shall be resolved as soon as practical by negotiation.

8.5 LIQUIDATED DAMAGES FOR DELAY

8.5.1 The damages incurred by the County due to the Contractor's failure to complete the Work within required Milestone dates and the Contract Time, including any extensions thereof, shall be in the amount set forth in the County-Contractor Agreement, for each consecutive day beyond the Milestone dates or the Contract Time (Sundays and all holidays included) for which the Contractor shall fail to complete the Work.

8.5.2 The amount of liquidated damages provided in this Contract is neither a penalty nor a forfeiture and shall compensate the County solely for the County's inability to use the Work for its fully intended purpose, and is not intended to, nor does said amount include: (a) any damages, additional or extended costs, incurred by the County for extended administration of this Contract, or by the County's agents, consultants or independent contractors for extended administration of this Contract, or (b) any additional services, relating to or arising as a result of the delay in the completion of the Work. County shall be entitled to claim against Contractor for its actual damages and any amounts not specifically included within the liquidated damages as set forth herein. Such costs shall be computed separately and together with liquidated damages, either deducted from the Contract Sum or billed to the Contractor, at the option of the County.

8.6 TIME EXTENSIONS FOR WEATHER

8.6.1 The Contract Time will not be extended due to inclement weather conditions that are normal to the general locality of the Work site. The time for performance of this Contract is in calendar days and all requests for time extension due to inclement weather shall be made in calendar days.

8.6.2 The following is the schedule of monthly anticipated normal inclement weather days for the project location and will constitute the base line for monthly weather time extension evaluations. The anticipated normal inclement weather calendar days have been included in the designated contract time for completion.

January	7
February	7
March	7
April	7
May	9
June	7
July	7
August	7
September	6
October	6
November	6
December	7

8.6.3 The Contractor, in his planning and scheduling of the Work as required by the Contract Documents, shall allow for the normal inclement weather for the locality of the Work site. If the Contractor believes that the Progress of the Work has been adversely affected and that it will directly result in a failure to meet a Contract Milestone date or Completion within the Contract Time, by weather conditions above and beyond the amount normally expected, he shall submit a written request to the County with a copy to the A/E for an Extension of Time, pursuant to Paragraph 8.3 Claims for Time Extensions. Such request shall be evaluated by the County in accordance with the provisions of the Contract Documents.

8.6.4 The Contractor shall not be entitled to any money damages whatsoever for any delays resulting from inclement weather, whether normal or abnormal, foreseeable or unforeseeable. The Contractor and County stipulate and agree that for delays due to weather as determined in 8.6.3, the Contractor's sole relief is a time extension granted in accordance with this Article 8.6 Time Extensions for Weather.

ARTICLE 9: PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

9.1.1 The Contract Sum is stated in the County-Contractor Agreement and, including authorized adjustments thereto, is the total amount payable by the County to the Contractor for the performance of the Work under the Contract Documents. The Contract Sum includes, but is not limited to, the Contractor's profit and general overhead and all costs and expenses of any nature whatsoever (including without limitation taxes, labor and materials), foreseen or unforeseen, and any increases in said costs and expenses, foreseen or unforeseen, incurred by the Contractor in connection with the performance of the Work, all of which costs and expenses shall be borne solely by the Contractor. The Contractor agrees to assume all increases in costs of any nature whatsoever that may develop during the performance of the Work.

9.2 SCHEDULE OF VALUES

9.2.1 For Lump Sum Price Type Contracts, before the pre-construction meeting, the Contractor shall submit to the County and A/E, a schedule of values allocated to the various portions of the Work, prepared on payment forms provided by the County and supported by such data to substantiate its accuracy as the County may require. This schedule of values, unless rejected by the County, shall be used as a basis for the Contractor's Applications for Payment.

- 9.2.2 For Unit Price type Contracts, the Contractor shall utilize the payment request form provided by the County, wherein the schedule of values shall correspond with the individual unit price bid items. When so requested by the County, the Contractor shall provide a more detailed cost breakdown of the unit price items.
- 9.2.3 Contractor may include in his schedule of values a line item for "mobilization" which shall include a reasonable amount for mobilization for the Contractor and his subcontractors. The Contractor shall not front-end load his schedule of values.

9.3 APPLICATION FOR PAYMENT

- 9.3.1 The Contractor shall submit to the A/E an itemized Application for Payment on or about the first day of each month as designated in Article 4 of the County-Contractor Agreement. The Application for Payment shall be notarized, indicate in complete detail all labor and material incorporated in the Work during the month prior to submission, and supported by such data substantiating the Contractor's payment request as the County may require. The Application for Payment shall also contain Contractor's certification that due and payable amounts and bills have been paid by the Contractor for work for which previous Certificates of Payment were issued and payments received from the County.
- 9.3.2 Payment may be made for the value of materials, which are to be incorporated into the finished Work, and which are delivered to and suitably stored and protected on the Work site. The Contractor shall provide releases or paid invoices from the Seller to establish, to the County's satisfaction, that the County has title to said material. Stored materials shall be in addition to the Work completed and shall be subject to the same retainage provisions as the completed Work. Material once paid for by the County becomes the property of the County and may not be removed from the Work site without the County's written permission.
- 9.3.3 The requirements for the payment of materials stored on-site shall remain unchanged. The requirements for payment for materials stored off-site shall include, but is not limited to, those specified in Paragraph 9.3.2 and the additional requirements hereinafter specified. Material stored off-site under this provision shall be included in the definition of Work, Article 1 Contract Documents.
- 9.3.3.1 The requirements of Paragraph 10.2 Safety of Persons and Property are fully applicable to materials stored off-site.
- 9.3.3.2 For purposes of administering this provision, the following definitions are provided.
- a. Material stored NEAR the Work Site: A storage location shall be considered near the work site if it is not more than fifty (50) miles (approximately a one-hours drive) from the Work Site.
- b. Material stored DISTANT from the Work Site: Locations beyond the limit of fifty (50) miles shall be considered distant.
- 9.3.3.3 All proposed off-site locations, regardless of whether they are near or distant, shall be approved by the County prior to any payment under this Article. The approval process will include an inspection of the proposed storage site, which may or may not coincide with any inspection of materials stored.
- 9.3.3.4 Prior to payment for any material stored off-site, said material shall be inspected to verify that it is properly stored; i.e., segregated, inventoried, identified as the property of the County and Contractor and duly protected as required in Article 10.2 Safety of Persons and Property. This material shall be clearly identified and physically segregated from any other material or stock, in such a manner that it is clear, from casual observation, that said material is not a part of any other stock or

stored material.

- 9.3.3.5 For materials stored distant to the Work site, the Contractor shall reimburse the County for all reasonable costs incurred by the County, to include but not limited to salary, transportation, lodging and per diem, for the County's or the A/E's employees to travel to and from the storage locations for the purpose of verifying the material is properly stored. It is anticipated that such trips would occur whenever additional material is claimed for payment and/or at least every six (6) months until the material is delivered to the work site.
- 9.3.3.6 Except for unusual circumstances, the Contractor will not be required to reimburse the County's costs for visits to storage locations near the work site.
- 9.3.3.7 The Contractor shall hold the County harmless from any and all losses, additional costs, direct or indirect damages and/or delays, whatsoever, which may occur as a result of a failure of the Contractor to deliver (or have delivered), in a timely manner, materials (for which payment has been made) to the work site for installation and incorporation into the Work.
- 9.3.3.8 The Contractor shall provide to the County, a Release of Lien or other suitable certification by the Seller, in addition to paid invoices, verifying that the Contractor has valid title to all materials for which payment is requested. The Seller, however, shall not be required to waive his rights for recovery, if his Contract is breached.
- 9.3.4 The Contractor warrants that title to all Work, materials and equipment covered by an Application for Payment will pass to the County either by incorporation in the construction or upon the receipt of payment by the Contractor, whichever occurs first, free and clear of all liens, claims, security interests or encumbrances, hereinafter referred to as "liens". The Contractor further warrants that no Work, materials or equipment covered by an Application for Payment will have been acquired by the Contractor or by any other person performing Work at the site or furnishing materials and equipment for the Project that is subject to an agreement under which an interest therein or an encumbrance thereon is retained by the seller or otherwise imposed by the Contractor or such other person.
- 9.3.5 The Contractor's Application for Payment shall provide that the payment request attests that all Work for which the request is made has been completed in full according to the drawings, specifications and other terms of the Contract Documents. By submitting his Application for Payment, the Contractor also represents that he has no knowledge that any subcontractor or suppliers have not been fully and timely paid and that, insofar as he knows, the only outstanding items for payment with respect to the Contract are those to be paid from the funds for which Application is being made.

9.4 CERTIFICATES FOR PAYMENT

- 9.4.1 The A/E will, within seven (7) calendar days after the receipt of the Contractor's Application for Payment, recommend a Certificate for Payment to the County, for such amount as the A/E determines is properly due, with his reasons for withholding or adjusting a Certificate as provided in Paragraph 9.6 Payments Withheld, if any.
- 9.4.2 After the Certificate for Payment is recommended by the A/E, the County will review it and make any changes deemed necessary by the County's Representative. The recommendation of the Certificate for Payment by the A/E does not waive or limit the County's right to reduce the amount of the payment due to the Contractor as determined to be appropriate by the County.
- 9.4.3 The recommendation of a Certificate for Payment will constitute a representation by the A/E to the County, based on his observations at the site as provided in Article 2 Architect/Engineer hereof and the data comprising the Application for Payment, that the Work has progressed to the point indicated; that, to the best of his knowledge, information and belief: (a) the quality of the Work is in accordance with the Contract Documents (subject to an evaluation of the Work for conformance

with the Contract Documents upon Substantial or Final Completion, to the results of any subsequent tests required by or performed under the Contract Documents, to minor deviations from the Contract Documents correctable prior to completion, and to any specific qualifications stated in his Certificate); and that (b) the Contractor is entitled to payment in the amount certified. However, by recommending a Certificate for Payment, the A/E shall not thereby be deemed to represent that he has made exhaustive or continuous on-site inspections to check the quality or quantity of the Work or that he has reviewed the construction means, methods, techniques, sequences or procedures, or that he has made any examination to ascertain how or for what purpose the Contractor has used the moneys previously paid on account of the Contract Sum.

9.5 PROGRESS PAYMENTS

- 9.5.1 The County shall make payment in the manner and within twenty-three (23) calendar days after receipt of the Certificate of Payment from the A/E based upon the County's approval or adjustment of said Certificate. The Contractor shall be paid the amount approved or adjusted by the County, less five percent (5%) retainage which is being held to assure faithful performance; provided however, that said retainage is not applicable to Time and Material Change Orders.
- 9.5.2 In relation to punch list or other uncompleted work and in lieu of a portion of the above-specified five percent (5%) retainage, the County may, at its sole discretion, elect to retain fixed amounts directly relating to the various items of uncompleted Work. All amounts withheld shall be included in the Final Payment.
- 9.5.3 The Contractor shall, within seven (7) days after receiving payment from the County, do one of the following:
- 9.5.3.1 Pay all subcontractors for the proportionate share of the total payment received from the County for work performed by each subcontractor under the Contract; or
- 9.5.3.2 Notify the County and subcontractor(s), in writing, of his intention to withhold all or part of the subcontractor's payment with the reason for nonpayment.
- 9.5.4 The Contractor shall make payment to subcontractors as heretofore specified. Each payment shall reflect the percentage actually retained, if any, from payments to the Contractor on account of such subcontractor's Work.
- 9.5.5 The Contractor shall provide the County with his social security number, if an individual, and their federal identification number if a corporation, partnership, or proprietorship.
- 9.5.6 The Contractor shall be obligated to pay unpaid subcontractors interest on payments that are not made in accordance with this Article 9.5 Progress Payments. The rate of interest shall be in compliance with the Prompt Payment section of the Virginia Public Procurement Act of the Code of Virginia. The Contractor shall, by an appropriate agreement with each subcontractor require each subcontractor to make payments to his subsubcontractors according to all the same requirements as provided in this Article 9.5 Progress Payments.
- 9.5.7 The County may, upon written request, furnish to any subcontractor, if practicable, information regarding the percentages of completion or the amounts applied for by the Contractor and the action taken thereon by the County on account of Work done by such subcontractor.
- 9.5.8 Neither the County nor the A/E shall have any obligation to pay or to see to the payment of any monies to any subcontractor except as may otherwise be required by law.
- 9.5.9 No Certificate for a progress payment, nor any progress payment, nor any partial or entire use or occupancy of the Project by the County, shall constitute an acceptance of any Work not in accordance with the Contract Documents.

9.6 PAYMENTS WITHHELD

- 9.6.1 The County may withhold the payment in whole or in part, if necessary to reasonably protect the County. If the A/E is unable to make representations as provided in subparagraph 9.4.3 and to recommend payment in the amount of the application, he will notify the County as provided in subparagraph 9.4.1. If the Contractor and the County cannot agree on a revised amount, the County will promptly issue a Certificate for Payment for the amount for which he is able to make representations with respect to payment due for work performed. The County may also decline to certify or make payment or, because of subsequently discovered evidence or subsequent observations, the County may nullify the whole or any part of any Certificate for Payment previously issued.
- 9.6.2 The County may withhold from the Contractor so much of any payment approved by the A/E, as may in the judgment of the County be necessary:
- 9.6.2.1 To protect the County from loss due to defective work not remedied;
 - 9.6.2.2 To protect the County upon receipt of Notice of the filing in court or in an arbitration proceeding as may be required in any third party contract, of verified claims of any persons supplying labor or materials for the Work, or other verified third party claims;
 - 9.6.2.3 To protect the County upon reasonable evidence that the Work will not be completed for the unpaid balance of the Contract Sum;
 - 9.6.2.4 To protect the County upon reasonable evidence that the Work will not be completed within the Contract Time, or any Contract Milestones as established by this Contract; or
 - 9.6.2.5 To protect the County upon the Contractor's failure to properly schedule and coordinate the work in accordance with or as required by the Contract Documents, or failure to provide progress charts, revisions, updates or other scheduling data as required by the Contract Documents, or upon the Contractor's failure to provide as-built drawings as required herein, or upon Contractor's failure to otherwise substantially or materially comply with the Contract Documents.
- 9.6.3 If required by the County-Contractor Agreement, the Contractor shall, concurrent with his submission of the Construction Schedule, submit a practicable and realistic payment schedule showing the dates on which the Contractor will submit each and every Application for Payment and the amount he expects to receive for each and every monthly progress payment. If during the performance of the Work, the Contractor expects to receive an amount for a monthly progress payment larger than that indicated on the payment schedule, the Contractor shall notify the County at least thirty (30) days in advance of that payment so that the necessary allocation of funds can be processed. In the event the Contractor fails to submit a practicable and realistic payment schedule, the Contractor's Application for Payment shall be honored only to the extent that the Work is actually performed and that the proportion of payments made to the Contract Sum does not exceed the proportion of the Contract Time expired as of the time of the request.

9.7 FAILURE OF PAYMENT

If the County does not make payment to the Contractor within the thirty (30) calendar days after receipt of the Contractor's Application for Payment by the A/E through no fault of Contractor, and the County otherwise not being entitled under the Contract Documents or applicable law to withhold payment, then the Contractor may, upon fifteen (15) additional days' written Notice to the County and the A/E, stop the Work until payment of the amount owing has been received. In such event, the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, which shall be effected by appropriate Change Order as provided herein.

9.8 SUBSTANTIAL COMPLETION AND GUARANTEE BOND

9.8.1 Unless otherwise specified in Article 9.9 Final Completion and Final Payment, when the Contractor considers that the Work, or a designated portion thereof which is acceptable to the County, is substantially complete as defined in Article 8 Contract Time, the Contractor shall request in writing that the A/E and the County perform a Substantial Completion inspection. Prior to such inspection the Contractor shall:

9.8.1.1 If applicable, secure a Certificate of Occupancy for the Project or a designated portion thereof; and

9.8.1.2 Submit five (5) copies each of the Operations and Maintenance Manuals to the A/E as specified and one (1) copy to the County.

9.8.2 The County shall determine whether the project is substantially complete and shall compile a punch list of items to be completed or corrected. 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 Documents.

9.8.3 When the County on the basis of his inspection determines that the Work or a designated portion thereof is substantially complete, the A/E will then prepare a Certificate of Substantial Completion which shall establish the Date of Substantial Completion and shall state the responsibilities of the County and the Contractor for security, maintenance, heat, utilities, damage to the Work and insurance. The Certificate of Substantial Completion shall be submitted to the County and the Contractor for their written acceptance of the responsibilities assigned to them in such Certificate.

9.8.4 The Contractor shall have the number of days from the Date of Substantial Completion as shown in Article 2 of the County-Contractor Agreement to complete all items on the punch list to the satisfaction of the County. If the Contractor fails to complete all punch list items within the designated time, the County shall have the option to correct or conclude any remaining items by utilizing its own forces or by hiring others. The cost of such correction of remaining punch list items by the County or others shall be deducted from the final payment to the Contractor.

9.8.5 Guarantees and warranties required by the Contract Documents shall commence on the Date of Final Completion of the Work, unless otherwise provided in the Certificate of Substantial or Final Completion, or the Contract Documents. Provided, however, that if Contractor does not complete certain punch list items within this time period, specified in 9.8.4, all warranties and guarantees for such incomplete Punch List items shall become effective upon issuance of final payment for the project.

9.8.5.1 The Contractor shall guarantee for a term of one (1) year from the date of Final Completion or Final Payment, (unless otherwise provided for in the Certificate(s) of Substantial or Final Completion or the Contract Documents): (a) the quality and stability of all materials equipment and Work; (b) all the Work against defects in materials, equipment or workmanship; and (c) all shrinkage, settlement or other faults of any kind which are attributable to defective materials or workmanship. The Contractor shall remedy at his own expense, when so notified in writing to do so by the County, and to the satisfaction of the County, the Work or any part thereof that does not conform to any of the warranties and guaranties described in the Contract Documents.

9.8.5.2 In order to make good the guarantee as herein required, the Contractor shall deposit with the County, after Substantial Completion but before Final Payment, a Guarantee Bond(s) issued by a surety licensed to do business in Virginia and otherwise acceptable to the County, for the faithful performance of the guarantee. Said Bond(s) shall be for a period of one (1) year and in the amount of five percent (5%) of the final gross value of the Contract.

9.8.5.3 The Contractor shall complete repairs during the guarantee period, within five (5) working days after the receipt of notice from the County and if the Contractor shall fail to complete such repairs within the said five (5) working days, the County may employ such other person or persons as it may deem proper to make such repairs and pay the expenses thereof out of any sum retained by it, provided nothing herein contained shall limit the liability of the Contractor or his surety to the County for non-performance of the Contractor's obligations at any time.

9.8.6 The issuance of the Certificate of Substantial Completion does not indicate final acceptance of the project by the County, and the Contractor is not relieved of any responsibility for the project except as specifically stated in the Certificate of Substantial Completion.

9.8.7 Upon Substantial Completion of the Work, or designated portion thereof, and upon application by the Contractor and certification by the A/E, the County shall make payment, adjusted for retainage and payments withheld, if any, for such Work or portion thereof, as provided in the Contract Documents.

9.8.8 Should the County determine that the Work or a designated portion thereof is not substantially complete, he shall provide the Contractor a written notice stating why the project or designated portion is not substantially complete. The Contractor shall expeditiously complete the Work and shall re-request in writing that the County perform a substantial completion inspection.

9.9 FINAL COMPLETION AND FINAL PAYMENT

9.9.1 A Certificate of Final Completion shall be issued by the A/E prior to final payment. At the County's sole option, this Final Completion Certificate may be issued without a Certificate of Substantial Completion. The Contractor, prior to application for Final Payment and within the time specified for completion of the Work, shall complete all Work, to include punch list items and provide operating manuals and as-built data, for the Work, as completed and in place. Said Certificate of Final Completion shall be issued, even if a Certificate of Substantial Completion has been issued previously and temporary authority to operate the Work has been granted.

9.9.1.1 The Certificate of Final Completion shall certify that all Work has been completed in accordance with Contract Documents and is ready for use by the County.

9.9.2 For all projects where Substantial Completion Certificates have been issued for various portions of the Work, at differing times, the Contractor shall request and the County shall, prior to final payment, issue a Certificate of Final Completion which certifies that all required Work, including punch list items, has been completed in accordance with the Contract Documents.

9.9.3 Neither the final payment nor any remaining retainage shall become due until the Contractor submits to the A/E the following:

9.9.3.1 An Application for Payment for all remaining monies due under the Contract.

9.9.3.2 Consent of surety, if any, to final payment;

9.9.3.3 If required by the County, other data establishing payment or satisfaction of all such obligations, such as receipts, releases and waivers of claims arising out of the Agreement, to the extent and in such form as may be designated by the County. If any subcontractor refuses to furnish waiver of claims satisfactory to the County, the Contractor may furnish a bond satisfactory to the County to indemnify him against any such claim. If any such claim remains unsatisfied after all payments are made, the Contractor shall refund to the County all monies that the latter may be compelled to pay in discharging such claim, including all costs and reasonable

attorneys' fees;

9.9.3.4 As-built drawings, operation and maintenance manuals and other project closeout submittals, as required by the Contract Documents;

9.9.3.5 Construction releases as required by the Contract Documents from County property on whose property an easement for construction of this project has been obtained by the County, such release to be in the forms to be provided by the County. This release is for the purpose of releasing the County and the Contractor from liability, claims, and damages arising from construction operations on or adjacent to the easement and includes proper restoration of the property after construction. It shall be the Contractor's sole responsibility to obtain all such releases and furnish them to the County; and

9.9.3.6 A written certification that:

a. The Contractor has reviewed the requirements of the Contract Documents,

b. The Work has been inspected by the Contractor for compliance with all requirements of the Contract Documents,

c. Pursuant to this inspection, the Contractor certifies and represents that the Work complies in all respects with the requirements of the Contract Documents,

d. The Contractor further certifies and represents that all equipment and systems have been installed in accordance with the Contract Documents and have been tested in accordance with specification requirements and are operational, and

e. The Contractor hereby certifies and represents that the Work is complete in all respects and ready for final inspection.

9.9.4 Upon receipt of the documents required in subparagraph 9.9.3 and upon receipt of a final Application for Payment, the A/E and County will promptly make a final inspection. When the A/E finds the Work acceptable under the Contract Documents and the Contract fully performed, he will promptly issue a final Certificate for Payment and a Final Certificate of Completion. The Certificate of Completion will state that to the best of his knowledge, information and belief, and on the basis of his observations and inspections, the Work has been completed in accordance with the terms and conditions of the Contract Documents and that the entire balance designated in the final certificate for payment is due and payable. The final Certificate for Payment will constitute a further representation that the conditions precedent to the Contractor's being entitled to final payment as set forth in Subparagraph 9.9.3 have been fulfilled. The County shall review the Certificate of Payment and shall accept it and issue final acceptance, or reject it and notify the Contractor, within ten (10) days. Final payment to the Contractor shall be made within thirty (30) days after final acceptance. All prior estimates and payments, including those relating to change order work shall be subject to correction by this final payment.

9.9.5 The making of Final Payment shall constitute a waiver of all claims by the County, except those arising from:

9.9.5.1 Unsettled claims;

9.9.5.2 Faulty, defective, or non-conforming Work discovered or appearing after Substantial or Final Completion;

- 9.9.5.3 Failure of the Work to comply with the requirements of the Contract Documents;
 - 9.9.5.4 Terms of any warranties or guarantees required by the Contract Documents; or
 - 9.9.5.5 Fraud or bad faith committed by the Contractor or any subcontractor or supplier during performance of work but discovered by County after Final Payment.
- 9.9.6 The acceptance of Final Payment shall constitute a waiver of all claims by the Contractor, except those previously made in writing and so identified by the Contractor, as unsettled at the time of the final Application for Payment. No payment, however, final or otherwise, shall operate to release the Contractor or his sureties from any obligations under this Contract or the Performance or the Guarantee Bonds.

ARTICLE 10: PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

- 10.1.1 The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. The requirement applies continuously throughout the Contract performance, until Final Payment is made, and is not limited to regular working hours.

10.2 SAFETY OF PERSONS AND PROPERTY

- 10.2.1 The Contractor shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury or loss to:
 - 10.2.1.1 All employees on the Work and all other persons who may be affected thereby;
 - 10.2.1.2 All the Work and all materials and equipment to be incorporated therein, whether in storage on or off the site, under the care, custody or control of the Contractor or any of his subcontractors or sub-subcontractor's. Machinery, equipment and all hazards shall be guarded or eliminated in accordance with the safety provisions of the Manual of Accident Prevention in Construction published by the Associated General Contractors of America, to the extent that such provisions are not in contravention of applicable law; and
 - 10.2.1.3 Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.
- 10.2.2 The Contractor shall give all notices and comply with all applicable laws, ordinances, rules, regulations, permits, resolutions and lawful orders of any public authority bearing on the safety of persons or property or their protection from damage, injury or loss. The Contractor shall at all times safely guard the County's property from injury or losses in connection with the Contract. He shall at all times safely guard and protect his own work and adjacent property as provided by law and the Contract Documents, from damage. All passageways, guard fences, lights and other facilities required for protection by local authorities or local conditions must be provided and maintained without additional cost to the County.
- 10.2.3 The Contractor shall erect and maintain, as required by existing conditions and progress of the Work, all reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying Owners and users of adjacent utilities.
- 10.2.4 When the use or storage of explosives or other hazardous materials or equipment is necessary for the execution of the Work, the Contractor shall exercise the utmost care and shall carry on such activities under the supervision of properly qualified personnel.

- 10.2.5 The Contractor is responsible for the proper packing, shipping, handling and storage (including but not limited to shipment or storage at the proper temperature and humidity) of materials to be incorporated in the Work, so as to insure the preservation of the quality and fitness of the material for proper installation and incorporation in the Work, as required by the Contract Documents. For example, but not by way of limitation, Contractor shall, when necessary, place material on wooden platforms or other hard and clean surfaces and not on the ground and/or place such material under cover or in any appropriate shelter or facility. Stored materials or equipment shall be located so as to facilitate proper inspection. Material and equipment that is delivered crated shall remain crated until ready for installation. Lawns, grass plots or other private property shall not be used for storage purposes without the written permission of the County or lessee unless otherwise within the terms of the easements obtained by the County.
- 10.2.6 In the event of any indirect or direct damage to public or private property referred to in Paragraphs 10.2.1.2 and 10.2.1.3, caused in whole or in part by an act, omission or negligence on the part of the Contractor, any subcontractor, any sub-subcontractor, or anyone directly or indirectly employed by any of them or by anyone for whose acts any of them may be liable, the Contractor shall at his own expense and cost promptly remedy and restore such property to a condition equal to or better than existing before such damage was done. The Contractor shall perform such restoration by underpinning, replacing, repairing, rebuilding, replanting, or otherwise restoring as may be required or directed by the County, or shall make good such damage in a satisfactory and acceptable manner. In case of failure on the part of the Contractor to promptly restore such property or make good such damage, the County may, upon two (2) calendar days written Notice, proceed to repair, replace, rebuild or otherwise restore such property as may be necessary and the cost thereof, or a sum sufficient in the judgment of the County to reimburse the Owners of property so damaged, will be deducted from any monies due or to become due the Contractor under the Agreement.
- 10.2.7 The Contractor shall designate a responsible member of his organization at the site whose duty shall be the prevention of accidents and the protection of material, equipment and other property. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the County.
- 10.2.8 The Contractor shall not load or permit any part of the Work to be loaded so as to endanger the safety of any portion of the Work.
- 10.2.9 The Contractor shall give notice in writing at least forty-eight (48) hours before breaking ground, to all persons, Public Utility Companies, owners of property having structures or improvements in proximity to site of the Work, superintendents, inspectors, or those otherwise in charge of property, streets, water pipes, gas pipes, sewer pipes, telephone cables, electric cables, railroads or otherwise, who may be affected by the Contractor's operation, in order that they may remove any obstruction for which they are responsible and have representative(s) on site to see that their property is properly protected. Such notice does not relieve the Contractor of responsibility for any damages and claims. Nor does such notice relieve the Contractor from his responsibility to defend and indemnify the County from actions resulting from the Contractor's performance of such work in connection with or arising out of the Contract.
- 10.2.10 The Contractor shall protect all utilities encountered while performing its work, whether indicated on the Contract Drawings or not. The Contractor shall maintain utilities in service until moved or abandoned. The Contractor shall exercise due care when excavating around utilities and shall restore any damaged utilities to the same condition or better as existed prior to starting the Work, at no cost to the County. The Contractor shall maintain operating utilities or other services, even if they are shown to be abandoned on the Contract Drawings, in service until new facilities are provided, tested and ready for use.
- 10.2.11 The Contractor shall return all improvements on or about the site and adjacent property which are not shown to be altered, removed or otherwise changed to conditions which existed prior to starting work.

10.2.12 The Contractor shall protect the Work, including but not limited to, the site, stored materials and equipment, excavations, and excavated or stockpiled soil or other material, intended for use in the Work, and shall take all necessary precautions to prevent or minimize damage to same and to prevent detrimental effect upon his performance or that of his subcontractors, caused by or due to rain, snow, ice, run-off, floods, temperature, wind, dust, sand and flying debris. For example, but not by way of limitation, Contractor shall, when necessary, utilize temporary dikes, channels or pumping to carry-off, divert or drain water, and shall as necessary tie-down or otherwise secure the Work and employ appropriate covers and screens.

10.3 OBLIGATION OF CONTRACTOR TO ACT IN AN EMERGENCY

10.3.1 In case of an emergency that threatens immediate loss or damage to property and/or safety of life, the Contractor shall act to prevent threatened loss, damage, injury or death. The Contractor shall notify the County of the situation and all actions taken immediately thereafter. If the Contractor fails to act and any loss, damage, injury or death occurs that could have been prevented by the Contractor's prompt and immediate action, the Contractor shall be fully liable to the County or any other party for all costs, damages, claims, actions, suits, costs of defense, and all other expenses arising therefrom or relating thereto.

10.3.2 Prior to commencing his work and at all times during the performance of the Work, the Contractor shall provide the County two (2), twenty-four hour (24) emergency phone numbers where his representatives can be contacted.

ARTICLE 11: INSURANCE

11.1 CONTRACTOR'S INSURANCE REQUIREMENTS

11.1.1 The Contractor shall be responsible for its work and every part thereof, and for all materials, tools, equipment, appliances, and property of any and all description used in connection therewith. The Contractor assumes all risk of direct and indirect damage or injury to the property or persons used or employed on or in connection with the work contracted for, and of all damage or injury to any person or property wherever located, resulting from any action, omission, commission or operation under the Contract.

11.1.2 The Contractor shall, during the continuance of all work under the Contract provide, and require that its subcontractors provide, the following:

11.1.2.1 Maintain Workers' Compensation and Employer's Liability to protect the Contractor from any liability or damages for any injuries (including death and disability) to any and all of its employees, including any and all liability or damage which may arise by virtue of any statute or law in force within the Commonwealth of Virginia.

11.1.2.2 The Contractor agrees to maintain Comprehensive General Liability insurance to protect the Contractor, its subcontractors, and the interest of the County, its officers, employees, and agents against any and all injuries to third parties, including bodily injury and personal injury, wherever located, resulting from any action or operation under the Contract or in connection with the contracted work. The General Liability insurance shall also include the Broad Form Property Damage endorsement, in addition to coverage for explosion, collapse, and underground hazards, where required.

11.1.2.3 The Contractor agrees to maintain owned, non-owned, and hired Automobile Liability insurance, covering all owned, non-owned, borrowed, leased, or rented vehicles operated by the Contractor. In addition, all mobile equipment used by the

Contractor in connection with the contracted work, will be insured under either a standard Automobile Liability policy, or a Comprehensive General Liability policy.

11.1.2.4 Builder's Risk Policy: The Contractor shall provide Builder's Risk and Fire and Extended Coverage insurance to protect the County and Contractor and subcontractors. Such insurable value shall reflect any increases to the Contract amount through Change Orders. Policy to be in Builder's Risk Completed Value forms, including the following:

- a. Policies shall be written to include the names of Contractors and County and the words "as their interest may appear";
- b. All insurance shall be in effect on or before the date when construction work is to commence; and
- c. All insurance shall be maintained in full force and effect until the final acceptance of the project by the County.

11.1.2.5 The Contractor shall purchase and maintain such boiler and machinery insurance as may be required by the Contract Documents. This insurance shall include the interests of the County, the Contractor and subcontractors.

11.1.3 The Contractor agrees to provide the above referenced policies with the following limits. Liability insurance limits may be arranged by General Liability and Automobile Liability policies for the full limits required, or by a combination of underlying policies for lesser limits with the remaining limits provided by an Excess or Umbrella Liability policy.

11.1.3.1 Workers' Compensation Coverage A: Statutory Coverage B: \$ 100,000

11.1.3.2 General Liability: Per Occurrence: \$1,000,000 Personal/Advertising Injury \$1,000,000 General Aggregate: \$2,000,000 Products/Completed Operations \$2,000,000 Fire Damage Legal Liability: \$ 100,000

GL Coverage, excluding Products and Completed Operations, should be on a Per Project Basis

11.1.3.3 Automobile Liability: Combined Single Limit: \$1,000,000

11.1.3.4 Builders' Risk: 100% of Value*

*100% of the insurable value of the Contract. Insurable value does not include site acquisition, site work, grading, infrastructure etc.

11.1.3.5 Boiler & Machinery: (If Applicable) \$1,000,000

11.1.4 The following provisions shall be agreed to by the Contractor:

11.1.4.1 No change, cancellation, or non-renewal shall be made in any insurance coverage without a forty-five (45) day written Notice to the County. The Contractor shall furnish a new certificate prior to any change or cancellation date. The failure of the Contractor to deliver a new and valid certificate will result in suspension of all payments until the new certificate is furnished.

11.1.4.2 Liability Insurance "Claims Made" basis:

If the liability insurance purchased by the Contractor has been issued on a "claims made" basis, the Contractor must comply with the following additional conditions.

The limits of liability and the extensions to be included as described previously in these provisions, remain the same. The Contractor must either:

- a. Agree to provide, prior to commencing work under the Contract, certificates of insurance evidencing the above coverage for a period of five (5) years after final payment for the Contract. This certificate shall evidence a "retroactive date" no later than the beginning of the Contractor's or subcontractor's work under this Contract, or
- b. Purchase the extended reporting period endorsement for the policy or policies in force during the term of this Contract and evidence the purchase of this extended reporting period endorsement by means of a certificate of insurance or a copy of the endorsement itself.

11.1.4.3 a. The Contractor agrees to provide insurance issued by companies admitted within the Commonwealth of Virginia, with the Best's Key Rating of at least A:VII.

b. European markets including those based in London, and the domestic surplus lines market that operate on a non-admitted basis are exempt from this requirement provided that the Contractor's broker can provide financial data to establish that a market's policyholder surpluses are equal to or exceed the surpluses that correspond to Best's A:VII Rating.

11.1.4.4 a. The Contractor will provide an original signed Certificate of Insurance and such endorsements as prescribed herein.

b. The Contractor will secure and maintain all insurance certificates of its subcontractors which shall be made available to the County on demand.

c. The Contractor will provide on request certified copies of all insurance coverage related to the Contract within ten (10) business days of demand by the County. These certified copies will be sent to the County from the Contractor's insurance agent or representative. Any request made under this provision will be deemed confidential and proprietary.

d. Any certificates provided shall indicate the Contract name and number.

11.1.4.5 The County, its officers and employees shall be named as an "additional insured" on the Automobile, General Liability policies, and it shall be stated on the Insurance Certificate with the provision that this coverage "is primary to all other coverage the County may possess."

11.1.4.6 Compliance by the Contractor and all subcontractors with the foregoing requirements as to carrying insurance shall not relieve the Contractor and all subcontractors of their liabilities provisions of the Contract.

11.1.5 The County, its officers and employees shall be endorsed to the Contractor's Automobile and General Liability policies as an "additional insured" with the provision that this coverage "is primary to all other coverage the County may possess." (Use "loss payee" where there is an insurable interest). A Certificate of Insurance evidencing the additional insured status must be presented to the County along with a copy of the Endorsement.

11.1.6 Nothing contained in the specifications shall be construed as creating any contractual relationship between any subcontractor and the County. The Contractor shall be as fully responsible to the County for the acts and omissions of the subcontractors and of persons employed by them as it is for acts and omissions of persons directly employed by it.

- 11.1.7 Precaution shall be exercised at all times for the protection of persons (including employees) and property.
- 11.1.8 The Contractor and all subcontractors are to comply with the Occupational Safety and Health Act of 1970, Public Law 91-956, as it may apply to this Contract.
- 11.1.9 Any loss insured under subparagraph 11.1.2.4 is to be adjusted with the County and made payable to the County as trustee for the requirements of any applicable mortgagee clause. The Contractor shall pay each subcontractor a just share of any insurance monies received by the Contractor, and by appropriate agreement, written where legally required for validity, shall require each subcontractor to make payments to his sub-subcontractors in similar manner.
- 11.1.10 When the County finds it necessary to occupy or use a portion or portions of the work prior to substantial completion thereof, such occupancy shall commence with a mutual agreement between the County and Contractor. The insurance company or companies providing the property insurance recognize this contingency and shall provide evidence of such endorsement prior to commencement of work. This insurance shall not be canceled or lapsed for the unoccupied part of the building on account of such partial occupancy. Consent of the Contractor and of the insurance company or companies to such occupancy or use shall not be unreasonably withheld.
- 11.1.11 If an "ACORD" Insurance Certificate form is used by the Contractor's insurance agent, the words "endeavor to" and "... but failure to mail such notice shall impose no obligation or liability of any kind upon the company" in the "Cancellation" paragraph of the form shall be deleted.
- 11.1.12 The Contractor agrees to waive all rights of subrogation against the County, its officers, employees, and agents.

ARTICLE 12: CHANGES AND MODIFICATIONS IN THE WORK

12.1 CHANGES IN THE WORK

- 12.1.1 The County, without invalidating the Contract and without Notice to the surety, may order a Change or Modification in the Work consisting of additions, deletions or other revisions to the general scope of the Contract, or changes in the sequence of the performance of the Work. The Contract Sum and the Contract Time shall be adjusted accordingly. All such Modifications in the Work shall be authorized by written Change Order, and all Work involved in a Change shall be performed in accordance with the terms and conditions of this Contract. If the Contractor should proceed with a Change in the Work upon an oral order, by whomsoever given, it shall constitute a waiver by the Contractor of any claim for an increase in the Contract Sum and/or Contract Time, on account thereof.

12.2 FIELD ORDER

- 12.2.1 A Field Order is a written order to the Contractor signed by the County interpreting or clarifying the Contract Documents or directing the Contractor to perform minor changes in the Work. A minor change in the work is defined as a change not involving adjustment in the Contract Sum or an extension of the Contract Time and is not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order and shall be binding on the County and the Contractor. The Contractor shall carry out such orders promptly. Any work relating to the issuance of a Field Order shall be performed promptly and expeditiously and without additional cost to the County and within the Contract Time, unless the Contractor submits a Proposed Change Order, defined below, which is approved by the County.
- 12.4.1 A Proposed Change Order is a written request from the Contractor to the County requesting a change in the Contract Amount and/or Contract Time. A Proposed Change Order is submitted as a proposal

in response to a Request For Proposal or as a claim for an increase in the Contract Sum or Contract Time pursuant to the issuance of a Field Order, or as a result of unforeseen circumstances, such as an unknown site conditions. Change Orders for unforeseen site conditions will only be entertained if the Contractor has not accepted responsibility for the unforeseen site conditions pursuant to other provisions in the Contract Documents. A Proposed Change Order must be submitted within twenty (20) calendar days of the issuance of a Request for Proposal or a Field Order or the discovery of an unforeseen circumstance. The Contractor shall not be entitled to time and/or costs of any nature from the County as a result of his failure to comply with this provision. Proposed Change Orders shall be numbered consecutively by date of issuance by the Contractor. The Contractor shall also indicate on the Proposed Change Order the number of the Request for Proposal or the Field Order to which it responds.

- 12.4.2 In the case of unit price items, it is understood and agreed by the Contractor that the estimates of the quantities in unit price items are approximate only and presented solely for the purpose of comparing bids and may not represent the actual amount of work to be performed. The Contractor, therefore, understands and agrees that the County reserves the right to increase, decrease or eliminate entirely the quantity of work to be done under any item. If called upon to do more work under any unit price item named in the Bid Documents, he will perform all such additional work and accept as payment the unit price named in the proposal, subject to the twenty percent (20%) deviation limitations specified in subparagraph 12.4.2.2.
- 12.4.2.1 The Contractor's Proposed Change Order shall be determined by applicable unit prices, if any, as set forth in the Contract.
- 12.4.2.2 However, if changes in quantities are greater or lesser than twenty percent (20%) of the original bid quantity the County or the Contractor shall have the right to request a decrease or an increase in the unit price for the quantity greater than one hundred twenty percent (120%) or less than eighty percent (80%) of the original bid quantity.
- 12.4.2.3 It shall be understood that such unit prices shall constitute full payment for the extra work performed, including, but not limited to, "general conditions" costs, plant, materials, labor, equipment, overhead, profit, and safety requirements.
- 12.4.3 If no such unit prices are set forth, the Contractor's proposal shall be on a lump sum basis and shall be itemized and segregated by labor, equipment, and materials for the various components of the Change in the Work (no aggregate labor total will be acceptable) and shall be accompanied by signed proposals of any subcontractors who will perform any portion of the Change in the Work and of any persons who will furnish materials or equipment for incorporation therein.
- 12.4.3.1 The portion of the proposal relating to labor, whether by the Contractor's forces or the forces of any of its subcontractors, may include reasonably anticipated gross wages of Job Site labor, including foremen, who will be directly involved in the Change in the Work (for such time as they will be so involved), plus separately identified payroll costs (including premium costs of overtime labor, if overtime is authorized, Social Security, Federal or State unemployment insurance taxes and fringe benefits required by collective bargaining agreements entered into by the Contractor or any such subcontractor in connection with such labor).
- 12.4.3.2 The portion of the proposal relating to materials may include the reasonably anticipated direct costs to the Contractor or to any of its subcontractors of materials to be purchased for incorporation in the Change in the Work, plus transportation and applicable sales or use taxes.
- 12.4.3.3 The proposal may further include the Contractor's and any of his subcontractor's reasonably anticipated equipment rental costs, except small hand tools, in connection with the Change in the Work.

- 12.4.4 Base Cost is defined as the total of labor, material and equipment rentals as described in subparagraphs 12.4.3.1, 12.4.3.2 and 12.4.3.3. The actual net cost in money to the County for the Change in the Work shall be computed as follows:
- 12.4.4.1 If the Contractor performs the Change in the Work without use of subcontractors or sub-subcontractors, his compensation will be the Base Costs as described above, plus a maximum mark-up of fifteen percent (15%) for overhead and profit.
 - 12.4.4.2 If the work is performed by a bona fide subcontractor, his compensation will be the Base Costs as described above plus a maximum mark-up of fifteen percent (15%) for overhead and profit. The Contractor's compensation will be a maximum mark-up of five percent (5%) of the subcontractor's Base Costs for his overhead and profit.
 - 12.4.4.3 If the work is performed by a bona fide sub-subcontractor, his compensation will be the Base Costs as herein described plus a maximum mark-up of fifteen percent (15%) for overhead and profit. The mark-up of any sub-subcontractor's work by the Contractor and all intervening tiers of subcontractors shall not exceed a total of ten percent (10%).
- 12.4.5 The mark-up on the cost of labor, materials, and equipment described in Paragraphs 12.4.4.1, 12.4.4.2, and 12.4.4.3 shall compensate the Contractors, subcontractor and sub-subcontractor for all indirect costs associated with or relating to the Change in the Work including, but not limited to, labor and/or equipment inefficiency, changes in sequence, delays, interferences, impact on unchanged work, gross receipts tax, superintendent, small tools, reproduction, administration, insurance, unrelated safety requirements, temporary structures and offices, all other general and administrative, home office and field office expenses.
- 12.4.6 The Proposed Change Order may also include the cost of increases in premiums for the Standard Labor and Material Payment Bond and the Standard Performance Bond, provided coverage for the cost of the Change in Work results in such increased costs. At the County's request, the Contractor shall provide proof of his notification to the Surety of the change in the Work and of the Surety's agreement to include such change in its coverage. The cost of the increase in premiums shall not be marked up.
- 12.4.7 In the event that it is necessary to increase the Contract Time in order to perform the Change in the Work, the Contractor shall provide an estimate of the increase in the Contract Time as part of the Proposed Change Order. The Contractor's request for a time extension shall be evaluated in accordance with the criteria described in Article 8.3 Claims for Time Extensions.
- 12.4.8 If the Contractor's Proposed Change Order is rejected by the County as being within the scope of the Work required by the Contract Documents the County may, at its sole option and discretion, direct the Contractor to perform the Work which is the subject of the said Proposed Change Order; the Contractor shall then promptly proceed with said Work. Nothing herein shall excuse the timely performance by the Contractor of the Work because any Proposed Change Order is pending.

12.5 CHANGE ORDER

- 12.5.1 A Change Order is a written order to the Contractor signed by the County, issued after execution of the Contract, authorizing a Change in the Work or an adjustment in the Contract Sum and/or the Contract Time. The Contract Sum and the Contract Time may be changed only by Change Order. A Change Order signed by the Contractor indicates his agreement therewith, including the adjustment in the Contract Sum and/or the Contract Time. Change Orders shall be numbered consecutively by date of issuance by the County and shall, if applicable, indicate the number of the Field Order(s), Request for Proposal(s) and/or Proposed Change Order(s) to which it relates.
- 12.5.1.1 If the County determines that the Contractor's Proposed Change Order, submitted

pursuant to Article 12.4 for a change in the Contract Sum or Contract Time, is acceptable, the County shall prepare and issue a Change Order which will authorize the Contractor to proceed with the Change in the Work for the cost and time stated in the Proposed Change Order, or as otherwise may be agreed upon by the parties. The amounts stated in the Change Order for the cost and time to perform the Change in the Work shall be binding on the parties.

- 12.5.2 After issuance of the Change Order, the Contractor shall ensure that the amount of the Performance and Payment Bond coverage has been revised to reflect the increase in the Contract Sum due to the Change Order.
- 12.5.3 If the Contractor's Proposed Change Order is not acceptable to the County or if the parties are unable to otherwise agree as to the cost and time necessary to perform the Change in the Work, the County may, at its sole option and discretion, direct the Contractor to perform the Work on a time and material basis. The Contractor shall then promptly proceed with the Work.
- 12.5.4 If the County elects to have the Change in the Work performed on a time and material basis, the same shall be performed, whether by the Contractor's forces or the forces of any of its subcontractors or sub-subcontractors, at actual cost to the entity performing the Change in the Work (without any charge for administration, clerical expense, supervision or superintendent of any nature whatsoever). The percent mark-ups for the Contractor, subcontractors and sub-subcontractor's shall be as described in subparagraphs 12.4.4 and 12.4.5.
- 12.5.4.1 Prior to starting the work on a time and material basis, the Contractor shall notify the County in writing as to what labor, materials, equipment or rentals are to be used for the Change in the Work. During the performance of the Change, the Contractor shall submit to the County daily time and material tickets, which shall list the categories and amounts of labor and equipment for which Change Order compensation is to be charged for the previous work day. Such tickets shall specifically include the following information: location and description of the Change in the Work, the classification of labor employed, including names and social security numbers of laborers, labor trades used, man hours, wage rates, insurance, taxes and fringe benefits, equipment and materials suppliers' quotations with detailed break-out and pricing, rental equipment hours and rates, and materials quantities and unit prices and such other evidence of cost as the County may require.
- 12.5.4.2 The Contractor shall commence submission of daily time and material tickets immediately upon commencement of the Change Order Work and continue to submit them until completion of the Change Order Work. The County may require authentication of all time and material tickets and invoices by persons designated by the County for such purpose.
- 12.5.4.3 No payment shall be made to the Contractor for any portion of the Change in the Work unless and until such daily time and material tickets and invoices are submitted. The submission of any such ticket or invoice shall not constitute an acknowledgment by the County that the items thereon were reasonably required for the Change in the Work.
- 12.5.4.4 For any work performed on a time and material basis, the Contractor shall submit its complete submission of the reasonable actual cost and time to perform the Change in the Work within twenty (20) days after such Work has been completed. The County shall review the costs and time submitted by the Contractor on the basis of reasonable expenditures and savings of those performing the Change in the Work. If such costs and time are acceptable to the County, or if the parties otherwise agree to the actual reasonable cost to perform the Change in the Work, a Change Order will be issued for the cost and time agreed upon. The amounts

stated in the Change Order for the cost and time to perform the Change in the Work shall be binding upon the parties.

12.6 UNILATERAL CHANGE ORDER

12.6.1 In the event that the parties are unable to agree as to the reasonable cost and time to perform the Change in the Work and the County does not elect to have the Change in the Work performed on a time and material basis, the County may issue a unilateral Change Order based on the reasonable cost and time to perform the Change in the Work as determined by the County. Failure of the parties to reach agreement regarding the cost and time of performing the Change in the Work shall not relieve the Contractor from performing the Change in the Work promptly and expeditiously. Any unresolved dispute resulting from the Unilateral Change Order shall be resolved pursuant to the procedure outlined in Article 13 Claims and Dispute Procedure.

12.7 DECREASES AND WORK NOT PERFORMED (Deductive Change Orders)

12.7.1 Should it be deemed expedient by the County to decrease the dimensions, quantity of material or work, or vary in any other way the work herein contracted for, the County may direct by written Change Order, such decreases to be made or performed without in any way affecting the validity of the Contract. The Contractor shall, comply with the Change Order from the County. The difference in expense occasioned by such decrease shall be deducted from the amount payable under this Contract.

12.7.2 When work is deleted from the Agreement by County, the amounts to be credited to the County shall reflect the same current pricing as if the work were being added to the Contract at the time the deletion is ordered, and documentation will be required for a credit as specified in Article 12.5.4. If such deleted materials and equipment shall have already been purchased and stored on site and cannot be used in other projects, returned for credit or cannot be returned for credit at the price paid by the Contractor at the time of purchase, the Contractor shall be entitled, upon proper documentation and certification, to an adjustment in the pricing of the credit to avoid hardship to the Contractor. If necessary in order to establish such reasonable value, the Contractor may be required to submit a detailed breakdown of his original bid for the items or work involved.

12.7.3 If work is not performed, and such deletion of work was not directed or approved by the County, the County shall ascertain the amount of the credit due.

12.8 CHANGES IN LINE AND GRADE

12.8.1 The County reserves the right to make such alterations in the line and grade of various structures or pipe lines shown on the drawings, as may be necessitated by conditions found during construction or that in the judgment of the County appears advisable. Such alterations shall in no way affect the validity of the Agreement.

12.8.1.1 In case of a unit price contract, if such changes increase the amount of the work or materials, the Contractor will be paid according to the quantity of work actually done at the prices established for such work under the Contract.

12.8.1.2 In case of a lump sum contract, the price for the work shall be determined as specified in Article 12.4 Proposed Change Order.

12.9 SUBSURFACE CONDITIONS FOUND DIFFERENT

12.9.1 Should the Contractor encounter (a) subsurface and/or latent conditions at the site materially differing from those shown on the drawings (such as unsuitable organic matter or soil with inadequate bearing capacity in previously rough graded parking areas) or indicated in the specifications, or (b) unusual physical conditions at the site of an unusual nature, which differ materially from those

ordinarily encountered and generally recognized as inherent in the work of the character provided for in the Contract and which were not reasonably anticipated, he shall immediately give Notice to the County of such conditions before they are disturbed. The County shall thereupon promptly investigate the conditions and if he finds that they materially differ from those shown on the drawings or indicated in the specifications, he shall at once make such changes in the drawings and/or specifications as he may find necessary. Any increase or decrease of cost resulting from such changes shall be adjusted in the manner provided herein for adjustments as to extra and/or additional work and changes.

12.9.2 Due to its prevalence in the vicinity, rock shall not be considered subsurface and/or latent conditions at the site materially differing from those shown on the drawings or an unusual physical condition at the site of an unusual nature.

12.10 OTHER CLAIMS

12.10.1 If the Contractor claims that additional cost or time is involved because of, but not limited to, (a) any written interpretation pursuant to Article 2 Architect/Engineer, (b) any order by the County to stop the Work pursuant to Article 3 County where the Contractor was not at fault, (c) failure of payment by the County pursuant to Article 9 Payments and Completion, or (d) any written order for a minor change in the Work issued pursuant to Article 12.8. Changes in Line and Grade; the Contractor shall make such claim as provided in this Article 12 Changes and Modification in the Work.

ARTICLE 13: CLAIMS AND DISPUTE PROCEDURE

13.1 No claim shall be made under this Agreement until and unless the Contractor has failed to obtain a Change Order pursuant to the provisions of the Contract Documents. The Contractor shall give the County written Notice of his intent to file a claim within ten (10) calendar days of the occurrence giving rise to the claim or at the beginning of the Work upon which the claim is to be based, or the rejection of his Proposed Change Order, whichever is earlier.

13.2 No claim shall be allowed and no amounts paid for any and all costs incurred if Notice of intent to file a claim is not given to the County as herein provided.

13.3 The complete written claim, with all supporting documentation, shall be submitted to the County's designated representative no later than sixty (60) days after final payment. If the claim is not disposed of by agreement, the County representative shall reduce his decision to writing and mail or otherwise forward a copy thereof to the Contractor within thirty (30) days of receipt of the claim.

13.4 The County representative's decision shall be final unless the Contractor appeals within thirty (30) days by submitting a written letter of appeal to the County Administrator. The County Administrator shall render a decision within sixty (60) days of receipt of the appeal.

13.5 No litigation shall be instituted prior to the exhaustion of the aforesaid claims process. The Contractor may not introduce factual matters in such litigation that were not set forth in the aforesaid claims process. Each party shall bear its own costs and expenses resulting from any litigation, including attorney's fees.

ARTICLE 14: UNCOVERING AND CORRECTION OF WORK

14.1 UNCOVERING OF WORK

14.1.1 If any portion of the Work should be covered contrary to: (a) the request of the A/E or County; (b) requirements specifically expressed in the Contract Documents; or (c) the requirements of applicable Construction Permits, it must, if required in writing by the County, be uncovered for their observation and shall be replaced at the Contractor's expense.

14.1.2 If any other portion of the Work has been covered which the County has not specifically requested to observe prior to being covered, the County may request to see such Work and it shall be uncovered by the Contractor. If such Work be found in accordance with the Contract Documents, the cost of uncovering and replacement shall, by appropriate Change Order, be charged to the County. If such Work be found not in accordance with the Contract Documents, the Contractor shall pay such costs unless it be found that this condition was caused solely by the County, in which event the County shall be responsible for the payment of such costs. If such Work be found not in accordance with the Contract Documents and the condition was caused by a separate contractor, Contractor may proceed against said separate contractor as provided in Article 6 Work by County or by Separate Contractors.

14.2 WARRANTY AND CORRECTION OF WORK

14.2.1 The Contractor guarantees and warrants to the County all work as follows:

14.2.1.1 That all materials and equipment furnished under this Contract will be new and the best of its respective kind unless otherwise specified;

14.2.1.2 That all Work will be of first-class quality and free of omissions and faulty, imperfect or defective material or workmanship;

14.2.1.3 That the Work shall be entirely watertight and leak proof in accordance with all applicable industry customs and practices, and shall be free of shrinkage and settlement which are attributable to defective materials or workmanship;

14.2.1.4 That the Work, including but not limited to, mechanical and electrical machines, devices and equipment shall be fit and fully usable for its intended and specified purpose and shall operate satisfactorily with ordinary care;

14.2.1.5 That consistent with requirements of the Contract Documents the Work shall be installed and oriented in such a manner as to facilitate unrestricted access for the operation and maintenance of fixed equipment; and

14.2.1.6 That the Work will be free of abnormal or unusual deterioration which occurs because of poor quality materials or workmanship.

14.2.2 All Work not conforming to guarantees and warranties specified in the Contract Documents, including substitutions not properly approved and authorized, may be considered defective. If required by the County, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment furnished and installed.

14.2.3 The Contractor shall within five (5) working days after receipt of written notice from the County during the performance of the Work, reconstruct, replace or correct all Work rejected by the A/E or County as defective, as failing to conform to the Contract Documents, or as not in accordance with the guarantees and warranties specified in the Contract Documents whether observed before or after Substantial Completion and whether or not fabricated, installed or completed. The Contractor shall bear all costs of reconstructing, replacing or correcting such rejected Work, including compensation for the A/E's additional services made necessary thereby.

14.2.4 If, within one (1) year after the Date of Substantial or Final Completion of the Work or designated portion thereof or within one (1) year after acceptance by the County of designated equipment or within such longer period of time as may be prescribed by law or by the terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be defective, not in accordance with the Contract Documents, or not in accordance with the guarantees and warranties specified in the Contract Documents, the Contractor shall correct it within five (5) working days after receipt of a written notice from the County to do so unless the County has previously given the Contractor a written acceptance of such condition pursuant to 14.3 Acceptance of Faulty, Defective

or Non-Conforming Work. This obligation shall survive termination of the Contract. The County shall give such notice promptly after discovery of the condition.

- 14.2.5 Subject to limitation as prescribed by law, if at any time deficiencies in the Work are discovered which are found to have resulted from fraud or misrepresentation, or an intent or attempt to defraud the County by the Contractor, any subcontractor or Supplier, the Contractor will be liable for replacement or correction of such Work and any damages which County has incurred related thereto, regardless of the time limit of any guarantee or warranty.
- 14.2.6 Any materials or other portions of the Work, installed, furnished or stored on site which are not of the character or quality required by the specifications, or are otherwise not acceptable to the County, shall be immediately removed and replaced by the Contractor to the satisfaction of the County, when notified to do so by the County.
- 14.2.7 If the Contractor fails to correct defective or nonconforming Work as required by Articles 14.2.3 and 14.2.4, or if the Contractor fails to remove defective or nonconforming Work from the site, as required by Article 14.2.6, the County may elect to either correct such Work in accordance with Article 3.5 County's Right to Carry out the Work or remove and store materials and equipment at the expense of the Contractor. If the Contractor does not pay the cost of such removal and storage within ten (10) days thereafter, the County may upon ten additional days written Notice sell such Work at auction or at public or private sale and shall account for the net proceeds thereof, after deducting all the costs that should have been borne by the Contractor, including compensation for the A/E's additional services made necessary thereby. If such proceeds of sale do not cover all costs that the Contractor should have borne, the difference shall be charged to the Contractor and an appropriate Change Order shall be issued. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the County.
- 14.2.8 The Contractor shall bear the cost of making good all work of the County, separate contractors or others, destroyed or damaged by such correction or removal required under this Article.
- 14.2.9 Nothing contained in this Section 14.2 shall be construed to establish a period of limitation with respect to other obligations which the Contractor might have under the Contract Documents. Establishment of the time period of one (1) year as described in 14.2.4 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

14.3 ACCEPTANCE OF FAULTY, DEFECTIVE OR NON-CONFORMING WORK

If the County prefers to accept faulty, defective or nonconforming Work, he may do so instead of requiring its removal and correction, in which case a Change Order will be issued at County's option, to reflect a reduction in the Contract Sum in an amount to be determined by the County.

ARTICLE 15: TERMINATION OF THE CONTRACT

15.1 CONTRACTOR'S RIGHT TO STOP WORK OR TERMINATE CONTRACT

- 15.1.1 If the Work should be stopped under an order of any court or other public authority for a period of ninety (90) days through no fault of the Contractor or anyone employed by him, or if the County should fail to pay to the Contractor within thirty (30) days any sum certified by the A/E when no dispute exists as to the sum due or any provision of the Contract, then the Contractor may, upon ten (10) calendar days written Notice to the County, stop Work or terminate the Contract and recover from the County payment for the cost of the Work actually performed, together with overhead and profit thereon, but profit on the Work performed shall be recovered only to the extent that the Contractor can demonstrate that he would have had profit on the entire Contract if he had completed

the Work. The Contractor may not receive profit or any other type of compensation for parts of the Work not performed. The Contractor may recover the reasonable cost of physically closing down the Site, but no other costs of termination. The County may offset any claims it may have against the Contractor against the amounts due to the Contractor. In no event shall termination of the Contract by the Contractor terminate the obligations of the Contractor's surety on its payment and performance bonds.

15.2 COUNTY'S RIGHT TO TERMINATE CONTRACT FOR CAUSE

- 15.2.1 The County may terminate the Agreement if:
- 15.2.1.1 If the Contractor should be adjudged as bankrupt, or if he should make a general assignment for the benefit of his creditors, or if a receiver should be appointed on account of his insolvency
 - 15.2.1.2 If the Contractor should refuse or should repeatedly fail, except in cases for which extension of time is provided, to supply enough properly skilled workmen or proper materials and equipment to achieve substantial completion of the Work within the contract time.
 - 15.2.1.3 If the Contractor should fail to make prompt payment to subcontractors or suppliers of material or labor
 - 15.2.1.4 If the Contractor should refuse to prosecute the Work or any part thereof with such diligence as will ensure the Substantial Completion of the Work within the Contract Time.
 - 15.2.1.5 If the Contractor fails to substantially complete the work within the contract time.
 - 15.2.1.6 If the Contractor should disregard laws, ordinances or the written instructions of the A/E or the County, or otherwise be in substantial violation of any provision of the Contract.
 - 15.2.1.7 If the Contractor fails to complete preconstruction requirements as defined in the contract documents per 8.1.2.
- 15.2.2 Prior to termination of the Contract, the County shall give the Contractor and his surety ten (10) calendar days written Notice during which the Contractor and/or his surety may rectify the basis for the Notice. If rectified to the satisfaction of the County within said ten (10) days, the County may rescind its Notice of termination. If not, the termination for cause shall become effective at the end of the ten (10) day notice period. In the alternative, the County may, in writing, postpone the effective date of the termination for cause, at its sole discretion, if it should receive reassurances from the Contractor and/or its surety that the basis for the termination will be remedied in a time and manner which the County finds acceptable. If at any time after such postponement, the County determines that Contractor and/or its surety has not or is not likely to rectify the causes of termination in an acceptable manner or within the time allowed, then the County may immediately terminate the Contract for cause, without the necessity of further ten (10) day notice, by notifying the Contractor and his surety in writing of the termination. In no event shall termination for cause terminate the obligations of the Contractor's surety on its payment and performance bonds.
- 15.2.3 Upon termination of the Contract, the Contractor shall immediately cease work and the County shall take possession of the Site and of all materials, tools and equipment thereon and finish the Work by whatever method he may deem expedient. In such case the Contractor shall not be entitled to receive any further payment until the County has finally completed the project through its own resources or those of a subsequent contractor. If the expense of finishing the Work, including compensation for additional design, managerial and administrative services, shall exceed the unpaid balance of the Contract Price, the Contractor shall pay the difference to the County, together with any other

expenses of terminating the Contract and having it completed by others. If the unpaid balance of the Contract Price exceeds the costs of finishing the Work, including compensation for additional design, managerial and administrative services, such excess shall be paid to the Contractor.

- 15.2.4 If it should be judicially determined that the County improperly terminated this Agreement for cause, then the termination shall be deemed to be a termination for the convenience of the County.
- 15.2.5 Termination of the Agreement under this Section is without prejudice to any other right or remedy of the County.

15.3 COUNTY'S RIGHT TO TERMINATE AGREEMENT FOR CONVENIENCE

15.3.1 County may terminate this Agreement, in whole or in part, at any time without cause upon giving the Contractor written Notice of such termination. Upon such termination, the Contractor shall immediately cease Work and remove from the Site all of its labor forces and such of its materials as County elects not to purchase or to assume in the manner hereinafter provided. Upon such termination, the Contractor shall take such steps as County may require to assign to the County the Contractor's interest in all subcontracts and purchase orders designated by County. After all such steps have been taken to County's satisfaction, the Contractor shall receive as full compensation for termination and assignment the following:

- 15.3.1.1 Amounts due for Work performed in accordance with the Agreement through the date of termination.
- 15.3.1.2 Reasonable compensation for the actual cost of demobilization incurred by the Contractor as a direct result of such termination. The Contractor shall not be entitled to any compensation or damages for lost profits or for any other type of contractual compensation or damages other than those provided by the preceding sentence. Upon payment of the foregoing, County shall have no further obligations to Contractor of any nature.

15.3.2 In no event shall termination for the convenience of the County terminate the obligations of the Contractor's surety on its payment and performance bonds.

15.3.3 After receipt of a Notice of Termination, the Contractor shall submit to the County his termination claim. Such claim shall be submitted promptly but in no event later than forty-five (45) days from the effective date of termination. Upon failure of the Contractor to submit his termination claim within the time allowed, the County may determine, on the basis of information available to him, the amount, if any, due to the Contractor by reason of the termination.

15.4 CONTRACTOR'S RESPONSIBILITIES UPON TERMINATION

15.4.1 After receipt of a Notice of Termination pursuant to 15.3 County's Right to Terminate Agreement for Convenience the Contractor shall mitigate any damages to the extent reasonably possible.

15.4.2 In addition to the provisions of 15.4.1, the Contractor shall:

15.4.2.1 At the option of the County, assign to the County, in the manner, at the time, and to the extent directed by the County, all of the right, title, and interest of the Contractor under the orders and subcontracts so terminated, in which case the County shall have the right, in its discretion, to settle or pay any or all claims arising out of the termination of such orders and subcontracts;

15.4.2.2 Transfer title and deliver to the County in the manner, at the times, and to the extent, if any, directed by the County:

- a. The fabricated or unfabricated parts, work in process, completed Work, supplies, and other material procured as a part of, or acquired in connection with the performance of the Work terminated by the Notice of Termination, and
- b. The completed or partially completed drawings, releases, information, manuals and other property which, if the Contract had been completed, would have been required to be furnished to the County;

15.4.2.3 Complete performance of such part of the Work as shall not have been terminated by the Notice of Termination; and

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

15.4.2.5 Perform site clean up pursuant to the provisions of Section 4.19.

15.5 DISPUTES UPON TERMINATION

15.5.1 The provisions of 13.0 Claims and Dispute Procedures shall be applicable to any claim, dispute or other matter arising because of termination under this Article 15.

SECTION 01 11 00
SUMMARY OF WORK

PART 1 - GENERAL

1.01 SUMMARY:

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Work by Owner.
4. Access to site.
5. Work restrictions.
6. Specification and drawing conventions.

B. Related Requirements:

1. Division 01 Section "Temporary Facilities" for limitations and procedures governing temporary use of Owner's facilities.

1.02 PROJECT INFORMATION:

A. Owner's Representative: .

B. Engineer: AECOM Technical Services, Inc., 10 S. Jefferson Avenue, Suite 1600, Roanoke, VA 24011. Point of Contact: Shane Powers, Project Manager, 540-529-1356, Shane.Powers@aecom.com .

1.03 WORK COVERED BY CONTRACT DOCUMENTS:

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. Demolition of the existing Intervale Lift Station building; existing lift station wetwell to remain.
2. Demolition of the existing stand-by generator and appurtenances.
3. Removal of the existing submersible pumps, controls, and appurtenances.
4. Installation of new submersible pumps, controls, and appurtenances within the existing wet well.

5. Installation of a new stand-by generator, automatic transfer switch, and appurtenances.
 6. Construction of a composite wood-framed platform.
 7. Minor site work to restore site conditions upon project completion.
- B. Type of Contract:
1. Project will be constructed under a single prime contract.
- 1.04 WORK BY OWNER:
- A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.
 - B. Concurrent Work: Owner will perform the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.
 1. Bypass Pumping: Owner will furnish, install, and operate the required bypass pumping system for the duration of the project.
 2. Owner will pay for disposal fees at local landfill.
- 1.05 ACCESS TO SITE:
- A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
- 1.06 WORK RESTRICTIONS:
- A. Work Restrictions, General: Comply with restrictions on construction operations.
 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
 - B. On-Site Work Hours: Limit work at the Site to normal business working hours of 7 a.m. to 7 p.m., Monday through Friday, unless otherwise indicated.
 1. Weekend Hours: No further restrictions.
 2. Early Morning Hours: No further restrictions.
 3. Hours for Utility Shutdowns: None.
 - C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after

providing temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.
 2. Obtain Owner's written permission before proceeding with utility interruptions.
- D. Controlled Substances: Use of tobacco products and other controlled on Project site is not permitted.
- E. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.
1. Maintain list of approved screened personnel with Owner's representative.

1.07 SPECIFICATION AND DRAWING CONVENTIONS:

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

(Not Used)

END OF SECTION

SECTION 01 14 14

CONTROL OF WORK

PART 1 - GENERAL

1.01 PLANT AND HOURS OF CONSTRUCTION:

- A. Furnish plant and equipment which will be efficient, appropriate, and large enough to secure a satisfactory quality of work and a rate of progress which will insure the completion of the work within the Contract Time. If at any time such plant appears to the Owner to be inefficient, inappropriate, or insufficient for securing the quality of work required or for producing the rate of progress aforesaid, the Owner may order the Contractor to increase the efficiency, change the character, or increase the plant equipment, and the Contractor shall conform to such order. Failure of the Owner to give such order shall in no way relieve the Contractor of his obligations to secure the quality of the work and rate of progress required.
- B. Normal construction activity shall take place only between the hours of 7 a.m. to 7 p.m., excluding Saturdays, Sundays, and legal holidays. Work outside the above time periods will be permitted only on an emergency basis and only with the written approval of the Owner.

1.02 OCCUPYING PRIVATE LAND:

- A. The Contractor shall not (except after written consent from the proper parties) enter or occupy with personnel, 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 Owner.

1.03 PIPE LOCATIONS:

- A. Exterior pipelines will be located substantially as indicated on the Drawings, but the right is reserved to the Owner, acting through the Engineer, to make such modifications in location as may be found desirable to avoid interference with existing structures or for other reasons. Where fittings, etc., are noted on the Drawings, such notation is for the Contractor's convenience and does not relieve him from laying and jointing different or additional items where required.

1.04 DIMENSION OF EXISTING STRUCTURES:

- A. The Contractor shall verify the dimensions and locations of existing structures in the field before the fabrication of any material or equipment which is dependent on the correctness of such information.

1.05 OPEN EXCAVATIONS:

- A. All open excavations shall be adequately safeguarded by providing temporary barricades, fencing, caution signs, lights, and other means to prevent accidents to persons and damage to property, and in accordance with applicable occupational health and safety regulations. The Contractor shall, at his own expense, provide suitable and safe bridges and other crossings for accommodating travel by pedestrians and workmen. Bridges provided for access during construction shall be removed when no longer required. The length or size of excavation will be controlled by the particular surrounding conditions, but shall always be confined to the limits prescribed by the Owner. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, the Owner may require special construction procedures such as limiting the length of the open trench, prohibiting stacking excavated material in the street, and requiring that the trench shall not remain open overnight.
- B. The Contractor shall take precautions to prevent injury to the public due to open trenches. All trenches, excavated material, equipment, or other obstacles which could be dangerous to the public shall be well lighted at night.

1.06 INTERFERENCE WITH AND PROTECTION OF STREETS:

- A. The Contractor shall not close or obstruct any portion of a street, road, or private way without obtaining permits therefor from the proper authorities. If any street, road or private way shall be rendered unsafe by the Contractor's operations, he shall make such repairs or provide such temporary ways or guards as shall be acceptable to the proper authorities.
- B. Streets, roads, private ways, and walks not closed shall be maintained passable and safe by the Contractor, who shall assume and have full responsibility for the adequacy and safety of provisions made therefor.
- C. The Contractor shall, at least 24 hours in advance, notify the Police and Fire Departments in writing, with a copy to the Owner, if the closure of a street or road is necessary. The Contractor shall cooperate with the Police Department in the establishment of alternate routes and shall provide adequate detour signs, plainly marked and well lighted, in order to minimize confusion.

1.07 TRAFFIC CONTROL:

- A. For control of moderate traffic, the Contractor shall provide an adequate number of flagmen employed at his own expense.
- B. Whenever and wherever, in the opinion of the Engineer, traffic is sufficiently congested or public safety is endangered, the Owner will furnish uniformed special officers to direct traffic and to keep traffic off the highway area affected by construction operations. Such officers shall be in addition to the watchmen required under other provisions of the contract.

- C. The Contractor will be billed by the Owner for the cost of such special officers and will be reimbursed under the appropriate item in the Bid.
- D. Whenever and wherever, in the opinion of the Engineer, traffic is sufficiently congested or public safety is endangered, the Contractor, as required, shall furnish uniformed special officers to direct traffic and to keep traffic off the highway area affected by his construction operations. Such officers shall be in addition to the watchmen required under other provisions of the contract.
- E. To reimburse the Contractor for this additional expense, the Owner shall pay to the Contractor, in addition to the contract prices, the cost of such special officers. Such cost shall consist of the actual wages paid to such officers, plus the premium paid by the Contractor to insure these special additional men under his Workmen's Compensation Policy, plus the amount paid by the Contractor for such special officers on account of Social Security or other direct assessment on his payroll by Federal or other properly authorized public agencies. In taking out Workmen's Compensation coverage, the Contractor shall specifically include in the classification of workmen all such special officers.
- F. The cost of such special officers will be paid for under the appropriate item in the Bid. The Contractor shall insure these special officers under his Workmen's Compensation Policy and in taking out his Workmen's Compensation coverage the Contractor shall specifically include in the classification of workmen all such special officers. In addition, the Contractor shall make all necessary payments for such special officers on account of Social Security or other direct assessment on his payroll by Federal or other properly authorized public agencies.
- G. The employment or presence of traffic flagmen, special officers, or police shall in no way relieve the Contractor of any responsibility or liability which is his under the terms of the contract.

1.08 CARE AND PROTECTION OF PROPERTY:

- A. The Contractor shall be responsible for the preservation of all public and private property, and shall use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work on the part of the Contractor, such property shall be restored by the Contractor, at his expense, to a condition similar or equal to that existing before the damage was done, or he shall make good the damage in other manner acceptable to the Owner.

1.09 INTERFERENCE WITH EXISTING WORKS:

- A. The Contractor shall at all times conduct his operations so as to interfere as little as possible with existing works. The Contractor shall develop a program, in cooperation with the Engineer and interested officials, which shall provide for the construction and putting into service of the new works in the most orderly manner possible. This program shall be adhered to except as deviations therefrom are expressly permitted. All work of connecting

with, cutting into, and reconstructing existing pipes or structures shall be planned to interfere with the operation of the existing facilities for the shortest possible time when the demands on the facilities best permit such interference, even though it may be necessary to work outside of normal working hours to meet these requirements. Before starting work which will interfere with the operation of existing facilities, the Contractor shall do all possible preparatory work and shall see that all tools, materials, and equipment are made ready and at hand.

- B. The Contractor shall make such minor modifications in the work relating to existing structures as may be necessary, without additional compensation.
- C. The Contractor shall have no claim for additional compensation by reason of delay or inconvenience in adapting his operations to meet the above requirements.
- D. The Contractor shall have no claim for additional compensation by reason of delay or inconvenience in adapting his operations to the need for continuous flow of sewage.

1.10 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES:

- A. The Contractor shall assume full responsibility for the protection of all buildings, structures, and utilities, public or private, including poles, signs, services to buildings, utilities in the street, water pipes, hydrants, sewers, drains, and electric and telephone cables, whether or not they are shown on the Drawings. The Contractor shall carefully support and protect all such structures and utilities from injury of any kind. Any damage resulting from the Contractor's operations shall be repaired by him at his expense.
- B. The Contractor shall bear full responsibility for obtaining all locations of underground structures and utilities (including existing water services, drain lines, and sewers). Services to buildings shall be maintained, and all costs or charges resulting from damage thereto shall be paid by the Contractor.
- C. Protection and temporary removal and replacement of existing utilities and structures as described in this Section shall be a part of the work under the Contract and all costs in connection therewith shall be included in the Total Price Bid in the Bid Form.

1.11 INSPECTION OF WORK AWAY FROM THE SITE:

- A. If work to be done away from the construction site is to be inspected on behalf of the Owner during its fabrication, manufacture, or testing, or before shipment, the Contractor shall give notice to the Owner of the place and time where such fabrication, manufacture, testing, or shipping is to be done. Such notice shall be in writing and delivered to the Engineer in ample time so that the necessary arrangements for the inspection can be made.

1.12 COOPERATION WITHIN THIS CONTRACT:

- A. All firms or persons authorized to perform any work under this Contract shall cooperate with General Contractor and his Subcontractors or trades, and shall assist in incorporating the work of other trades where necessary or required.

- B. Cutting and patching, drilling and fitting shall be carried out where required by the trade or subcontractor having jurisdiction, unless otherwise indicated herein or recommended by the Engineer.

1.13 CLEANUP AND DISPOSAL OF EXCESS MATERIAL:

- A. During the course of the work, the Contractor shall keep the site of his operations in as clean and as neat a condition as is possible. He shall dispose of all residue resulting from the construction work and, at the conclusion of the work, he shall remove and haul away any surplus excavation, broken pavement, lumber, equipment, temporary structures, and any other refuse remaining from the construction operations, and shall leave the entire site of the work in a neat and orderly condition.
- B. In order to prevent environmental pollution arising from the construction activities related to the performance of this Contract, the Contractor and his subcontractors shall comply with all applicable Federal, State, and local laws, and regulations concerning waste material disposal, as well as the specific requirements stated in this Section and elsewhere in the Specifications.
- C. The Contractor is advised that the disposal of excess excavated material in wetlands, stream corridors, and plains is strictly prohibited even if the permission of the property owner is obtained. Any violation of this restriction by the Contractor or any person employed by him, will be brought to the immediate attention of the responsible regulatory agencies, with a request that appropriate action be taken against the offending parties. Therefore, the Contractor will be required to remove the fill at his own expense and restore the area impacted.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

(Not Used)

END OF SECTION

SECTION 01 25 00

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Section includes administrative and procedural requirements for substitutions.

1.02 DEFINITIONS:

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.03 SUBMITTALS:

- A. Submit the following shop drawings in accordance with Section 01 33 00.
- B. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use Form 01 25 00-1 to request substitution.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Justification for use of the proposed equivalent item(s), including evidence, as applicable, that Contract specified material, product or equipment is unobtainable or unobtainable within an acceptable time for Contract completion.
 - b. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable. If the Contractor is proposing the substitution because of unavailability of the product, submit a letter from the manufacturer stating the product is unavailable with an explanation of why it is unavailable with the form 01 25 00-1

- c. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
 - d. Detailed comparison of qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, electrical characteristics, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated and specified. Indicate deviations, if any, from the Work specified.
 - e. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - f. Samples, where applicable or requested.
 - g. Certificates and qualification data, where applicable or requested.
 - h. List of similar installations for completed projects with project names and addresses and names, telephone numbers and addresses of engineers and owners.
 - i. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. A prediction of any effects the proposed change will have on operation and maintenance costs, where applicable.
 - m. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is intended for applications indicated.
 - n. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within seven days of receipt of a request for

substitution. Engineer will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

- a. Forms of Acceptance: Change Order, Construction Change Directive, or Engineer's Supplemental Instructions for minor changes in the Work.
- b. Use product specified if Engineer does not issue a decision on use of a proposed substitution within time allocated.

1.04 ACCEPTABLE EQUIVALENT PRODUCTS, MATERIALS AND EQUIPMENT:

- A. Any other product the contractor wants to substitute must follow the requirements of this Section.
- B. If the Contractor chooses to substitute equipment other than a named manufacturer, any additional costs or time required to accommodate such equipment shall be made without a change in the Contract Price or Contract Time and at no additional cost to the Owner.
- B. The Contractor may choose equipment from a manufacturer of an acceptable equivalent product, however, this will be treated as a substitution and the Contractor must follow the requirements of this Section. Any additional costs or time required to accommodate such equipment shall be made without a change in the Contract Price or Contract Time.

1.05 MATERIAL AND WORKMANSHIP:

- A. Whenever a material, article, system or sub-system is specified or described by using the name and/or model of a proprietary product or trademark or the name of the manufacturer or vendor, the specified item shall establish the type, function, and quality required; it shall be understood that the words "or approved equivalent" are implied whether or not they follow the proprietary enumeration.
- B. The Engineer reserves the right to determine when proprietary items have no equivalency, and when uniformity of operations, interchangeability of parts, standard parts inventory, etc., are in Owner's best interest.
- C. Requests for review of equivalency will be considered upon submission of sufficient information as described herein, to allow complete review.
- D. Such requests will not be accepted from anyone other than the Contractor. Such submission must be made prior to purchase, fabrication, manufacture or use of the equivalent items under consideration.
- E. The Contractor is responsible for all delays caused by its failure to submit complete and accurate information with any request for approval of any material, article, system or subsystem, as an equivalent.

1. Contractor Risk:

- a. If the Contractor includes in his bid or later proposes any material, product or equipment that he considers equivalent to that specified, the Contractor assumes all risk of any sort associated with acceptance or rejection of proposed equivalent items.
 - b. The Contractor shall have no right to make claim based upon his bid that includes a proposed equivalent item(s) of work which resulted in a lower bid amount for said item(s) or lower total bid.
2. Equivalency:
- a. An item will be considered equivalent to the item specified if:
 - (1) It is equal or better in design and strength in all subparts, quality, reliability and durability, operation, maintenance and serviceability, as applicable; and
 - (2) It is equal or better in specified parameters in performance in all respects for the specific function(s) indicated in the contract.
3. Supplemental Requirements:
- a. The time associated with equivalency review will be paid by the Contractor.
 - b. Any tests required by the Engineer to establish quality and performance standards shall be promptly conducted by or through the Contractor at no additional cost to the Owner.
 - c. The Contractor shall submit any additional data requested by the Engineer for the equivalency review.
 - d. The Contractor shall satisfactorily accomplish all changes, including any engineering associated with use of equivalent items, at no additional cost to the Owner.
 - e. The Contractor shall have no right of appeal to any decision rejecting the equivalency of any item.

1.06 QUALITY ASSURANCE:

- A. Comply with the requirements specified in Section 01 43 00.
- B. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers at no cost to the Engineer or Owner.

1.07 PROCEDURES:

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS:

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Engineer will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Engineer will return requests without action, except to record noncompliance with these requirements:

- a. Requested substitution is consistent with the Contract Documents and will produce specified and indicated results.
- b. Substitution request is fully documented and properly submitted.
- c. Requested substitution will not negatively affect Contractor's construction schedule.
- d. Requested substitution has received necessary approvals of authorities having jurisdiction.
- e. Requested substitution is compatible with other portions of the Work.
- f. Requested substitution has been coordinated with other portions of the Work.
- g. Requested substitution provides specified warranty.
- h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

- B. Substitutions for Convenience: Engineer will consider requests for substitution if received within 60 days after the Notice of Award. Requests received after that time may be considered or rejected at discretion of Engineer.

2. Conditions: Engineer will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Engineer will return requests without action, except to record noncompliance with these requirements:

Substitution Procedures
Section No. 01 25 00-5

- a. Requested substitution offers Owner an advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Engineer for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
- b. Requested substitution does not require revisions to the Contract Documents.
- c. Requested substitution is consistent with the Contract Documents and will produce specified and indicated results.
- d. Substitution request is fully documented and properly submitted.
- e. Requested substitution will not affect Contractor's construction schedule.
- f. Requested substitution has received necessary approvals of authorities having jurisdiction.
- g. Requested substitution is compatible with other portions of the Work.
- h. Requested substitution has been coordinated with other portions of the Work.
- i. Requested substitution provides specified warranty.
- j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION

3.01 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01 77 00.

Form 01 25 00-1
SUBSTITUTION REQUEST

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to design, including Engineer design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

Telephone: _____

Attachments: _____

[Engineer][CM] REVIEW AND ACTION

- Substitution approved – Make submittals in accordance with Specification Section 01 25 00.
- Substitution approved as noted – Make submittals in accordance with Specification Section 01 25 00.
- Substitution rejected – Use specified materials.
- Substitution Request received too late – Use specified materials.

Signed by: _____ Date: _____

Additional Comments: Contractor Subcontractor Supplier Manufacturer Engineer Other: _____

Form 01 25 00-1 (Continued)
SUBSTITUTION REQUEST

Project: _____ Substitution Request Number: _____
_____ From: _____

To: _____ Date: _____
_____ Engineer Project Number: _____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____

Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No. _____

Installer: _____ Address: _____ Phone: _____

History: New product 1-4 years old 5-10 years More than 10 years old

Differences between proposed substitution and specified product: _____

Point-by-point comparative data attached – REQUIRED BY Engineer

Reason for not providing specified item: _____

Similar Installation:

Project: _____ Engineer/Architect: _____

Address: _____ Owner: _____

_____ Date Installed: _____

Proposed substitution affects other part of Work: No Yes, explain _____

Savings to Owner for accepting substitution: _____

Proposed substitution changes Contract Time: No Yes [Add] [Deduct] _____ days.

Supporting Data Attached: Drawings Product Data Samples Tests Reports _____

END OF SECTION

Substitution Procedures
Section No. 01 25 00-8

SECTION 01 29 02

MEASUREMMENT AND PAYMENT (LUMP SUM)

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Summary:

1. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.02 DEFINITIONS:

- ###### A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.03 REFERENCES:

A. American Society for Testing and Materials International (ASTM):

1. A615/A615M: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

1.04 SCHEDULE OF VALUES:

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with continuation sheets.
 - b. Submittal schedule.
 - c. Items required to be indicated as separate activities in Contractor's construction schedule.
2. Submit the schedule of values to Engineer at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
3. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.

- B. Format and Content: Use Contract Documents table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Name of Engineer.
 - c. Engineer's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 2. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent
 - (1) Labor
 - (2) Materials.
 - (3) Equipment.
 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Contract Documents table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
 4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.
6. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
8. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.05 MEASUREMENT:

A. General:

1. In determining the quantities of excavation to which unit prices shall apply, the limits of normal width and depth of excavation shall be as described below, unless other limits are indicated on the Drawings or specified.
2. For pipes in trench, the normal width of the trench shall be measured between vertical planes which are a distance apart equal to the sum of 18 inches plus 1-1/3 times the nominal inside diameter of the pipe. If the width so computed is less than 3 feet, a width of 3 feet shall be taken as the normal width for payment. The normal depth shall be measured to a distance of 0.2 feet below the bottom of the pipe in earth and 0.7 feet in rock, unless there be a cradle underneath the pipe, in which case the normal depth shall be measured to the underside of the cradle. The width of trench for the cradle shall be assumed to be that specified above for pipes in trench.
3. For concrete placed directly against undisturbed earth, the normal width and depth of the excavation for such concrete shall be measured to the neat lines of the concrete as indicated on the Drawings or as ordered.

4. For concrete placed against rock surfaces resulting from rock excavation, the normal width and depth of the excavation shall be measured to 4 inches outside the neat lines of the concrete as indicated on the Drawings or as ordered.
5. For other structures, except manholes as noted below, the normal width shall be measured between vertical planes 1 foot outside the neat lines of the several parts of the structure, except that the width at any elevation shall be measured as not less than the width at a lower elevation. The normal depth shall be measured to the underside of that part of the structure for which the excavation is made.
6. No additional width or depth of trenches excavated in earth or rock shall be allowed at standard circular manholes.
7. Wherever bell holes are required for jointing pipe, they shall be provided without additional compensation over and above that resulting from measurements as above described.

B. Lift Station Rehabilitation:

1. The lump sum price constitute full compensation for the Lift Station Rehabilitation, complete, as indicated on the drawings and as specified.

C. Miscellaneous Earth Excavation:

1. Should modifications in the structures or pipelines be ordered, and should such modifications increase or decrease the quantity of earth excavation and backfill above normal grade from that indicated on the drawings or specified, adjustment shall be made therefore under the appropriate subdivision of this item.
 - a. The quantity of earth excavation and backfill above normal grade to be considered under this item shall be the additional quantity done or that quantity omitted in accordance with the requirements of the Engineer. The limits of measurement shall be as defined above.
 - b. The quantities to be considered under this item shall be cumulative, that is, an increase on any part of the work shall offset a decrease on any other part of the work and the final adjustment shall be based on the net increase or decrease.
 - c. If an additional quantity of earth excavation and backfill above normal grade is ordered or permitted by the Engineer, the Contractor shall be paid therefore at the unit price for this item.
 - d. The unit price for this item shall constitute full compensation for excavation and backfill and all work incidental thereto including drainage.

- e. If the quantity of excavation and backfill done by the Contractor is less than that indicated on the drawings or specified, the Owner shall receive credit for such decrease at the unit price for this item.
- f. If, in the opinion of the Engineer, the material below normal grade of any excavation is unsuitable for foundation, it shall be removed to such limits as the Engineer may direct, which work shall be done under the appropriate subdivision of this item; whether done by hand or by machine.
- g. The quantity of excavation below normal grade to be paid for under this item shall be equal to the number of cubic yards of unsuitable material excavated, measured to the extent of the work done as ordered by the Engineer.
- h. The unit price for this item shall constitute full compensation for excavation below normal grade and disposal of unsuitable material.

D. Trench Rock Excavation and Disposal:

- 1. Where rock is encountered and it is not indicated on the drawings, it shall be uncovered but not excavated until measurements have been made by the Engineer, unless in the opinion of the Engineer, satisfactory measurements can be made in some other manner.
 - a. The quantity of rock to be paid for under this item shall be the number of cubic yards of rock, measured in place before excavation, within the limits of normal excavation as defined above, unless rock excavation beyond such limits has been authorized in writing by the Engineer, in which case measurement shall be made to the authorized limits.
 - b. Excavated rock which has not been disposed of will not be included for payment.
 - c. The unit price shall constitute full compensation for rock excavation and disposal, for all necessary backfilling, and for furnishing all additional material needed for backfilling.
 - d. If material suitable for backfilling is not available in sufficient quantity from other excavations, the Contractor shall, at his own expense, furnish suitable material from outside sources.

E. Extra Work:

- 1. Extra work, if any, shall be performed in accordance with Article 8.4 of the General Conditions and will be paid for in accordance with Article 9 of the General Conditions.

1.06 APPLICATIONS FOR PAYMENT:

- A. The following subsections describe the measurement of and payment for the work to be
Measurement and Payment (Lump Sum)
Section No. 01 29 02-5

done under the items listed in the BID.

1. Estimates of lump sum items shall be based on a schedule of values dividing each such item into its appropriate component parts together with a quantity and a unit price for each part so that the sum of the products of prices and quantities will equal the Contract price for the item. This schedule shall be submitted by the Contractor for and must have the acceptance of the Engineer before the first estimate becomes due. Submit the schedule of values in accordance with Articles 2.05 and 2.07 of the General Conditions.
- B. Each unit or lump-sum price stated in the BID shall constitute full compensation as herein specified for each item of work completed in accordance with the drawings and specifications, including cleaning up.
- C. The prices for those items which involve excavation shall include compensation for disposal of surplus excavated material, handling water, and installation of all necessary sheeting and bracing.
- D. In all items involving excavation, the price shall be based on doing the entire excavation in subgrade material indicated on the Contract Drawings. Where rock is required to be excavated in quantities exceeding those indicated on the Contract Drawings, the price therefore shall be in addition to the cost of excavating earth, and no deduction will be made in the amount for earth excavation.
- E. If changes are made in the design based on the drawings and specifications as issued, and should such changes increase or decrease the quantity of work to be done under Item 1, adjustment will be made therefore as stipulated under I, inclusive.
- F. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Engineer and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, Monthly Application for Progress Report, and final Application for Payment involve additional requirements.
- G. Payment Application Times: Submit Application for Payment to Engineer by the 15th of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.
- H. Application for Payment Forms: Use EJCDC Document C-620 as form for Applications for Payment.
- I. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Engineer will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- J. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
 3. Provide summary documentation for stored materials indicating the following:
 - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
 - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
 - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- K. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Engineer by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- L. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.

2. When an application shows completion of an item, submit conditional final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
- M. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of values.
 3. Pre-construction surveys and photographs.
 4. Health and safety and environmental protection plans.
 5. Contractor's construction schedule (preliminary if not final).
 6. Products list (preliminary if not final).
 7. Schedule of unit prices.
 8. Submittal schedule (preliminary if not final).
 9. List of Contractor's staff assignments.
 10. List of Contractor's principal consultants.
 11. Copies of building permits.
 12. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 13. Initial progress report.
 14. Report of preconstruction conference.
- N. Application for Monthly Progress Payment: Administrative actions and submittals that must precede or coincide with submittal of monthly Application for Progress Payment include the following:
1. Schedule of values.
 2. Schedule of unit prices.
 3. Construction photographs.

4. Contractor's updated construction progress schedule and specified reports.
 5. Documented proof that it has recorded information on the Contract Drawings to reflect "As Built" information.
- O. Application for Payment at Substantial Completion: After Engineer issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum. Documentation include, evidence of all the following:
 - a. Each item of mechanical, electrical, instrumentation, piping and HVAC equipment installed or modified under this Contract have been tested to demonstrate compliance with the performance requirements of this Contract, including successful functional testing, water testing, performance testing and facility commissioning.
 - b. All operating, maintenance manuals and as-built drawings have been provided to the Owner.
 - c. All spare parts and materials have been provided to the Owner.
 - d. All warranty certificates and test results have been provided to the Owner.
 - e. The Contractor has provided instructions and training to the Owner's staff to enable the Owner to operate the Works.
 2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- P. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. Evidence that claims have been settled.
 5. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

6. Final liquidated damages settlement statement.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

(Not Used)

END OF SECTION

SECTION 01 31 19
PROJECT MEETINGS

PART 1 - GENERAL

1.01 SUMMARY:

- A. Contractor shall schedule and administer progress meetings with their own staff and/or other contractors, construction foremen's meetings, and specially called meetings with these parties throughout progress of Work. Contractor shall:
 - 1. Prepare agenda for meetings.
 - 2. Distribute written notice of specially called meetings minimum of one working day(s) in advance of meeting date.
 - 3. Make physical arrangements for meetings.
 - 4. Preside at meetings.
 - 5. Record minutes; include significant proceedings and decisions.
 - 6. Prepare formal minutes and distribute within two working days after each meeting to the following:
 - a. Meeting participants.
 - b. Parties affected by decisions made at meeting.
 - c. Engineer and Owner - furnish both with electronic (PDF) copies of minutes.
- B. Representatives of Contractor, Subcontractors, and Suppliers attending meetings shall be qualified and authorized to act on behalf of entity each represents.
- C. Owner and Engineer may attend meetings.

1.02 PRECONSTRUCTION CONFERENCE:

- A. Engineer will schedule and conduct preconstruction conference in accordance with General Conditions and this section.
- B. Location: At location to be selected by Owner.
- C. Attendance.
 - 1. Contractor's Project Manager.

2. Contractor's Resident Superintendent.
 3. Contractor's "hands-on" person designated by Contractor to submit Shop Drawings to Engineer.
 4. Subcontractors' or suppliers' representatives Contractor may desire to invite or Engineer may request.
 5. Engineer's representatives.
 6. Owner's representatives.
 7. Local utility representatives, if applicable.
- D. Suggested format includes, but not be limited to following:
1. Project Safety.
 2. Presentation of preliminary progress schedule in accordance with Section 01 32 16 "Construction Progress Schedule" and preliminary schedule of Shop Drawing and sample submissions in accordance with Section 01 33 00 "Submittals" of Contract Documents.
 3. Check of required bonds and insurance policies prior to Notice to Proceed.
 4. Liquidated damages.
 5. Procedures for handling submittals such as substitutions and Shop Drawings.
 6. O&M submittal procedures.
 7. Training requirements.
 8. Requirements for functional testing, startup, commissioning, performance testing, and reliability testing.
 9. Direction of correspondence and coordinating responsibility.
 10. Weekly and monthly progress meetings.
 11. Equal opportunity requirements.
 12. Laboratory and field testing requirements.
 13. Provisions for inventory of material stored on-site or off-site if off-site storage is authorized.
 14. Schedule of values, application for progress payment, and progress payment procedures.

15. Change Order procedures.
16. Contractor's proposed Environmental Management and Erosion Control Plan.
17. Contractor's proposed Health and Safety Plan.
18. Contractor's proposed Quality Control Plan.
19. Coordination requirements with staff and ongoing operations.
20. Construction sequencing and stipulated construction and operational constraints.

1.03 PROGRESS MEETINGS:

A. In addition to other regular project meetings for other purposes (as indicated elsewhere in the Contract Documents), hold general progress meetings once each month with times coordinated with preparation of payment requests. Meetings shall be held at the Alleghany County Governmental Complex located at 9212 Winterberry Avenue, Covington, Virginia 24426. Meeting dates shall be established by the Owner. Require every entity then involved in the planning, coordination or performance of work to be properly represented at each meeting. Include (when applicable):

1. Consultants
2. Separate contractors (if any)
3. Principal subcontractors
4. Suppliers/manufacturers/fabricators
5. Governing authorities
6. Insurers
7. Special supervisory personnel and others with an interest or expertise in the progress of the work.

B. Suggested format includes, but not limited to following:

1. Review each entity's present and future needs including interface requirements
2. Construction sequence, coordination and shutdown requirements
3. Construction schedule and progress reporting
4. On-site witness testing by independent subconsultants and approval/regulatory agencies
5. Deliveries

6. Access
 7. Site utilization
 8. Temporary facilities and services
 9. Hours of work
 10. Safety, hazards and risks
 11. Housekeeping
 12. Submittals
 13. Change managements (request for quotation, change directives, change orders)
 14. Contract administration logs (request for information, etc.)
 15. Documentation of information for payment requests
 16. O&M submittal
 17. Training
 18. Functional testing, startup, commissioning, performance testing, and reliability testing
- C. Discuss whether each element of current work is ahead of schedule. Determine how behind-time work will be expedited and secure commitments from the entities involved in doing so. Discuss whether schedule revisions are required to ensure that current work and subsequent work will be completed within the Contract Time. Review everything of significance which could affect the progress of the work.
- D. Within two days after each progress meeting date, the Contractor will forward copies of the minutes-of-the-meeting, to the Owner and Engineer.
- E. Immediately following each progress meeting where revisions to the Progress Schedule/Critical Path Schedule have been made or recognized (regardless of whether agreed to by each entity represented), revise the Schedule. Reissue revised Schedule within 10 working days after meeting.
- F. At intervals matching the preparation of payment requests, revise and reissue the Schedule to show actual progress of the work in relation to the latest revision of the Schedule.
- 1.04 CONSTRUCTION FOREMEN'S MEETING:
- A. Schedule weekly.

B. Attendance.

1. Resident superintendent.
2. Subcontractor's foremen.

C. Suggested Agenda.

1. Health and safety.
2. Review agenda of Work progress since previous meeting.
3. Proposed progress and schedule for succeeding Work period.
4. Field observations, problems, and conflicts.
5. Problems which affect construction schedule.
6. Coordination and shutdown requirements.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

(Not Used)

END OF SECTION

SECTION 01 33 00

SUBMITTALS

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. This Section specifies the general methods and requirements of submissions applicable to the following work-related submittals as indicated and in compliance with Contract Documents.
 - 1. Shop Drawings, Product Data and Samples.
 - 2. Construction Photographs.
 - 3. Contractor's Responsibilities.
 - 4. Submission Requirements.
 - 5. Review of Shop Drawings, Product Data, Working Drawings and Samples.
 - 6. Distribution.
 - 7. General Procedures for Submittals.
 - 8. Certificate of Design.
 - 9. Certificates of Compliance.
 - 10. Schedules.
- B. Additional general submission requirements are contained in Paragraph 6.17 of the General Conditions.
- C. Detailed submittal requirements will be specified in the technical specifications section.

1.02 DEFINITIONS:

- A. Written and graphic information and physical samples that require Engineer's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

- C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.
- D. Shop drawings, as defined in the General Conditions, and as specified in individual work Sections include, but are not necessarily limited to: custom-prepared data such as fabrication and erection/installation (working) drawings of concrete reinforcement, structural details and piping layout, scheduled information, setting diagrams, actual shopwork manufacturing instructions, custom templates, special wiring diagrams, coordination drawings, individual system or equipment inspection and test reports including performance curves and certifications as applicable to the work.

1.03 SUBMITTALS:

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Engineer and additional time for handling and reviewing submittals required by those corrections.
 - 1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
 - 2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 - 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
 - 4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Engineer's final release or acceptance.

g. Scheduled date of fabrication.

1.04 SUBMITTAL ADMINISTRATIVE REQUIREMENTS:

- A. Engineer's Digital Data Files: Electronic digital data files of the Contract Drawings will not be provided by Engineer for Contractor's use in preparing submittals.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on accepted submittal schedule.
 - 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 - 4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
 - 5. The Contractor shall revise and resubmit rejected submittals and those requiring corrections or verification of information in a timely manner such that the overall progress of the Work is not impeded.
 - 6. Coordination of Submittal Times: The Contractor shall prepare and transmit each submittal sufficiently in advance of performing the related Work or other applicable activities, or within the time specified in the individual Sections of the Specifications, so that the installation will not be delayed by processing times, including rejection and resubmittal (if required), coordination with other submittals, testing, purchasing, fabrication, delivery, and similar sequenced activities. No extension of Contract Time will be authorized because of the Contractor's failure to transmit submittals sufficiently in advance of the Work.
- C. All shop drawings shall be submitted using the transmittal form furnished by the Engineer.
- D. All shop drawings submitted by subcontractors for approval shall be sent directly to the Contractor for checking. The Contractor shall be responsible for their submission at the proper time so as to prevent delays in delivery of materials.
- E. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt of submittal. No

extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 working days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 working days for review of each resubmittal.
 - a. .

F. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Engineer .
4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:
 - a. Project name.
 - b. Date.
 - c. Name and address of Engineer.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Name of firm or entity that prepared submittal.
 - g. Names of subcontractor, manufacturer, and supplier.

- h. Category and type of submittal.
 - i. Submittal purpose and description.
 - j. Specification Section number and title.
 - k. Specification paragraph number or drawing designation and generic name for each of multiple items.
 - l. Drawing number and detail references, as appropriate.
 - m. Location(s) where product is to be installed, as appropriate.
 - n. Related physical samples submitted directly.
 - o. Indication of full or partial submittal.
 - p. Transmittal number, numbered consecutively.
 - q. Submittal and transmittal distribution record.
 - r. Other necessary identification.
 - s. Remarks.
- G. Options: Identify options requiring selection by Engineer.
- H. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Engineer on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- I. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
- 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked with acceptance notation from Engineer's action stamp.
- J. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- K. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with acceptance notation from Engineer's action stamp.

1.05 CONSTRUCTION PHOTOGRAPHS:

- A. NOT USED.

PART 2 - PRODUCTS

2.01 SUBMITTAL PROCEDURES:

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 - 1. Submit electronic submittals via email as PDF electronic files.
 - a. Engineer will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 - b. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
 - c. Provide a notarized statement on original paper copy certificates and certifications where indicated.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each copy of each submittal to show which products and options are applicable.
 - 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.

- h. Availability and delivery time information.
- 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
- 5. Submit Product Data before or concurrent with Samples.
- 6. Submit Product Data in the following format:
 - a. PDF electronic file.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
 - 1. Certified shop and erection drawings. Contractor shall submit electronic files of the proposed equipment in the capacity, size, and arrangement as indicated and specified. Electronic files shall conform to the following minimum requirements:
 - a. Electronic Files: AutoCAD latest version, 3D, drawn to scale.
 - b. Submit electronic files as part of the Shop Drawing submittal.
 - c. Submit electronic files in a compressed electronic file format (zip).
 - d. Drawings shall include plan views, sectional views, title block, Tag Numbers, serial numbers, Parts List (identifying each component), dimensions, connection sizes and types and all details of all related items. In cases where certain information is proprietary and is omitted, provided a statement indicating that the information is proprietary and is being omitted.
 - e. Drawings shall be in conformance with all other requirements as specified in this specification.
 - 2. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.

- d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
3. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm), but no larger than 30 by 42 inches (750 by 1067 mm).
 4. Submit Shop Drawings in the following format:
 - a. PDF electronic file.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 - e. Specification paragraph number and generic name of each item.
 3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 4. Disposition: Maintain sets of accepted Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

- a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Engineer will return submittal with options selected.
- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 2. Manufacturer and product name, and model number if applicable.
 3. Number and name of room or space.
 4. Location within room or space.
 5. Submit product schedule in the following format:
 - a. PDF electronic file.
- F. Coordination Drawing Submittals: Comply with requirements specified in Division 01 Section "Project Management and Coordination."
- G. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- H. Application for Payment and Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."
- I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."
- J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."
- K. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."
- L. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of Engineers and owners, and other information specified.
- M. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

- N. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- O. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- P. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- Q. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- R. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- S. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- T. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- U. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- V. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests

performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

- W. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

PART 3 - EXECUTION

3.01 CONTRACTOR'S REVIEW:

- A. Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents prior to submission to the Engineer. Mark with approval stamp before submitting to Engineer.
- B. Contractor review shall verify the following:
 - 1. Field measurements
 - 2. Field construction criteria
 - 3. Catalog numbers and similar data
 - 4. Conformance with the Specifications
- C. If a shop drawing shows any deviation from the requirements of the Contract Documents, the Contractor shall make specific mention of the deviations in the Transmittal Form furnished by the Engineer and provide a description of the deviations in a letter attached to the submittal.
- D. The review and approval of shop drawings, samples or product data by the Engineer shall not relieve the Contractor from his responsibility with regard to the fulfillment of the terms of the Contract. All risks of error and omission are assumed by the Contractor and the Engineer will not have responsibility for any such errors and omissions.
- E. No portion of the work requiring a shop drawing, sample, or product data shall be started nor shall any materials be fabricated or installed prior to the approval or qualified approval of such item by the Engineer. Any fabrication performed, materials purchased or on-site construction accomplished which does not conform to accepted shop drawings and data shall be at the Contractor's own risk. The Owner will not be liable for any expense or

delay due to corrections or remedies required to accomplish conformity with the requirements of the Contract.

- F. Project Closeout and Maintenance Material Submittals: See requirements in Division 01 Section "Closeout Procedures."
- G. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.02 ENGINEER'S ACTION:

- A. The Engineer's review is for general conformance with the design concept and contract documents. Markings or comments shall not be construed as relieving the Contractor from compliance with the contract plans and specifications or from departures therefrom. The Contractor remains responsible for details and accuracy, for coordinating the work with all other associated work and trades, for selecting fabrication processes, for techniques of assembly, and for performing work in a safe manner.
- B. Submittals will be reviewed for the Contractor's approval stamp. Submittals not stamped by the Contractor will be returned without any action.
- C. The review of shop drawings, data, and samples will be general. They shall not be construed:
 - 1. as permitting any departure from the Contract requirements;
 - 2. as relieving the Contractor of responsibility for any errors or omissions, including details, dimensions, and materials;
 - 3. as approving departures from details furnished by the Engineer, except as otherwise provided herein.
- D. If the shop drawings, data or samples as submitted describe variations and show a departure from the Contract requirements which the Engineer finds to be in the interest of the Owner and to be so minor as not to involve a change in Contract Price or time for performance, the Engineer may return the reviewed drawings without noting an exception.
- E. Submittals will be returned to the Contractor under one of the action codes indicated below and defined on the transmittal form furnished by the Engineer.
 - 1. Marking: No Exception Taken.
 - a. When submittals are marked as "No Exception Taken," Work covered by submittal may proceed provided it complies with Contract Documents. Acceptance of Work depends on that compliance.

2. Marking: Make Corrections Noted.
 - a. When submittals are marked as “Make Corrections Noted,” Work covered by submittal may proceed provided it complies with Engineer’s notations or corrections on submittal and with Contract Documents. Acceptance of Work depends on that compliance. Resubmittal not required.
 3. Marking: Amend and Resubmit.
 - a. When submittals are marked as “Amend and Resubmit,” do not proceed with Work covered by submittal. Do not permit Work covered by submittals to be used at Project site or elsewhere where Work is in progress.
 - b. Revise submittal or prepare new submittal in accordance with Engineer's notations in accordance with resubmittal requirements of this section. Resubmit without delay. Repeat if required to obtain different action marking.
 4. Marking: Rejected; See Remarks.
 - a. When submittals are marked as “Rejected; See Remarks,” do not proceed with Work covered by submittal. Work covered by submittal does not comply with Contract Documents.
 - b. Prepare new submittal for different material or equipment supplier or different product line or material of same supplier complying with Contract Documents.
 5. Marking: For Information Only.
 - a. When submittals are marked as “For Information Only,” the Engineer will review the submittal but take no action.
 - b. It will be recorded as “For Information Only”. Work covered by this submittal may proceed provided it complies with the Contract Documents.
 6. Marking: Not Required for Review.
 - a. When submittals are marked as “Not Required for Review,” the Engineer has not reviewed the submittal and it is being returned.
 - b. Work covered by this submittal may proceed provided it complies with the Contract Documents.
- F. Resubmittals will be handled in the same manner as first submittals. On resubmittals the Contractor shall direct specific attention, in writing, on the letter of transmittal and on resubmitted shop drawings by use of revision triangles or other similar methods, to revisions other than the corrections requested by the Engineer, on previous submissions.

Any such revisions which are not clearly identified shall be made at the risk of the Contractor. The Contractor shall make corrections to any Work done in relation to revisions which are not specifically pointed out to the Engineer which are deemed, by the Engineer, not to be in accordance with the Contract Documents .

- G. Partial submittals may not be reviewed. The Engineer will be the only judge as to the completeness of a submittal. Submittals not complete will be returned to the Contractor, and will be considered "Rejected" until resubmitted. The Engineer may at his option provide a list or mark the submittal directing the Contractor to the areas that are incomplete.
- H. If the Contractor considers any correction indicated on the shop drawings to constitute a change to the Contract Documents, the Contractor shall give written notice thereof to the Engineer at least seven working days prior to release for manufacture. The shop drawing and the Product data sheet reviews do not authorize changes in Contract Price or Contract Time. Changes involving Contract Price or Contract Time are authorized only by a signed Change Order, in accordance with the General Conditions.
- I. When the shop drawings have been completed to the satisfaction of the Engineer, the Contractor shall carry out the construction in accordance therewith and shall make no further changes therein except upon written instructions from the Engineer.
- J. Material and equipment delivered to the Site will not be paid for until the pertinent shop drawings have been reviewed and accepted by the Engineer.

3.03 DISTRIBUTION:

- A. Distribute reproductions of accepted shop drawings and copies of accepted product data and samples, where required, to the job site file and elsewhere as directed by the Engineer. Number of copies shall be as directed by the Engineer but shall not exceed 6.

3.04 CERTIFICATE OF DESIGN:

- A. If specifically specified in other Sections of these Specifications, the Contractor shall submit the applicable Certificate of Design for each item required, Form 01 33 00-1, completely filled in and signed and sealed by a registered professional engineer.

3.05 CERTIFICATES OF COMPLIANCE:

- A. Certificates of Compliance as specified in the specifications shall include and mean certificates, manufacturer's certificates, certifications, certified copies, letters of certification and certificate of materials.
- B. The Contractor shall be responsible for providing Certificates of Compliance as specified in the technical specifications. Certificates are required for demonstrating proof of compliance with specification requirements and shall be executed in six (6) copies unless otherwise specified. Each certificate shall be signed by an official authorized to certify on behalf of the manufacturing company and shall contain the name and address of the

Supplier, the project name and location, and the quantity and date or dates of shipment or delivery to which the certificates apply. Copies of laboratory test reports submitted with certificates shall contain the name and address of the testing laboratory and the date or dates of the tests to which the report applies. Certification shall not be construed as relieving the Supplier from furnishing satisfactory material, if after tests are performed on selected samples, the material is found not to meet the specific requirements.

3.06 SCHEDULES:

- A. Provide all schedules specified in Articles 2.05 B, 2.07, 14.01 and elsewhere in the General Conditions.
- B. Article 14.02 of the General Conditions, Progress Payments, shall be subject to meeting the Schedule Requirements of Section 01 33 00 Table 01 33 00-1. No progress payment identified in Section 01 33 00 Table 01 33 00-1 over the limits identified will be made until the milestones set in this table are satisfied.

Table 01 33 00-1		
Section Number	Submittal	Schedule Requirement/ Payment Milestone
01 29 02	Schedule of values is submitted and reaches no exceptions taken status.	Prior to 5% payment
01 32 17	Project schedule is submitted and reaches no exceptions taken status.	Prior to 5% payment
01 33 00	Shop drawings are submitted and reached no exceptions taken status.	Prior to 25% payment.
01 77 00 (01700)	Record documentation is submitted and reaches no exceptions taken status.	Prior to 95% payment.
01 77 00 (01700)	Punch list is completed and corrected.	Prior to 95% payment.
01 78 23(01730)	O&M Manual Content reaches no exceptions taken status.	Prior to 25% payment.

Table 01 33 00-1		
Section Number	Submittal	Schedule Requirement/ Payment Milestone
01 78 23(01730)	Initial O&M Manual	Prior to 50% payment
01 78 23(01730)	Pre-Final O&M Manual reaches no exceptions taken status.	Prior to 75% payment.

END OF SECTION

Form 01 33 00-1

CERTIFICATE OF DELEGATED DESIGN SERVICES

The undersigned hereby certifies that he/she is a Professional Engineer registered in the state of _____ and that he/she has been employed by (Name of Contractor) _____ to design _____ in accordance with Specifications Section _____ for the (Name of Project) _____. The undersigned further certifies that he/she has performed similar designs previously and has performed the design of the _____; that said design is in conformance with all applicable local, state, and federal codes, rules, and regulations and professional practice standards; that his/her signature and Professional Engineer (P.E.) Stamp have been affixed to all calculations and drawings used in, and resulting from, the design; and that the use of that stamp signifies the responsibility of the undersigned for that design.

The undersigned hereby certifies that he/she has Professional Liability Insurance with limits of \$1,000,000.00 and a Certificate of Insurance is attached.

The undersigned hereby agrees to make all original design drawings and calculations available to the Town/City of _____ or Owner's representative within seven (7) days following written request therefore by the Owner.

P.E. Name Contractor's Name

Signature Signature

Title Title

Address Address

Submittals
Section No. 01 33 00-17

Form 01 33 00-2

CERTIFICATE OF UNIT RESPONSIBILITY

For Specification Section _____

(Section title)

In accordance with Section 01 33 00, paragraph 3.05 of the contract documents, the undersigned manufacturer accepts unit responsibility for all components of equipment furnished under specification Section [_____] and the requirements specified in Section 01 41 20. We hereby certify that these components are compatible and comprise a functional unit suitable for the specified and indicated performance and design requirements.

Notary Public

Name of Corporation

Commission expiration date

Address

Seal: By: _____
Duly Authorized Official

Legal Title of Official

Date: _____

Submittals
Section No. 01 33 00-18

PUMP, MOTOR and VFD COORDINATION CERTIFICATE

Owner:

Project:

Contract No.:

Submittal Number:

Pump Tag Numbers	
Pump Service	
Specification Section	
Pump Manufacturer	
Pump Model Number	
Pump Rated Capacity, gpm	
Motor Manufacturer and Model Number	
Motor Enclosure	
VFD Manufacturer and Model Number	

Motor Data:

HP	Full Load RPM	Type	Enclosure	Phase	Hertz	Volts	Amperes		Service Factor	Rotation
							Full Load	Locked Rotor		

GUARANTEED EFFICIENCY	POWER FACTOR	TORQUE AT FULL VOLTAGE		
		Full Load Torque At Full Load Speed (Lb.Ft.)	Locked Starting	Pullout Breakdown

Full Load	$\frac{3}{4}$ Load	$\frac{1}{2}$ Load	Full Load	$\frac{3}{4}$ Load	$\frac{1}{2}$ Load		Percent of Full Load	

The undersigned hereby CERTIFY that the motor design as furnished by the pump manufacturer and the VFD design as furnished by the VFD will work properly together throughout all operation conditions specified in section _____ and as indicated. The contractor shall assume all responsibility for the proper installation and start-up of the motor and VFD as a complete system to meet the contract requirements.

Pumps shall not be shipped from the place of manufacture until the completed pump motor-VFD coordination certification has been received and pump and motor submittals have received a code 1. The contractor shall accommodate, at no additional cost to the owner, any changes resulting from the coordination of the motor and VFD required to meet the contract requirements.

CERTIFIED BY: _____

Contractor:

(Company Name)

(Print Name and Title)

(Signature)

(Date)

Pump Manufacturer:

(Company Name)

(Print Name and Title)

(Signature)

(Date)

VFD Manufacturer:

(Company Name)

(Print Name and Title)

(Signature)

(Date)

SECTION 01 35 43

PROTECTION OF ENVIRONMENT

PART 1 - GENERAL

1.01 SUMMARY:

- A. Contractor, in executing Work, shall maintain Work areas on- and off-site free from environmental pollution that would be in violation of federal, state or local regulations as indicated and in compliance with Contract Documents.
- B. The control of environmental pollution requires consideration of air, water, and land, and involves management of noise and solid waste, as well as other pollutants.
- C. Any contamination shall be reported by the Contractor to the Owner, the Engineer and the Virginia Department of Environmental Quality (VDEQ) and cleaned up as per VDEQ requirements.
- D. The Contractor shall be responsible for the protection of the natural environment of the Site and surrounding areas, both land and water. Protection of the environment must start with avoidance and prevention, and then control/mitigation, compensation, or enhancement (in order of descending preference).
- E. Schedule and conduct all work in a manner that will minimize the erosion of soils in the area of the work. Provide erosion control measures such as diversion channels, sedimentation or filtration systems, berms, staked hay bales, seeding, mulching, or other special surface treatments as are required to prevent silting and muddying of streams, rivers, impoundments, lakes, etc. All erosion control measures shall be in place in an area prior to any construction activity in that area.
- F. Ensure that construction is achieved with a minimum of disturbance to the existing ecological balance between a water resource and its surroundings. It is the Contractor's responsibility to determine the specific construction techniques to meet these guidelines.
- G. Schedule and conduct all work in a manner that will minimize the level of noise escaping the site, especially at night and on weekends.
- H. Payment:
 - 1. Consider Work specified in this section incidental and include payment as part of appropriate lump sum or unit prices specified in Bid Form.

1.02 REFERENCES:

- A. United States Environmental Protection Agency (USEPA):

1. EPA-72-015: Guidelines for Erosion and Sedimentation Control Planning and Implementation
 2. EPA 43019-73-007: Processes, Procedures, and Methods to Control Pollution Resulting from All Construction Activity
- B. Federal Environmental Protection Act and applicable regulations.
- C. Owner's environmental management plans and associated environmental protection plans.

1.03 SUBMITTALS

- A. Submit shop drawings in accordance with the requirements of Section 01 33 00 "Submittals".
- B. Prior to commencing any Work on this Contract and not later than fifteen (15) Working Days following receipt of the Notice to Commence, the Contractor shall submit Environmental Protection shop drawings for the Engineer's review and approval. Submit shop drawings for the following:
1. Plans and sketches showing areas proposed to be used for construction storage, the Contractor's Site office, vehicle cleaning, equipment fuelling and associated access routes.
 2. Surface drainage and storm sewer control plan.
 3. Erosion and sediment control plan
 4. Mud and dust control plan.
 5. Noise control plan.
 6. Fuels and lubricants storage and dispensing control plan .
 7. Construction Equipment Cleaning control plan.
 8. Spills response and spills reporting plan.
 9. Erosion and sediment control contingency plan.
 10. Fire contingency plan.
 11. Contaminated site contingency plan.
 12. Fuel spills contingency plan

1.04 PROTECTION OF STORM SEWERS:

- A. Prevent construction material (including volatile liquid wastes such as oil, chemicals, paints), pavement, concrete, earth or other debris from entering existing storm sewer or sewer structure.

1.05 PROTECTION OF WATERWAYS:

- A. Observe rules and regulations of the Commonwealth of Virginia and Federal agencies of U.S. government prohibiting pollution of lakes, streams, rivers or wetlands by dumping of refuse, rubbish, dredge material or debris.
- B. The Contractor shall not cause or permit action to occur which would cause an overflow to existing waterways. Provide holding ponds or accepted method which will divert flows, including storm flows and flows created by construction activity, to prevent excessive silting of waterways or flooding damage to property.
- C. Comply with procedures outlined in U.S. EPA manuals entitled, "Guidelines for Erosion and Sedimentation Control Planning and Implementation", Manual EPA-72-015 and "Processes, Procedures, and Methods to Control Pollution Resulting from All Construction Activity", Manual EPA 43019-73-007. In cases of conflicts, the most stringent requirements will govern this contract.

1.06 DISPOSAL OF EXCESS EXCAVATED AND OTHER WASTE MATERIALS:

- A. Excess excavated material not required or not suitable for backfill and other waste material shall be disposed of in accordance with local regulatory requirements.
- B. Provide watertight conveyance for liquid, semi-liquid or saturated solids which tend to bleed during transport. Liquid loss from transported materials is not permitted, whether being delivered to construction site or hauled away for disposal. Fluid materials hauled for disposal must be specifically acceptable at selected disposal site.

1.07 PROTECTION OF AIR QUALITY:

- A. Minimize air pollution by requiring use of properly operating combustion emission control devices on construction vehicles and equipment and encourage shutdown of motorized equipment not in use.
- B. Do not burn trash on or adjacent to construction site.
- C. If temporary heating devices are necessary for protection of Work, they shall not cause air pollution.
- D. The Contractor shall conduct operations of dumping rock and of carrying rock away in trucks in such a way as to minimize dust. Give unpaved streets, roads, detours, or haul roads used in construction area a dust-preventive treatment or periodically water them to

prevent dust. Strictly adhere to all applicable environmental regulations for dust prevention.

1.08 USE OF CHEMICALS:

- A. Chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant or of other classification, shall be approved by U.S. EPA or U.S. Department of Agriculture and any other applicable regulatory agency.
- B. Use and disposal of chemicals and residues shall comply with manufacturer's instructions.

1.09 NOISE CONTROL:

- A. Conduct operations to cause least annoyance to residents in vicinity of Work, and comply with applicable local ordinances.
- B. Equip compressors, hoists, and other apparatus with mechanical devices necessary to minimize noise and dust. Equip compressors with silencers on intake lines.
- C. Equip gasoline or oil-operated equipment with silencers or mufflers on intake and exhaust lines.
- D. Line storage bins and hoppers with material that will deaden sounds. Conduct operation of dumping rock and of carrying rock away in trucks so as to cause minimum of noise and dust. Route vehicles carrying rock, concrete or other material over such streets as will cause least annoyance to public and do not operate on public streets.
- G. No excessive idling of motorized equipment is permitted.
- H. Where necessary, the Contractor shall place noise attenuation devices (barriers) around the Contractor's construction equipment.
- I. Submit a plan to mitigate construction noise and to comply with noise control ordinances, including methods of construction, equipment to be used, and acoustical treatments.

1.10 MUD AND DUST CONTROL:

- A. Due to close geographic location of Project to other off-site facilities and residential homes take special care in providing and maintaining temporary site roadways, Owner's existing roads, and public roads used during construction operations in clean, dust free condition.

- B. Comply with local environmental regulations for dust control. If Contractor's dust control measures are considered inadequate by Engineer, Engineer may require Contractor to take additional dust control measures.
- C. The Contractor shall employ only wet type equipment for saw cutting and concrete grinding to control dust nuisance.
- D. The Contractor shall obtain the Engineer's acceptance before chemicals for dust control are used. Sodium chloride is not permitted for dust control.
- E. All trenches and disturbed areas created during the execution of the Work that will produce dust shall be maintained dust free by an application of calcium chloride at the Engineer's direction.
- F. The Contractor shall not use calcium chloride on access roads.
- G. The Contractor shall transport dusty materials in covered haulage vehicles.
- H. The Contractor shall be responsible for a prompt and complete clean up of all dirt and mud deposited on the public and/or private property as a consequence of the execution of the Work. In the event that the Contractor fails to comply with this obligation the Owner may proceed with the necessary clean up and charge all the costs for the cleanup to the Contractor.
- I. The Contractor shall wash mud from construction vehicles before leaving the construction Site.
- J. The Contractor shall wash and clean the following roads at the end of each work day during the Contract:
 - 1. County streets impacted by construction activities.

1.11 CLEANING OF EQUIPMENT

- A. The Contractor shall keep construction equipment clean so that no debris is deposited on the plant roadways or any public roadway. The Contractor shall identify a designated vehicle cleaning area within the working limits of the Contract. The Contractor shall contain all construction debris in this designated area only. The Contractor shall dispose of debris off Site.
- B. The Contractor shall ensure that debris cleaned from equipment cannot gain access to storm sewers and watercourses.

1.12 FUELS AND LUBRICANTS:

- A. Comply with local, state and federal regulations concerning transportation and storage of fuels and lubricants.

- B. The Contractor shall designate an area within the working limits to be used exclusively for fuelling of construction equipment. The Contractor shall carry out all refueling in this area only. Refueling of backhoes or shovels will be allowed at locations other than the accepted refueling areas, but not closer than 30 feet from any watercourse.
- C. Fuel storage area and fuel equipment shall be approved by Owner prior to installation. Submit containment provisions to Engineer for approval.
- D. The Contractor shall submit to the Engineer for review prior to starting the Work, procedures for the interception and rapid clean-up and disposal of fuel spillages which may occur. The Contractor shall ensure that the materials required for the clean-up of fuel spillages are readily accessible on Site at all times.
- E. The cleaning of equipment in streams and lakes and the emptying of fuel, lubricants and pesticides into watercourses is prohibited. The Contractor shall contain fuel, lubricants, pesticides and construction debris and dispose of it off Site in approved locations.
- F. Report spills or leaks from fueling equipment or construction equipment to Owner and cleanup as required by local, state or federal regulations.
- G. Owner may require Contractor to remove damaged or leaking equipment from Project site.

1.13 CONTINGENCY AND EMERGENCY RESPONSE PLANS:

A. General

1. The Contractor shall adopt a pollution preventative strategy to fulfill its commitment to protecting public and worker health and safety, and the environment, as stipulated in the General Conditions under “Occupational Health and Safety Act, Environmental Protection Act and Fisheries Act” and under “Spills Reporting”. Through this strategy, the potential issues and emergency events that can be anticipated shall be identified by the Contractor and procedures put in place by the Contractor to minimize their potential occurrence.
2. To address any unanticipated events, the Contractor shall develop Contingency and Emergency Response Plans and implement these plans during the performance of the Work.

B. Spills Response and Spills Reporting:

1. Prior to commencing construction, the Contractor shall be responsible for preparing a Spills Response Plan. The Spills Response Plan must address the response, containment, and cleanup of an accidental spill. It must take care of the specific roles and responsibilities of construction staff, accountability, reporting and documentation. Specifically, the plan must include:
 - a. the names and the telephone numbers of the persons in the local municipalities to be notified forthwith of a spill

- b. the names and the telephone numbers of the representatives of the fire, the police and the health departments of the local municipalities who are responsible to respond to emergency situations
 - c. the names and the telephone numbers of the companies experienced in the control and clean-up of hazardous materials that would be called upon in an emergency involving a spill
 - d. the Contractor's proposal for the immediate containment and control of the spill, the clean-up procedures to be initiated immediately and any other action to be taken to mitigate the potential environmental damage while awaiting additional assistance, and,
 - e. the name and the telephone number of the Contractor's representative responsible for preparing, implementing, directing and supervising the contingency plan
2. The Contractor shall submit for the Engineer's review and for the review of other authorities having jurisdiction a copy of the Spills Response plan and shall make the appropriate changes to it based upon the comments received from these authorities
3. In the event of a spill or other emission of a pollutant caused by the execution of the Work into the natural environment, the Contractor shall immediately notify the following of the spill, of the circumstances thereof, and of the action taken or intended to be taken with respect thereto:
 - a. Virginia Emergency Operations Center (VEOC) 1-800-468-8892
 - b. The Owner 540-863-6650
 - c. The owner of the pollutant, if known,
 - d. The person having control of the pollutant, if known,
 - e. The Engineer
4. The Contractor shall make the necessary allowances to ensure the immediate availability of the products with which to effect temporary repair to broken pipelines and other services so the spill or other emission of a pollutant is immediately controlled and stopped and to mitigate the damages. The Contractor shall do everything practicable to restore the natural environment.
5. The Contractor shall prepare a written report of the spill, and the spill event is to be recorded in the Contractor's log book. The report must contain the following information, at a minimum:
 - a. Date and time spill occurred.

- b. Estimated volume of spill.
- c. Duration of the spill.
- d. Cause and discovery of the spill.
- e. Cleanup and recovery measures taken.
- f. Name of hauler or outside contractors called in to assist with cleanup and recovery measures.
- g. Personnel on the scene.
- h. Names of parties and agencies notified and the date and time of notification of each.
- i. Steps to be taken to prevent a reoccurrence of the spill.

C. Fire Contingency Plan

- 1. The Contractor shall develop and submit a Fire Contingency Plan to ensure a rapid response to a fire thereby minimizing the threat to worker and public safety, and the environment.
- 2. The plan must include, but is not limited to an explanation of the purpose of the plan and when the plan is triggered, an explanation of relevant roles and responsibilities, and accountability for implementing the plan, and provision of fire prevention training and equipment for implementing the plan.

1.14 NOTIFICATIONS:

- A. The Engineer will notify the Contractor in writing of any non-compliance with the foregoing provisions or of any environmentally objectionable acts and corrective action to be taken. State or local agencies responsible for verification of certain aspects of the environmental protection requirements shall notify the Contractor in writing, through the Engineer, of any non-compliance with State or local requirements. The Contractor shall, after receipt of such notice from the Engineer or from the regulatory agency through the Engineer, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails or refuses to comply promptly, the Owner may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor unless it is later determined that the Contractor was in compliance.

1.15 IMPLEMENTATION:

- A. Prior to commencement of the work, meet with the Engineer to develop mutual understandings relative to compliance with this provision and administration of the environmental pollution control program.
- B. Remove temporary environmental control features, when accepted by the Engineer, and incorporate permanent control features into the project at the earliest practicable time.
- C. Implementation of the Contingency and Emergency Response Plans
 - 1. The responsibility for implementing the Contingency and Emergency Response Plans shall lie with the Contractor. Specific responsibilities include:
 - a. Reviewing the Contingency Plans and Emergency Response Plans and identifying any issues / concerns and providing suggested changes / updates;
 - b. Ensuring that all construction staff are trained in Contingency Plan Implementation and Emergency Response Techniques and that they have the appropriate equipment on hand;
 - c. Providing advice to construction staff on proper emergency response procedures;
 - d. Auditing the Contractor's response to events resulting in the activation of its Contingency Plans and Emergency Response Plans;
 - e. Initiating actions to correct any response deficiencies identified through the audit process and reporting it;
 - f. Maintaining emergency response records for review by the Engineer and the appropriate regulatory agencies.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

(Not Used)

END OF SECTION

SECTION 01 42 13

DEFINITIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. General: Basic Contract definitions are included in the General Conditions.
- C. "Approved": When used to convey Engineer's action on Contractor's submittals, applications, and requests, "approved" is limited to Engineer's duties and responsibilities as stated in the Conditions of the Contract.
- D. "Directed": A command or instruction by Engineer. Other terms including "requested," "ordered," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- E. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- F. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- G. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- H. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- I. "Provide": Furnish and install, complete and ready for the intended use.
- J. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.
- K. "Elevation": The figures given on the Drawings or in the other Contract Documents after the word "elevation" or abbreviation of it shall mean the distance in feet above the datum adopted by the Engineer.
- L. "Rock": The word "rock," wherever used as the name of an excavated material or material to be excavated, shall mean only boulders and pieces of concrete or masonry exceeding 1

Definitions

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cubic yard in volume, or solid ledge rock which, in the opinion of the Engineer, requires, for its removal, drilling and blasting, wedging, sledging, barring, or breaking up with a power-operated tool. No soft or disintegrated rock which can be removed with a hand pick or power-operated excavator or shovel, no loose, shaken, or previously blasted rock or broken stone in rock fillings or elsewhere, and no rock exterior to the maximum limits of measurement allowed, which may fall into the excavation, will be measured or allowed as "rock."

M. "Earth":

1. The word "earth", wherever used as the name of an excavated material or material to be excavated, shall mean all kinds of material other than rock as above defined.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

(Not Used)

END OF SECTION

SECTION 01 43 00

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. This section covers Quality Assurance and Quality Control requirements for this contract as indicated and in compliance with Contract Documents.
- B. The Contractor is responsible for controlling the quality of work, including work of its subcontractors, and suppliers and for assuring the quality specified in the Technical Specifications is achieved.
- C. Refer to the General Conditions Article 6 - Contractor's Responsibilities, paragraphs 4.0, 6.02, and 6.03.

1.02 SUMMARY:

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Engineer, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Requirements:
 - 1. Divisions 02 through 43 Sections for specific test and inspection requirements.

1.03 REFERENCES:

- A. American Society for Testing and Materials (ASTM):

1. E329: Standard Specification for Agencies Engaged in Construction Inspection and/or Testing

1.04 DEFINITIONS:

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Engineer.
- C. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- D. Product Testing: Tests and inspections that are performed by a Nationally Recognized Testing Laboratory (NRTL), an (National Voluntary Laboratory Accreditation Program (NVLAP), or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- E. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- F. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- H. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- I. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and

extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.05 CONFLICTING REQUIREMENTS:

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Engineer for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Engineer for a decision before proceeding.

1.06 SUBMITTALS:

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Qualification Data: For Contractor's quality-control personnel.
- C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
 - 1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Engineer.
 - 2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Engineer.
- D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.
 - 4. Identification of applicable standards.

5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

1.07 CONTRACTOR'S QUALITY-CONTROL PLAN:

- A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Engineer. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
 1. Project quality-control manager may also serve as Project superintendent..
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
 1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
 2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
 3. Owner-performed tests and inspections indicated in the Contract Documents.
- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and accepted mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports including log of accepted and rejected results. Include work Engineer has indicated as nonconforming or

defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.08 REPORTS AND DOCUMENTS:

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.

5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement that equipment complies with requirements.
 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 4. Statement whether conditions, products, and installation will affect warranty.
 5. Other required items indicated in individual Specification Sections.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.09 QUALITY ASSURANCE:

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated.
- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Engineer, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

- K. Copies of applicable referenced standards are not included in the Contract Documents. Where copies of standards are needed by the Contractor for superintendence and quality control of the work, the Contractor shall obtain a copy or copies directly from the publication source and maintain at the jobsite, available to the Contractor's personnel, subcontractors, and Engineer
 - L. Quality of Materials: Unless otherwise specified, all materials and equipment furnished for permanent installation in the Work shall conform to applicable standards and specifications and shall be new, unused, and free from defects and imperfections, when installed or otherwise incorporated in the Work. The Contractor shall not use material and equipment for any purpose other than that intended or specified unless the Engineer authorizes such use.
 - M. Where so specified, products or workmanship shall also conform to the additional performance requirements included within the Contract Documents to establish a higher or more stringent standard or quality than that required by the referenced standard.
- 1.10 OFFSITE INSPECTION:
- A. When the specifications require inspection of materials or equipment during the production, manufacturing, or fabricating process, or before shipment, such services shall be performed by the Owner's independent testing laboratory, or inspection organization acceptable to Engineer in conjunction with or by the Engineer.
 - B. The Contractor shall give appropriate written notice to the Engineer not less than 30 days before offsite inspection services are required, and shall provide for the producer, manufacturer, or fabricator to furnish safe access and proper facilities and to cooperate with inspecting personnel in the performance of their duties.
- 1.11 MATERIALS AND EQUIPMENT:
- A. The Contractor shall maintain control over procurement sources to ensure that materials and equipment conform to specified requirements in the Contract Documents.
 - B. The Contractor shall comply with manufacturer's printed instructions regarding all facets of materials and/or equipment movement, storage, installation, testing, startup, and operation. Should circumstances occur where the contract documents are more stringent than the manufacturer's printed instructions, the Contractor shall comply with the specifications. In cases where the manufacturer's printed instructions are more stringent than the contract documents, the Contractor shall advise the Engineer of the disparity and conform to the manufacturer's printed instructions. In either case, the Contractor is to apply the more stringent specification or recommendation, unless accepted otherwise by the Engineer.
- 1.12 QUALITY CONTROL:
- A. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify

that the Work complies with requirements, whether specified or not.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
3. Comply with manufacturers' instructions, including each step in sequence.
4. When manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
5. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
6. Perform Work by persons qualified to produce required and specified quality.
7. Verify field measurements are as indicated on Shop Drawings or as instructed by manufacturer.
8. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
9. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
10. Notify testing agencies at least [24] hours in advance of time when Work that requires testing or inspecting will be performed.
11. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
12. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
13. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

B. Tolerances:

1. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

2. Comply with manufacturers' tolerances. When manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.
 3. Adjust products to appropriate dimensions; position before securing products in place.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittals."
- D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

- H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.
 - 1. Distribution: Distribute schedule to Owner, Engineer, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

- A. .

3.02 EXAMINATION:

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

3.03 PREPARATION:

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

3.04 QUALITY CONTROL:

- A. Quality control is the responsibility of the Contractor, and the Contractor shall maintain control over construction and installation processes to assure compliance with specified requirements.
- B. Certifications for personnel, procedures, and equipment associated with special processes (e.g., welding, cable splicing, instrument calibration, surveying) shall be maintained in the Contractor's field office, available for inspection by the Engineer. Copies shall be made available to the Engineer upon request.

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- C. Means and methods of construction and installation processes are the responsibility of the Contractor, and at no time is it the intent of the Engineer to supersede or void that responsibility.

3.05 TEST AND INSPECTION LOG:

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
 - 1. Date test or inspection was conducted.
 - 2. Description of the Work tested or inspected.
 - 3. Date test or inspection results were transmitted to Engineer.
 - 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Engineer's reference during normal working hours.

3.06 REPAIR AND PROTECTION:

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES

PART 1 - GENERAL

1.01 SCOPE OF WORK:

- A. The Contractor shall provide all temporary facilities for the proper completion of the work as indicated and in compliance with Contract Documents.

1. Section Includes:

- a. User Charges:
 - (1) Sewer.
 - (2) Water.
 - (3) Electric.
 - (4) Temporary heat.
- b. Project identification.
- c. Traffic regulation.
- d. Temporary Facilities:
 - (1) Field offices and sheds (as desired by the Contractor).
- e. Equipment.
- f. Support facility installation.
- g. Security and Protection:
- h. Operation, termination, and removal.

1.02 REFERENCES:

- A. American National Standards Institute (ANSI):
 - 1. A 117.1: Accessible and Usable Buildings and Facilities.
- B. American Society for Testing and Materials (ASTM):
 - 1. E84: Standard Test Method for Surface Burning Characteristics of Building Materials

2. E136: Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 deg. C.

C. National Fire Protection Association (NFPA):

1. 70: National Electrical Code
2. 241: Standard of Safeguarding Construction, Alteration, and Demolition Operations
3. 701: Standard Methods of Fire Tests for Flame Propagation of Textiles and Films

1.03 USE CHARGES:

A. General: Costs for installation, removal and use of temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's staff, Engineer, testing agencies, and authorities having jurisdiction.

B. Sewer Service: Owner will pay sewer-service use charges for sewer usage by all entities for construction operations.

1. The Contractor shall provide adequate sanitary facilities for the use of those employed on the Work. Such facilities shall be made available when the first employees arrive on the site of the Work, shall be properly secluded from public observation, and shall be constructed and maintained during the progress of the Work in suitable numbers and at such points and in such manner as may be required by pertinent health and safety regulations.

2. The Contractor shall maintain the sanitary facilities in a satisfactory and sanitary condition at all times and shall enforce their use. He shall rigorously prohibit the committing of nuisances on the site of the Work, on the lands of the Owner, or on adjacent property.

- a. The Contractor shall not use the Owner's sanitary facilities.

C. Potable Water Service: Owner will pay water-service use charges for potable water used by all entities for construction operations.

1. For all necessary operations at the site of the work (except as noted in the next paragraph below) the Owner, without charge therefor, shall provide reasonable quantities of water at the then existing pressure from a mutually convenient hydrant of the water distribution system. The Contractor shall furnish all necessary pipe or hose extensions to conduct the water to the points of use and shall exercise due care not to waste water. The Contractor shall not contaminate the water supply and shall comply with all applicable regulations and code requirements.

2. The Owner reserves the right to limit, suspend, or terminate the supplying of water as set forth above should it consider such action to be necessary on account of

damage to the distribution system, the necessity of conserving water, or other emergency. In this event, the Contractor shall obtain water from some other approved source, at his own expense.

- D. Electric Power Service: Owner will pay electric-power-service use charges for electricity used by all entities for construction operations.
 - 1. The Contractor shall make all necessary applications and arrangements and pay all fees and charges for electrical energy for power and light necessary for the proper completion of the Work and during its entire progress. The Contractor shall provide and pay for all temporary wiring, switches, connections, and meters.
 - 2. The Contractor shall provide sufficient electric lighting so that all work may be done in a workmanlike manner when there is not sufficient daylight.
- E. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- F. Notwithstanding the availability of potable water services from the existing system, the Contractor shall be solely responsible for the provision of water for leakage and other testing, for concrete protection and to prevent freezing of equipment, as required by the Contract.
- G. Temporary Heat:
 - 1. If temporary heat is required for the protection of the Work, the Contractor shall provide and install suitable heating apparatus, shall provide adequate and proper fuel, and shall maintain heat as required. Costs for temporary heating, cooling, and ventilating required to execute the Work shall be borne by the Contractor.
 - 2. Temporary heating apparatus shall be installed and operated in such manner that finished work will not be damaged thereby. After the permanent heating system has been installed, tested, and made ready for operation, the Contractor may, at his own risk and expense, use it for providing heat for protection of the Work. He shall provide and pay for all fuel and care necessary, and, when the Work is ready for acceptance, he shall, at his own expense, put the system into first-class condition, even to the extent of replacing worn or damaged parts.
 - 3. The Contractor shall provide 24-hour monitoring of temporary heating, cooling and ventilating equipment.

1.04 TRAFFIC REGULATION:

- A. Signs, Signals, And Devices:
 - 1. Post Mounted and Wall Mounted Traffic Control and Informational Signs: As approved by authority having jurisdictions.

2. Traffic Control Signals: As approved by authority having jurisdictions.
 3. Traffic Cones and Drums, Flares and Lights: As approved by authority having jurisdictions.
 4. Flagperson Equipment: As required by local jurisdictions.
- B. Flag Persons: Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.
- C. Flares and Lights: Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.
- D. Haul Routes:
1. Consult with authority having jurisdiction, establish public thoroughfares to be used for haul routes and site access.
 2. Confine construction traffic to designated haul routes.
 3. Provide traffic control at critical areas of haul routes to regulate traffic, to minimize interference with public traffic.
- E. Traffic Signs and Signals:
1. Provide signs approaches to site and on site, at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.
 2. Provide, operate, and maintain traffic control signals to direct and maintain orderly flow of traffic in areas under Contractor's control, and areas affected by Contractor's operations.
 3. Relocate as Work progresses, to maintain effective traffic control.
- F. Removal:
1. Remove equipment and devices when no longer required
 2. Repair damage caused by installation.
 3. Remove post settings to depth of 2 feet.
- 1.05 SUBMITTALS:
- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

- B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
 - C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
 - D. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.
 - 1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
 - 2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
 - 3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
- 1.06 QUALITY ASSURANCE:
- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
 - B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- 1.07 PROJECT CONDITIONS:
- A. During adverse weather and against the possibility thereof, the Contractor shall take all necessary precautions so that the Work may be properly done and satisfactory in all respects. When required, protection shall be provided by use of tarpaulins, wood and building-paper shelters, or other suitable means.
 - B. During cold weather, materials shall be preheated, if required, and the materials and adjacent structure into which they are to be incorporated shall be made and kept sufficiently warm so that a proper bond will take place and a proper curing, aging, or drying will result. Protected spaces shall be artificially heated by suitable means which will result in a moist or a dry atmosphere according to the particular requirements of the

work being protected. Ingredients for concrete and mortar shall be sufficiently heated so that the mixture will be warm throughout when used.

PART 2 - PRODUCTS

2.01 TEMPORARY FACILITIES:

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. The Contractor will not be required to maintain a temporary field office. If desired by the Contractor, the office shall be located where it will not interfere with the progress of the work. In charge of this office there shall be a competent superintendent of the Contractor as specified under "Supervision of Work" in the AGREEMENT.
- C. Temporary Storage Yards: The Contractor shall construct temporary storage yards for storage of Products that are not subject to damage by weather conditions.
- D. Temporary Storage Buildings:
 - 1. The Contractor shall arrange for a chain link partition fence to provide security of contents and ready access for inspection and inventory.
- E. The Contractor shall store combustible materials (paints, solvents, fuels) in a well ventilated and remote building meeting all applicable safety standards.

2.02 EQUIPMENT:

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL:

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.02 TEMPORARY UTILITY INSTALLATION:

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
 - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- E. Heating: Provide temporary heating required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
 - 1. .
- F. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
- G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
 - 1. Install electric power service overhead unless otherwise indicated.
 - 2. Connect temporary service to Owner's existing power source, as directed by Owner.
- H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
 - 2. Install lighting for Project identification sign.

3.03 SUPPORT FACILITIES INSTALLATION:

- A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E136. Comply with NFPA 241.
 2. Maintain support facilities until Engineer schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.
1. Provide dust-control treatment that is nonpolluting and non-tracking. Reapply treatment as required to minimize dust.
 2. Do not use chemical means of dust control without prior written approval from the Engineer. The use of petroleum products will not be allowed at any time.
- C. Traffic Controls: Comply with requirements of authorities having jurisdiction.
1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 2. Maintain access for fire-fighting equipment and access to fire hydrants.
1. Unless described and approved under a Traffic Control Plan (TCP), conduct operations on the site so that the use of any plant roads by vehicles employed under this Contract will not restrict pedestrian and vehicular traffic thereon nor hinder the use of such facilities.
 2. All roads within the plant are used simultaneously by vehicles and pedestrians. The speed limit of 15 mph (20km/h) applies throughout the plant, including the access roads and parking lots. Failure to comply with speed limit or to operate vehicles safely will result in possible removal of the staff from the plant.
- D. Parking: Provide temporary parking areas for construction personnel. The Contractor shall not use public roads or undesignated areas for parking.
- E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
 2. Remove snow and ice as required to minimize accumulations.

- F. Waste Disposal Facilities: Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."
- G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Division 01 Section "Execution."

3.04 SECURITY AND PROTECTION FACILITIES INSTALLATION:

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
 - 1. Comply with work restrictions specified in Division 01 Section "Summary."
- C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways.
 - 1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
 - 2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
 - 3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
 - 4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

3.05 OPERATION, TERMINATION, AND REMOVAL:

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

- B. Maintenance: Maintain facilities in good operating condition until removal.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
 3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION

SECTION 01 57 13

EROSION CONTROL, SEDIMENTATION AND CONTAINMENT OF CONSTRUCTION MATERIALS

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide all work and take all measures necessary to control soil erosion resulting from construction operations, prevent flow of sediment from construction site, and contain construction materials (including excavation and backfill) within protected working area as to prevent damage to any stream or wetlands as indicated and in compliance with Contract Documents.

1.02 REFERENCES:

- D. United States Environmental Protection Agency (USEPA):
 - 1. Guidelines for Erosion and Sediment Control, Planning and Implementation.
 - 2. Processes, Procedures and Methods to Control Pollution Resulting from all Construction Activity.

1.03 SUBMITTALS:

- A. Submit the following shop drawings in accordance with Section 01 33 00.
- B. Two weeks prior to the start of the work, submit to Engineer, for review, a plan with detailed sketches showing the proposed methods to be used for controlling erosion during construction.

1.04 QUALITY ASSURANCE:

- A. Comply with the requirements specified in Section 01 43 00.
- B. Use acceptable procedures, including use of water diversion structures, diversion ditches, settling basins, and sediment traps.
- C. Operations restricted to areas of work indicated on drawings and area which must be entered for construction of temporary or permanent facilities.
- D. If construction materials are washed away during construction, remove materials from fouled areas.
- E. Stabilize diversion outlets by means acceptable to Engineer.

- F. Engineer has authority to limit surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and fill operations and to direct immediate permanent or temporary pollution control measures to prevent contamination of any stream or wetlands, including construction of temporary berms, dikes, dams, sediment basins, sediment traps, slope drains, and use of temporary mulches, mats, or other control devices or methods to control erosion.

PART 2 - PRODUCTS

2.01 BALES:

- A. Hay or straw or other suitable material acceptable to Engineer.

2.02 WOOD STAKES:

- A. 2 inches by 2 inches by 3 feet (50 mm by 50 mm by 0.9 m).

PART 3 - EXECUTION

3.01 GENERAL:

- A. Do not discharge chemicals, fuels, lubricants, bitumen, raw sewage and other harmful waste into or alongside any body of water or into natural or man-made channels.
- B. Design erosion and sediment controls to handle peak runoff resulting from storm events.
- C. The Contractor shall be responsible for inspecting and maintaining these control measures to ensure their proper function and adequate sediment storage at all times. The Contractor shall remove sediment once it reaches 50 percent of the capacity of the structure. Sediment collected shall be disposed of offsite at the Contractor's cost.

3.02 INSTALLATION:

- A. Install baled hay or straw erosion checks in all locations as directed, surrounding base of all deposits of stored excavated material outside of disturbed area, and where directed by the Engineer.
- B. Install checks immediately after site is cleared and before trench excavation. Locate checks, surrounding stored material, approximately 6 feet from material.
- C. Hold bales in place with two 2 inches by 2 inches by 3 feet stakes so that each bale is butted tightly against adjoining bale thereby precluding shortcircuiting of erosion check.
- D. Construct earth berms or diversions to intercept and divert runoff water from critical areas.
- E. Discharge silt-laden water from excavations onto filter fabric mat and/or baled hay or straw sediment traps to ensure that only sediment-free water is returned to watercourses.

- F. Do not place excavated soil material adjacent to water-course in manner that will cause it to wash away by high water or runoff.
- G. Prevent damage to vegetation by excessive watering or silt accumulation in the discharge area.
- H. Do not dump spoiled material into any streams, wetlands, surface waters, or unspecified locations.
- I. Prevent indiscriminate, arbitrary, or capricious operation of equipment in streams, wetlands or surface waters.
- J. Do not pump silt-laden water from trenches or excavations into surface waters, streams, wetlands, or natural or man-made channels leading thereto.
- K. Prevent damage to vegetation adjacent to or outside of construction area limits.
- L. Do not dispose of trees, brush, debris, paints, chemicals, asphalt products, concrete curing compounds, fuels, lubricants, insecticides, washwater from concrete trucks or hydroseeders, or any other pollutant in streams, wet-lands, surface waters, or natural or man-made channels leading thereto, or unspecified locations.
- M. Do not alter flow line of any stream unless indicated or specified.

END OF SECTION

SECTION 01 61 00
CONTROL OF MATERIALS

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products as indicated and in compliance with Contract Documents.

1. Section Includes:

- a. Definitions.
- b. Submittals.
- c. Spare parts.
- d. Quality assurance.
- e. Delivery, storage and handling.
- f. Warranty.
- g. Products.
- h. Substitution and "Or Equal" items.
- i. Manufacturer's instructions.
- j. Special tools.
- k. Lubrication.
- l. Nameplates.
- m. General material and equipment requirements.
- n. Materials and Equipment.
- o. Field Quality Control; Installation, Instructional, and Post Startup Services.

1.02 REFERENCES:

- A. American Society of Mechanical Engineers (ASME):

1. B1.1: Unified Inch Screw Threads (UN and UNR Thread Form)
- B. American Society for Testing and Materials International (ASTM):
1. A123/A123M: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 2. A325/A325M: Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
- 1.03 DEFINITIONS:
- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 3. Comparable Product: Product that is demonstrated and accepted through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- 1.04 SUBMITTALS:
- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Comply with the requirements of Section 01 25 00.
 2. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
 3. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Engineer will notify Contractor of acceptance or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
 - a. Form of Acceptance: As specified in Section 01 33 00.

- b. Use product specified if Engineer does not issue a decision on use of a comparable product request within time allocated.

1.05 SPARE PARTS:

- A. Provide spare parts for Products as specified in the individual technical specification sections. Comply with the requirements specified in Section 01 61 00.
- B. Pack spare parts to protect them during storage. Tag spare parts and containers to clearly identify them in accordance with Contractor's parts numbering system as reviewed by the Engineer. All parts shall be cross-referenced to their applicable the Specification Section.

1.06 QUALITY ASSURANCE:

- A. Comply with the requirements specified in Section 01 61 00.
- B. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.07 DELIVERY STORAGE AND HANDLING:

- A. Arrange deliveries of materials and equipment in accordance with construction Progress Schedule, coordinate to avoid conflict with Work and conditions at site.
- B. Comply with the requirements of Section 01 66 00.
- C. Provide equipment and personnel to handle materials and equipment by methods recommended by manufacturer to prevent soiling or damage to materials or equipment, or their packaging.
- D. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- E. Owner assumes no responsibility for damage or loss due to storage of materials and equipment.
- F. Interior Storage:
 - 1. Store with seals and labels intact and legible.
 - 2. Store materials and equipment subject to damage by elements in weathertight enclosures.
 - 3. Maintain temperature and humidity within ranges required by manufacturer's instructions.
- G. Exterior Storage:

1. Store fabricated materials and equipment above ground, on blocking or skids, to prevent soiling or staining. Cover materials and equipment subject to deterioration with impervious sheet coverings. Provide ventilation to avoid condensation.
2. Store loose granular materials in well-drained area on solid surfaces to prevent mixing with foreign matter.
3. Store materials such as pipe, reinforcing steel, structural steel, and equipment on pallets or racks, off ground.

H. Inspection and Maintenance:

1. Arrange storage to provide easy access for inspection, maintenance, and inventory.
 2. Make periodic inspections of stored materials and equipment to ensure materials and equipment maintained under specified conditions are free from damage or deterioration, and coverings are in-place and in condition to provide required protection.
 3. Perform maintenance on stored material and equipment in accordance with manufacturer's written instructions and in presence of Owner or Engineer.
 - a. Notify Engineer 24 hrs before performance of maintenance.
 - b. Submit report of completed maintenance and condition of coverings to Engineer with each Application for Payment.
 - c. Failure to perform maintenance, to notify Engineer of intent to perform maintenance or to submit maintenance report may result in rejection of material or equipment.
- I. Wheeling of loads over finished floors, with or without plank protection, is not permitted in anything except rubber-tired wheelbarrows, buggies, trucks or dollies. This applies to finished floors and exposed concrete floors, as well as those covered with composition tile or other applied surfacing.
- J. Where structural concrete is also finished surface, avoid marking or damaging surface.

1.08 WARRANTY:

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 01 77 00.
- 1.09 PRODUCTS:
- A. Furnish products of qualified manufacturers suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise.
 - B. Do not use materials and equipment removed from existing premises, except as specifically permitted by Contract Documents.
 - C. Furnish interchangeable components from same manufacturer for components being replaced.
- 1.10 SUBSTITUTION AND "OR EQUAL" ITEMS:
- A. Follow the procedures in Section 01 25 00.
- 1.11 ACCEPTANCE OF MATERIALS:
- A. Unless otherwise specified, only new materials and equipment shall be incorporated in the work. All materials and equipment furnished by the Contractor shall be subject to the inspection and acceptance of the Engineer. No material shall be delivered to the work without prior acceptance of the Engineer.
 - B. As specified in Section 01 33 00, the Contractor shall submit to the Engineer, data relating to materials and equipment he proposes to furnish for the work. Such data shall be in sufficient detail to enable the Engineer to identify the particular product and to form an opinion as to its conformity to the specifications.
 - C. Facilities and labor for handling and inspection of all materials and equipment shall be furnished by the Contractor. If the Engineer requires, either prior to beginning or during the progress of the work, the Contractor shall submit additional samples or materials for such special tests as may be necessary to demonstrate that they conform to the

specifications. Such samples shall be furnished, stored, packed, and shipped at the Contractor's expense. Except as otherwise noted, the Owner will make arrangements for and pay for the tests.

- D. Any delay of acceptance resulting from the Contractor's failure to submit samples or data promptly shall not be used as a basis of a claim against the Owner or the Engineer.
- E. In order to demonstrate the proficiency of workmen or to facilitate the choice among several textures, types, finishes, and surfaces, the Contractor shall provide such samples of workmanship or finish as may be required.
- F. The materials and equipment used on the work shall correspond to the accepted samples or other data.

1.12 REUSE OF EXISTING MATERIAL:

- A. Except as specifically indicated or specified, do not use materials and equipment removed from existing structure(s) in new Work.
- B. For material and equipment specifically indicated or specified to be reused in Work:
 - 1. Use special care in removal, handling, storage, and reinstallation to ensure proper function in completed Work.
 - 2. Arrange and pay for transportation, storage, and handling of products which require off-site storage, restoration or renovation.
 - 3. Off-site storage areas and buildings shall conform to requirements of this section.

1.13 MANUFACTURER'S INSTRUCTIONS:

- A. Installation of equipment and materials shall comply with manufacturer's instructions. Obtain and distribute printed copies of such instructions to parties involved in installation, including 1 electronic copy to Engineer.
 - 1. Maintain one set of complete instructions at Site during installation and until completion of Work.
- B. Handle, store, install, connect, clean, condition, and adjust materials and equipment in accordance with manufacturer's written instructions and in conformance with Specifications.
 - 1. If Site conditions or specified requirements conflict with manufacturer's instructions, consult Engineer for further instructions. Do not proceed with Work without written instructions.

1.14 SPECIAL TOOLS:

- A. For each type of equipment furnished, the Contractor shall provide a complete set of all special tools (including grease guns or other lubricating devices) which may be necessary for the adjustment, operation, maintenance, and disassembly of such equipment. Tools shall be high-grade, smooth, forged, alloy, tool steel. Grease guns shall be lever type.
- B. Special tools are considered to be those tools which because of their limited use are not normally available, but which are necessary for the particular equipment.
- C. Pack items to protect them during storage. Tag items and containers to clearly identify them in accordance with Contractor's part system, as reviewed by the Engineer. Cross-reference all items to their applicable Specification Section.
- D. Special tools shall be delivered at the same time as the equipment to which they pertain. The Contractor shall properly store and safeguard such special tools until completion of the work, at which time they shall be delivered to the Owner.
- E. The Contractor shall furnish and erect one or more steel wall cases with flat key locks and clips or hooks to hold each tool in arrangement.

1.15 LUBRICATION:

- A. Where lubrication is required for proper operation of equipment, incorporate necessary and proper provisions in equipment in accordance with manufacturer's requirements. Where possible, lubrication shall be automated and positive.
- B. Where oil is used, reservoir shall be of sufficient capacity to supply unit for 24 hr period.
- C. Provide adequate and, as far as practicable, automatic means of lubrication for working parts. Arrange lubrication grease nipples, grease boxes and other lubrication devices so that they are readily accessible for routing greasing using grease nipples and Type 316 stainless steel or copper tubing extensions where required. Secure nipples and tubing to the equipment at appropriate locations. Indicate on the working drawings submitted, the types of lubricants to be used (must be readily available in [Virginia](#)). Use grease nipples of a consistent type, Alemite button head type or equivalent. Provide grease gun(s) of the appropriate size(s) and pressure(s).
- D. Provide a one (1) year supply of all lubricants necessary for the routine, daily operation of the equipment. All lubricants to be readily available [Virginia](#). Provide a complete schedule of all the lubricant including the manufacturer name, type, name and local address and phone number of where each lubricant can be purchased for each piece of equipment.

1.16 NAMEPLATES:

- A. With the exceptions mentioned below, each piece of equipment shall be provided with a nameplate of non-corrodible metal, securely fastened in place and clearly and permanently

inscribed with the manufacturer's name, model or type designation, serial number, principal rated capacities, electrical or other power characteristics, and similar information.

- B. This requirement shall not apply to standard, manually operated hydrants or to gate, globe check and plug valves.
- C. Each process valve shall be provided with a substantial tag of non-corrodible metal securely fastened in place and inscribed with an identification number in conformance with the Valve Identification Schedule indicated on the drawings or furnished later by the Engineer.

1.17 GENERAL MATERIAL AND EQUIPMENT REQUIREMENTS:

- A. The requirements of this Paragraph shall constitute the standards for the material and equipment specified herein. Should these requirements conflict with the Supplier's recommendations or in any way be less stringent than the Supplier's requirements, they shall be superseded by the Supplier's requirements.
- B. Bolts, Anchor Rods and Nuts:
 - 1. All necessary bolts, anchor rods, nuts, washers, plates and bolt sleeves shall be furnished by the contractor in accordance herewith. Anchor rods shall have suitable washers and hexagonal nuts.
 - 2. All anchor rods, nuts, washers, plates, and bolt sleeves shall be stainless steel unless otherwise indicated or specified.
 - 3. Unless otherwise specified, stud, tap, and machine bolts, and nuts shall conform to the requirements of ASTM Standard Specification for Carbon Steel Externally and Internally Threaded Standard Fasteners, Designation A325. Hexagonal nuts of the same quality of metal as the bolts shall be used. All threads shall be clean cut and shall conform to ANSI Standard B1.1 for Unified Inch Screw Threads (UN and UNR Thread Form).
 - 4. Bolts, anchor rods, nuts, and washers, specified to be galvanized, shall be zinc coated, after being threaded, by the hot-dip process in conformity with the ASTM Standard Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip, Designation A123, or the ASTM Standard Specifications for Zinc Coating (Hot Dip) on Iron and Steel Hardware, Designation A153, as is appropriate.
 - 5. Bolts, anchor rods, nuts, and washers specified to be stainless steel shall be Type 304 or Type 316 stainless steel, as indicated.
 - 6. Anchor rods shall be set accurately. They shall be carefully held in suitable templates of acceptable design. Where indicated on the Drawings, specified, or required, anchor bolts shall be provided with square plates at least 4 in. by 4 in. by

3/8 in. or shall have square heads and washers and set in the concrete forms with suitable pipe sleeves, or both. If anchor are set after the concrete has been placed, all necessary drilling and grouting or caulking shall be done by the Contractor and care shall be taken not to damage the structure or finish by cracking, chipping, spalling, or otherwise during the drilling and caulking.

C. Grease Fittings:

1. Provide extension fittings and tubing on all grease fittings that are installed in an inaccessible location. The extension is to be located so that equipment can be lubricated from the operating level without the use of ladders, staging or shutting down the equipment. Tubing: 316 stainless steel.

D. Concrete Inserts For Hangers:

1. Concrete inserts for hangers shall be designed to support safely, in the concrete that is used, the maximum load that can be imposed by the hangers used in the inserts. Inserts for hangers shall be of a type which will permit adjustment of the hangers both horizontally (in one plane) and vertically and locking of the hanger head or nut. All inserts shall be galvanized by the hot-dip process in conformity with the ASTM Standard Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip, Designation A123, or the ASTM Standard Specifications for Zinc Coating (Hot Dip) on Iron and Steel Hardware, Designation A153, as is appropriate.

E. Equipment Foundations, Installation and Grouting:

1. The Contractor shall furnish the necessary materials and construct suitable concrete foundations for all equipment installed by him, even though such foundations may not be indicated on the Drawings. The tops of foundations shall be at such elevations as will permit grouting as specified below.
2. All such equipment shall be installed by skilled mechanics and in accordance with the instructions of the manufacturer.
3. In setting pumps, motors, and other items of equipment customarily grouted, the Contractor shall make an allowance of at least 1 inch (25 mm) for grout under the equipment bases. Shims used to level and adjust the bases shall be steel. Shims may be left embedded in the grout, in which case they shall be installed neatly and so as to be as inconspicuous as possible in the completed work. Unless otherwise permitted, all grout shall be a suitable non-metallic, non-shrink grout.
4. Grout shall be mixed and placed in accordance with the recommendations of the manufacturer. Where practicable, the grout shall be placed through the grout holes in the base and worked outward and under the edges of the base and across the rough top of the concrete foundation to a peripheral form so constructed as to provide a suitable chamfer around the top edge of the finished foundation.

5. Where such procedure is impracticable, the method of placing grout shall be as accepted by the Engineer. After the grout has hardened sufficiently, all forms, hoppers, and excess grout shall be removed, and all exposed grout surfaces shall be patched in an accepted manner and given a burlap-rubbed finish.

F. Equipment Drive Guards:

1. All equipment driven by open shafts, belts, chains, or gears shall be provided with acceptable all-metal guards enclosing the drive mechanism. Guards shall be constructed of galvanized sheet steel (12 gage minimum) or galvanized woven wire or expanded metal set in a frame of galvanized steel members. Guards shall be secured in position by steel braces or straps which will permit easy removal for servicing the equipment. The guards shall conform in all respects to all applicable safety codes and regulations.
2. Provide pivoting access covers for shaft speed measurements.

G. Sleeves:

1. Unless otherwise indicated on the drawings, or specified, form openings for the passage of pipes, conduits, and circular ducts through floors and walls using sleeves of standard weight, galvanized-steel pipe. Provide sleeves of ample diameter to pass the pipe and its insulation, if any, and to permit expansion as may occur. Provide sleeves that are flush at the walls and at the bottom of slabs and project 4 inches above the finished floor surface. Threaded nipples shall not be used as sleeves.
2. Sleeves in exterior walls below ground or in walls that have liquids on one or both sides, shall have a 2-inch annular fin of 1/8-inch plated welded with a continuous weld completely around the sleeve at mid-length. Galvanize sleeves after the fins are attached.
3. Sleeves shall be set accurately before the concrete is placed or shall be built in accurately as the masonry is being built.

H. Protection Against Electrolysis:

1. Where dissimilar metals are used in conjunction with each other, provide insulation between adjoining surfaces to eliminate direct contact and any resultant electrolysis. Provide bituminous insulation, heavy bituminous coatings, nonmetallic separators or washers, impregnated felt, or other means to provide insulation.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT:

A. Material and Equipment Incorporated into Work:

1. Conform to applicable specifications and standards.
 2. Comply with size, make, type, and quality specified or as accepted by Submittal.
- B. Manufactured and Fabricated Materials and Equipment:
1. Design, fabricate, and assemble in accordance with engineering and shop practices standard with industry.
 2. Manufacture like parts of duplicate units to standard sizes and gauges, to be interchangeable.
 3. Two or more items of same kind shall be identical, by same manufacturer.
 4. Material and equipment shall be suitable for service conditions.
 5. Equipment capabilities, sizes, and dimensions shown or specified shall be adhered to, unless variations are specifically accepted, in writing.
 6. Equipment shall be adapted to best economy in power consumption and maintenance. Parts and components shall be proportioned for stresses occurring during continuous or intermittent operation, and for additional stresses occurring during fabrication or installation.
 7. Design so working parts are readily accessible for inspection and repair, easily duplicated, and replaced.
 8. Design structural members of equipment for anticipated shock and vibratory loads.
 9. Design machinery such that working parts are readily accessible for inspection and repair, and that each part is suitable for the service required.
- C. Do not use material or equipment for purpose other than for which it is designed or specified.

PART 3 - EXECUTION

3.01 FIELD QUALITY CONTROL; INSTALLATION, INSTRUCTIONAL, AND POST STARTUP SERVICES:

- A. General:
1. Provide on-site services of Supplier's representatives for equipment provided by Contractor during construction, installation, equipment startup, and training of Owner's personnel for equipment or plant operation as specifically required in Specification section for equipment or system.
 2. Include and pay costs for Supplier's services.

3. Work day is defined as 8 hr period during Owner's or Contractor's typical calendar day. Work day for purposes of this section does not include travel to or from Site.
4. Specifications include minimum mandays to provide basis for bidding. If additional time is required to perform services Contractor shall include that time in Contract Price.

B. Installation Services:

1. Where installation services are called for in Specifications, provide competent and experienced technical representatives of manufacturers of material or equipment and systems to resolve assembly or installation procedures attributable to, or associated with, equipment furnished.
2. After equipment is installed, representatives shall perform initial equipment and system adjustment and calibration to conform to Specifications and manufacturer's requirements and instructions.
3. Provide "Certificate of Installation Services" stating proper adjustments have been made to equipment or system and equipment or system is ready for startup and system demonstration. Use Form 01 61 00-1-1 and furnish 2 copies to Engineer.

C. Training:

4. Do not start training until Installation Services have been completed.
5. Where training is called for in Specifications, provide competent and experienced technical representative of Supplier to provide detailed instructions to Owner's personnel for operation of equipment. Training services shall include operation and maintenance of instrumentation and equipment in classroom and on-site. Training shall include electrical, mechanical, and safety aspects of equipment.
6. Submit documentation identifying name of specific representative, factory authorization, and background of named individual(s) to conduct training. Submit information 30 days before scheduled training period for review and acceptance by Engineer.
7. Coordinate training periods with Owner and Supplier's representatives.
 - a. No training shall be conducted unless instructor has been accepted by Engineer.
 - b. Notify Engineer at least 48 hrs before training sessions are to begin so Engineer can make arrangements with Owner's operating personnel.
 - c. Reschedule canceled training sessions 48 hrs in advance.

- d. Failure of Supplier's or manufacturer's representative to appear for scheduled training, failure to notify Engineer 24 hrs in advance of need to cancel scheduled training or failure to arrive within 30 min of start of scheduled training shall result in reimbursement to Owner for time lost by Owner's personnel in waiting for arrival of manufacturer's representative. Except in case of failure to arrive on time, time will not exceed 1 hr for each employee scheduled to receive training. Failure to arrive on time will be reimbursed by actual time late, up to 1 hr, after 1 hr training will be rescheduled.
 - e. Failure of Supplier's or manufacturer's representative to appear for scheduled training, failure to notify Engineer 24 hrs in advance of need to cancel scheduled training or failure to arrive within 30 min of start of scheduled training shall result in reimbursement to Owner for expenses and time incurred by Engineer in traveling and time spent on-site. Minimum time billed shall be 8 hrs.
- 8. Similar types of equipment differing in model, size or manufacturer shall require equal service time as stated in specific Specification section.
 - 9. O&M data shall constitute basis of instruction.
 - a. Review data contents with personnel in full detail to explain aspects of operations and maintenance.
 - 10. Instructional Services shall be completed before start of performance testing required in Section 01 78 26.
 - 11. Provide "Certificate of Instructional Services", cosigned by Owner and Supplier's representative, verifying training has been accomplished to satisfaction of each party. Use form in 01 78 24 and furnish 2 copies to Engineer.
- C. Post Startup Services:
- 1. After equipment/system has been in operation for at least 6 months, but no longer than 11 months, each equipment manufacturer or authorized equipment representative shall make final inspection when required in Specifications. Final inspection will provide assistance to Owner's operating personnel in making adjustments or calibrations required to ensure equipment or system is operating in conformance with design, manufacturer, and Specifications.
 - 2. Provide "Certificate of Post Startup Services", cosigned by Owner and equipment representative, verifying this service has been performed. Use form similar to Form 01 61 00-2 and furnish 2 copies to Engineer.

3.02 CLOSEOUT ACTIVITIES:

- A. Provide in accordance with Section 01 77 00.

EQUIPMENT MANUFACTURER'S CERTIFICATE OF INSTALLATION SERVICES

Owner - _____

Project - _____

Contract No. _____

AECOM No. _____

EQUIPMENT SPECIFICATION SECTION _____

EQUIPMENT DESCRIPTION _____

I _____, Authorized representative of

(Print Name)

(Print Manufacturer's Name)

hereby CERTIFY that _____

(Print equipment name and model with serial No.)

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.

on

Date: _____ Time: _____

CERTIFIED BY: _____ DATE: _____

(Signature of Manufacturer's Representative)

FORM 01 61 00-1-2

EQUIPMENT MANUFACTURER'S CERTIFICATE OF POST STARTUP SERVICES

Owner - _____

Project - _____

Contract No. _____

AECOM No. _____

EQUIPMENT SPECIFICATION SECTION _____

EQUIPMENT DESCRIPTION _____

I _____, Authorized representative of

(Print Name)

(Print Manufacturer's Name)

hereby CERTIFY that _____

(Print equipment name and model with serial No.)

Post Startup Services for the subject project (has) (have) been performed in a satisfactory manner, and that Owner assigned operating personnel have been suitably instructed in the operation, lubrication, and care of the unit(s) on

Date: _____ Time: _____

CERTIFIED BY: _____ DATE: _____

(Signature of Manufacturer's Representative)

OWNER'S ACKNOWLEDGMENT OF POST STARTUP SERVICES

(I) (We) the undersigned, authorized representatives of the Owner and/or Plant Operating Personnel have received Post Startup Services for the equipment as required by the contract on:

_____ Date: _____

SECTION 01 66 10

DELIVERY, STORAGE AND HANDLING

PART 1 - GENERAL

1.01 GENERAL:

- A. This Section specifies the general requirements for the delivery handling, storage and protection for all items required in the construction of the work as indicated and in compliance with Contract Documents. Specific requirements, if any, are specified with the related item.

1.02 TRANSPORTATION AND DELIVERY:

- A. Transport and handle items in accordance with manufacturer's printed instructions.
- B. Before shipping to the Site, contact the Engineer, in writing, giving at least fourteen (14) Days prior notice to enable the Engineer or its authorized inspector to inspect the equipment if necessary. Assemble the complete unit in the factory for inspection by the Engineer or its authorized inspector. Do not ship the equipment until the Engineer has completed its inspection.
- C. Schedule delivery to reduce long term on-site storage 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 Owner.
- D. Ship equipment, material and spare parts complete except where partial disassembly is required by transportation regulations or for protection of components.
- E. Pack spare parts in containers bearing labels clearly designating contents and pieces of equipment for which intended. All spare parts shall be cross-referenced to their applicable the Specification Section.
- F. Carefully pack and crate equipment for shipment. Protect polished and machined metal surfaces from corrosion and damage during shipment and installation. Specially pack electrical equipment to prevent damage by moisture. Cover equipment having exposed bearings and glands to exclude foreign matter. Carefully pack machines for shipment and protect electrical equipment from moisture damage. Protect bearings, seals and glands from grit and dirt.
- G. Identify each component with durable identifying labels or tags securely attached to each piece of equipment, crate or container.
- H. Finished surfaces of all exposed flanges shall be protected by fiberboard blank flanges strongly built and securely bolted thereto.

- I. Deliver spare parts at same time as pertaining equipment. Deliver spare parts to owner after completion of work.
- J. Coordinate delivery with installation to ensure minimum holding time for items that are hazardous, flammable, easily damaged or sensitive to deterioration.
- K. Deliver products to the site in manufacturer's original sealed containers or other packing systems, complete with instructions for handling, storing, unpacking, protecting and installing.
- L. Assume responsibility for equipment material and spare parts just before unloading from carrier at site.
- M. All items delivered to the site shall be unloaded and placed in a manner which will not hamper the Contractor's normal construction operation or those of subcontractors and other contractors and will not interfere with the flow of necessary traffic.
- N. Provide equipment and personnel to unload all items delivered to the site..
- O. Promptly inspect shipment to assure that products comply with requirements, quantities are correct, and items are undamaged. For items furnished by others (i.e. Owner, other Contractors), perform inspection in the presence of the Owner. Notify Owner verbally, and in writing, of any problems.
- P. Pay all demurrage charges if failed to promptly unload items.

1.03 STORAGE AND PROTECTION:

- A. Store and protect products and equipment in accordance with the manufacturer's instructions, with seals and labels intact and legible. Storage instruction shall be studied by the Contractor and reviewed with the Owner by him. Instructions shall be carefully followed and a written record of this kept by the Contractor for each product and pieces of equipment.
- B. Arrange storage of products and equipment to permit access for inspection. Periodically inspect to make sure products and equipment are undamaged and are maintained under specified conditions.
- C. Provide protective maintenance during storage consisting of manually exercising equipment, inspecting mechanical surfaces for signs or corrosion or other damage, lubricating, applying any coatings as recommended by the equipment manufacturer necessary for its protection and all other precautions to assure proper protection of all equipment stored and for compliance with manufacturers' requirements related to warranties. Log all protective maintenance for each piece of equipment in the written record noted above.
- D. Store loose granular materials on solid flat surface in a well-drained area. Prevent mixing with foreign matter.

- E. Cement and lime shall be stored under a roof and off the ground and shall be kept completely dry at all times. All structural, miscellaneous and reinforcing steel shall be stored off the ground or otherwise to prevent accumulation of dirt or grease, and in a position to prevent accumulations of standing water and to minimize rusting. Beams shall be stored with the webs vertical. Precast concrete shall be handled and stored in a manner to prevent accumulations of dirt, standing water, staining, chipping or cracking. Brick, block and similar masonry products shall be handled and stored in manner to reduce breakage, cracking and spalling to a minimum.
- F. All mechanical and electrical equipment and instruments shall be covered with canvas and stored in a weathertight building to prevent injury. The building may be a temporary structure on the site or elsewhere, but it shall be satisfactory to the Engineer. Building shall be provided with adequate ventilation to prevent condensation. Maintain temperature and humidity within range required by manufacturer and to prevent condensation on the equipment being stored.
1. All equipment shall be stored fully lubricated with oil, grease and other lubricants unless otherwise instructed by the manufacturer.
 2. Moving parts shall be rotated a minimum of once weekly to insure proper lubrication and to avoid metal-to-metal "welding". Log all rotation maintenance for each piece of equipment in the written record noted above.
 3. 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. Log all startup for each piece of equipment in the written record noted above.
 4. Lubricants shall be changed upon completion of installation and as frequently as required thereafter during the period between installation and acceptance. New lubricants shall be put into the equipment at the time of acceptance.
 5. 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.

PART 2 - PRODUCTS

(Not Used)

Delivery, Storage and Handling
Section No. 01 66 10-3

PART 3 - EXECUTION

(Not Used)

END OF SECTION

SECTION 01 74 23

CLEANING UP

PART 1 - GENERAL

1.01 SUMMARY:

- A. Execute cleaning during progress of Work and at completion of Work as indicated and in compliance with Contract Documents.
- B. Refer to specification sections for specific cleaning for Products or Work.

1.02 DISPOSAL REQUIREMENTS:

- A. Conduct cleaning and disposal operations to comply with local codes, ordinances, regulations, and anti-pollution laws. Do not burn or bury rubbish or waste materials on Project site. Do not dispose of volatile wastes, such as mineral spirits, oil, or paint thinner, in storm or sanitary drains. Do not dispose of wastes into streams or waterways.

PART 2 - PRODUCTS

2.01 MATERIALS:

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

PART 3 - EXECUTION

3.01 CLEANING DURING CONSTRUCTION:

- A. Comply with General Conditions.
- A. At all times maintain areas covered by the contract and adjacent properties and public access roads free from accumulations of waste, debris, and rubbish caused by construction operations.
- B. During execution of work, clean site, adjacent properties, and public access roads and dispose of waste materials, debris, and rubbish to assure that buildings, grounds, and public properties are maintained free from accumulations of waste materials and rubbish. Unneeded construction equipment shall be removed and all damage repaired so that the public and property owners will be inconvenienced as little as possible.
- C. Wet down dry materials and rubbish to lay dust and prevent blowing dust.

- D. Cover or wet excavated material leaving and arriving at the site to prevent blowing dust. Clean the public access roads to the site of any material falling from the haul trucks.
- E. Where material or debris has washed or flowed into or been placed in existing watercourses, ditches, gutters, drains, pipes structures, work done under this contract, or elsewhere during the course of the Contractor's operations, such material or debris shall be entirely removed and satisfactorily disposed of during the progress of the work, and the ditches, channels, drains, pipes, structures, and work, etc., shall, upon completion of the work, be left in a clean and neat condition.
- F. On or before the completion of the work, the Contractor shall, unless otherwise especially directed or permitted in writing, tear down and remove all temporary buildings and structures built by him; shall remove all temporary works, tools, and machinery or other construction equipment furnished by him; shall remove, acceptably disinfect, and cover all organic matter and material containing organic matter in, under, and around privies, houses, and other buildings used by him; shall remove all rubbish from any grounds which he has occupied; and shall leave the roads and all parts of the premises and adjacent property affected by his operations in a neat and satisfactory condition.
- G. Provide on-site containers for collection and removal of waste materials, debris, and rubbish in accordance with applicable regulations.

3.02 FINAL CLEANING:

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.

- e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - f. Remove debris and surface dust from trenches, equipment vaults, manholes, attics, and similar spaces.
 - g. Sweep concrete floors broom clean in unoccupied spaces.
 - h. Remove labels that are not permanent.
 - i. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - j. Vacuum inside and outside of all new and existing electrical panels, MCCs, variable speed drives, etc., which have been affected by dust or dirt due to construction activities.
 - k. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
 - l. Leave Project clean and ready for occupancy.
- C. Construction Waste Disposal: Comply with waste disposal requirements in Division 01 Section "Temporary Facilities and Controls.
- D. Touch-up paint or repaint damaged finishes on electrical items delivered to Project with finish coat of paint. Engineer will make final determination of items to be repainted or touched-up.
- E. Prior to substantial completion or Owner occupancy, Contractor with Owner, shall conduct inspection of sight-exposed interior and exterior surfaces and work areas to verify Work and site is clean.

END OF SECTION

SECTION 01 77 00
CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY:

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following as indicated and in compliance with Contract Documents:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Repair of the Work.
 - 6. Specific closeout and special cleaning requirements for the Work in those Sections.

1.03 SUBMITTALS:

- A. Submit the following shop drawings in accordance with Section 01 33 00.
- B. Product Data: For cleaning agents.
- C. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- D. Certified List of Incomplete Items: Final submittal at Final Completion.

1.04 SUBSTANTIAL COMPLETION PROCEDURES:

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
 2. Submit closeout submittals specified in individual Divisions 02 through 43 Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 3. Submit maintenance material submittals specified in individual Divisions 02 through 43 Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Owner. Label with manufacturer's name and model number where applicable.
 4. Submit test/adjust/balance records.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Complete startup and testing of systems and equipment.
 2. Perform preventive maintenance on equipment used prior to Substantial Completion.
 3. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
 4. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 5. Remove labels that are not permanent labels.
 6. Complete final cleaning requirements, including touchup painting.
 7. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Engineer, that must be completed or corrected before certificate will be issued.
 - 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 - 2. Results of completed inspection will form the basis of requirements for final completion.

1.05 STARTING OF SYSTEMS:

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Owner seven days prior to start-up of each item.
- C. Verify each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by equipment or system manufacturer.
- E. Verify wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable manufacturer's representative in accordance with manufacturers' instructions.
- G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, approve equipment or system installation prior to start-up, to supervise placing equipment or system in operation, and to train the Owner's staff.
- H. Submit a written report in accordance with Section 01 33 00 that equipment or system has been properly installed and is functioning correctly.

1.06 DEMONSTRATION AND INSTRUCTIONS:

- A. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- B. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed time, at equipment location.

- C. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
 - D. Required instruction time for each item of equipment and system is specified in individual sections.
- 1.07 TESTING, ADJUSTING AND BALANCING:
- A. Adjust operating Products and equipment to ensure smooth and unhindered operation.
- 1.08 PROJECT RECORDS DOCUMENTS
- A. The Contractor shall record any actual revisions to the Work and maintain one set of the following Project Record Documents on Site:
 - 1. Contract Drawings, Specifications, and Addenda.
 - 2. Change Orders, Field Orders, and other written notices.
 - 3. Shop drawings, Product data, and samples.
 - 4. Records of surveying and layout Work.
 - 5. Project Record Drawings.
 - B. The Contractor shall record information on the Project Record Documents concurrent with construction progress and store these documents separately from the documents used for construction.
 - 1. The Owner will supply a set of Contract Drawings. The Contractor shall mark thereon all revisions as the Work progresses in order to produce a set of as-built drawings.
 - 2. The Contractor shall note any changes made during construction by any of the Contractor's forces or those of any Subcontractors.
 - 3. The Contractor shall dimension the locations of buried or concealed Work, especially piping and conduit, with reference to exposed structures.
 - 4. The Contractor shall dimension the installed locations of concealed service lines on the Site or within the structure by reference from the centre line of the service to the structure column lines, or other main finished faces, or other structural points which are easily identified and located in the finished Work.
 - 5. Certificates of Substantial Performance and Total Performance shall not be issued until as-built drawings are complete and submitted, and the Contractor has satisfied all requirements for Substantial Performance and Total Performance of the Work.

- C. For Project Record Documents and Record Shop Drawings, the Contractor shall legibly mark each item to record actual construction including:
 - 1. Field changes of dimensions and details.
 - 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 3. Measured locations of internal utilities and appurtenances which are concealed in construction, referenced to visible and accessible features of the Work.
 - 4. Changes in the Work caused by Site conditions, or originated by the Owner, the Engineer, the Contractor, Preselected Equipment Vendors, or Subcontractors and by addenda, supplemental drawings, Site instructions, supplementary instructions, change orders, correspondence, and directions of any regulatory authorities.
 - 5. Record the location of concealed mechanical services and electrical main feeders, junction boxes and pullboxes.

- 1.09 PROTECTING INSTALLED CONSTRUCTION:
 - A. Protect installed Work and provide special protection where specified in individual specification sections.
 - B. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

- 1.10 SPARE PARTS AND MAINTENANCE PRODUCTS:
 - A. Furnish spare parts, maintenance, and extra products in quantities specified in individual specification sections.
 - B. Deliver to and place in location as directed by Owner; obtain receipt prior to final payment.

- 1.11 FINAL COMPLETION PROCEDURES:
 - A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
 - 1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
 - 2. Certified List of Incomplete Items: Submit certified copy of Engineer's Substantial Completion inspection list of items to be completed or corrected (punch list),

endorsed and dated by Engineer. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.12 LIST OF INCOMPLETE ITEMS (PUNCH LIST):

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use CSI Form 14.1A.

1. Organize list of spaces in sequential order.

2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

3. Include the following information at the top of each page:

a. Project name.

b. Date.

c. Name of Engineer.

d. Name of Contractor.

e. Page number.

4. Submit list of incomplete items in the following format:

a. MS Excel electronic file. Engineer will return annotated file.

1.13 SUBMITTAL OF PROJECT WARRANTIES:

A. Time of Submittal: Submit written warranties on request of Engineer for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

- B. Organize warranty documents into an orderly sequence based on the table of contents of Contract Documents.
 - 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
 - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
 - 4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.01 FINAL CLEANING:

- A. General: Perform final cleaning in accordance with Section 01 74 23.
- B. Construction Waste Disposal: Comply with waste disposal requirements in Division 01 Section "Temporary Facilities and Controls.

3.02 REPAIR OF THE WORK:

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and

properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

3.03 ADJUSTING:

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

END OF SECTION

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. This section includes procedural requirements for providing, compiling and submitting operation and maintenance data required for this project.

1.02 SUMMARY:

- A. This section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. General contents of data.
 - 2. Specific data for each equipment and system.
 - 3. Manual for materials and finishes.
 - 4. Assembly.

1.03 DEFINITIONS:

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.04 SUBMITTALS:

- A. O&M Manual Content: Operations and maintenance manual submittal requirements are specified in individual Specification Sections for the Products for which they must be supplied. Submit reviewed manual content formatted and organized by this Section and as defined in Section 01 33 00, Table 01 33 00-1.
 - 1. Engineer and Owner will comment on whether content of operations and maintenance submittals are acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Initial O&M Manual: Submit draft copy of each manual as defined in Section 01 33 00, Table 01 33 00-1. Engineer will comment on whether general scope and content of manual are acceptable.

- C. Pre-Final Manual Submittal: Submit 2 copies of each manual in final form prior to requesting inspection for Substantial Completion and as defined in Section 01 33 00, Table 01 33 00-1. Engineer will return one copy with comments.
 - 1. The contractor to correct or revise each manual to comply with Engineer's comments.
 - D. Submit 2 copies of each corrected manual as a final manual within 15 days of receipt of Engineer's comments and prior to commencing startup, commissioning, and/or training.
 - E. After acceptance, deliver one electronic copy to the Engineer.
- 1.05 FORMAT (HARDCOPY):
- A. Prepare data in the form of an O&M instructional manual.
 - B. Binders: Commercial quality, 8-1/2 x 11-inch three-hole post type binders with hardback, 3-inch maximum binder size. When multiple binders are used, correlate data into related consistent groupings. Three ring binders are not acceptable.
 - C. Arrange contents by Specification Section numbers and sequence of Table of Contents of this Project Manual.
 - D. Provide tabbed fly leaf for each separate product and system, with printed description of product and major component parts of equipment. Insert type tab labels must be secured or bonded to prevent the labels from falling out.
 - E. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
 - F. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages and insert into clear plastic envelopes that can be secured into the three-hole post binders.
- 1.06 FORMAT (ELECTRONIC DOCUMENTATION):

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

3.01 GENERAL CONTENTS OF DATA:

- A. Each individual manual shall contain equipment data pertaining to not more than one Specification section number as indicated in the Contract Documents.
 - 1. Completed Form 01 78 23-1, Contractor's Submittal Form. An electronic copy of Form 01 78 23-1 will be provided to the Contractor

- B. Title Sheet: First page in data listing following:
 - 1. Title: "OPERATION AND MAINTENANCE INSTRUCTIONS".
 - 2. Title of Project: As shown on Contract Documents.
 - 3. Name(s) of applicable building(s) or structure(s) in which equipment is located.
 - 4. Name of equipment as described in Contract Documents.
 - 5. Contractor's name, address, and telephone number.
 - 6. Subcontractor's name, address, and telephone number if equipment is provided by Subcontractor.
 - 7. Contractor's or Subcontractor's purchase order number, manufacturer's shop order number or other such numbers required for parts and service ordering.
 - 8. Manufacturer's name, address, and telephone number.
 - 9. Name, address, and telephone number for local source of supply for parts and service.

- C. Equipment List: Immediately following title sheet containing the following:
 - 1. Table of Contents: Immediately following equipment list. Arrange in logical, systematic order and shall include as minimum each tabbed divider. Each page shall be numbered.
 - 2. Tabbed Dividers: Insert tabbed section dividers between each major section
 - a. Provide title of section on each tab.

- b. Provide table of contents for each tabbed section, arranged in systematic order.
3. Equipment Data Sheets: Provide catalog sheets showing configuration, manufacturer's specifications, models, options, and styles of equipment and major components being provided. Product data sheets will show project specific information with inapplicable information deleted by crossing out or removal. Include in tabbed section(s).
4. Text:
 - a. Include only those sheets applicable to Project.
 - b. Each sheet shall:
 - (1) Identify specific equipment or part installed.
 - (2) Identify text applicable to equipment or part installed.
 - (3) Do not include inapplicable information or neatly strike it out.
5. Drawings:
 - a. Supplement text with drawings to clearly illustrate following:
 - (1) Equipment and components.
 - (2) Relations of component parts of equipment and systems.
 - (3) Control and flow diagrams.
 - b. Actual drawings of equipment from manufacturer. "Typical" drawings are not acceptable, unless they accurately illustrate actual installation for this contract.
6. Specially written information, as required to supplement text for particular installation.
 - a. Provide explanation of interrelationships of equipment and components, and effects one component has on another or entire system.
 - b. Provide overall instructions and procedures for equipment tying in instructions and procedures for separate components into unified instructional package.
 - c. Provide glossary of any special terms used by the manufacturer if applicable.
 - d. Organize in consistent format under separate headings for different O&M procedures.
 - e. Provide logical sequence of instructions in order of O&M action required for each procedure.

3.02 SPECIFIC DATA FOR EACH ITEM OF EQUIPMENT AND/OR SYSTEM:

A. For each item of equipment and system include:

1. Completed Equipment Data Form typewritten on copy of Form 01 78 23-2 to Section 01 78 23. An electronic copy of Form 01 78 23-2 will be provided to the contractor.
2. Description of equipment and component parts:
 - a. Function
 - b. Normal operating characteristics
 - c. Limiting conditions.
 - d. Performance curves
 - e. Engineering data
 - f. Test as applicable.
 - g. Complete nomenclature and model number of replaceable parts including keyed labeled exploded diagram.
 - h. Complete nameplate data.
 - i. Owners tag (or asset) numbers for equipment as indicated on the Contract Drawings.
3. Operating Procedures:
 - a. Startup and break-in.
 - b. Normal operating instructions.
 - c. Regulation and control
 - d. Stopping and shutdown,
 - e. Emergency instructions.
 - f. Summer and winter operating instructions, as applicable.
 - g. Special operating instructions.
4. Maintenance Procedures:
 - a. Routine maintenance operations.

- b. Guide to troubleshooting.
 - c. Disassembly, repair, and reassembly instructions.
 - d. Alignment, adjusting, and checking instructions.
 5. Servicing and Lubrication Schedule:
 - a. List of lubricants required and quantity to be applied.
 - b. Schedule of lubrication.
 - c. Schedule for other routine maintenance.
 6. Manufacturer's printed instructions regarding safety precautions for both (a) protection of personnel operating equipment and systems and (b) prevention of damage to equipment and systems.
 7. Description of sequence of operation of controls.
 8. Assembly drawings and diagrams required for maintenance.
 9. Manufacturer's parts list and illustrations
 - a. Predicted life of parts subject to wear.
 - b. Items recommended to be stocked by the Owner as spare parts and quantities of same.
 10. Accepted control diagrams such as ladder diagrams, instrumentation loop diagrams, and electrical schematics.
 11. Bill of material.
 12. Other data as required under applicable Specification sections.
- B. Each electric and electronic system, as applicable to equipment such as switchgear, motor control centers, panel boards, switchboards, starters, breakers, and relays shall include:
 1. Description of System and Component Parts:
 - a. Function
 - b. Normal operating characteristics
 - c. Limiting conditions.
 - d. Performance curves
 - e. Engineering data

- f. Rating tables
 - g. Tests, as applicable.
 - h. Complete nomenclature and model number of replaceable parts.
 - i. Complete nameplate data.
 - j. Owner's Tag (asset) numbers for equipment as indicated on the Contract Drawings.
2. Circuit Directories of Panel Boards:
- a. Electrical service.
 - b. Controls.
 - c. Communications.
3. Complete instrumentation
- a. Loop diagrams
 - b. Tabulated listing of components in each control circuit or loop.
4. Operating Procedures:
- a. Routine and normal operating instructions.
 - b. Sequences required.
 - c. Special operating instructions.
5. Maintenance Procedures:
- a. Routine maintenance operations.
 - b. Guide to troubleshooting.
 - c. Disassembly, repair, and reassembly instructions.
 - d. Adjustment and checking instructions.
6. Manufacturer's printed instructions regarding safety precautions for both:
- a. Protection of personnel operating equipment and systems.
 - b. Prevention of damage to equipment and systems.
7. List of original all of the manufacturer's components, spare parts with diagram, and recommended quantities to be maintained in storage by the Owner.

8. Other data as required under pertinent sections of Specifications.
- C. Prepare and include additional data when need for such data becomes apparent during instruction of Owner's personnel. Differences between the equipment O&M manual and the manufacturers training session shall result in the training and/or O&M Manual being corrected.
- 3.03 ASSEMBLY:
- A. Assemble in 2 sets.
 - B. Remove bindings of individual manuals.
 - C. Insert index tabs labeled with the respective piece of equipment to separate individual manuals.
 - D. Provide a Table of Contents at the front of each volume showing the equipment items in the order in which they appear in the volume. Each equipment items shall include the functional name, applicable specifications section, and the plan listing, if any.
 - E. The preventive maintenance schedule shall be bound in the front of each section immediately following the index tab sheet. The schedule shall be identified with respect to the piece of equipment it is referring to.
 - F. Sheet Size: 8-1/2 x 11 sheets.
 - G. Drawings may be on 11 x 17-inch sheets folded to 8-1/2 x 11 inches.
 - H. Engrave on covers and end of binder, title OPERATIONS AND MAINTENANCE INSTRUCTIONS, name of Project, Owner's project number, date of Contract, and volume number with subject matter of contents, and Engineer's name.

FORM 01 78 23-1 Page 1 of 5
 CONTRACTOR SUBMITTAL FORM

TO: (Engineer) (Address) (City, State, Zip) (Attn:)		DATE:	
		SPECIFICATION SECTION TITLE:	
		SECTION NO.:	
		MANUFACTURER/ VENDOR:	
FROM: (Contractor) (Address) (City, State, Zip)		NO. OF COPIES SUBMITTED TO Engineer:	
		SIGNATURE OF CONTRACTOR:	

GENTLEMEN:

We have checked the O&M manual submittal dated _____, 20__, and have found it to be in accordance with the requirements of Specification Section 01 78 23 as noted below.

FORMAT

Size: 8-1/2 x 11 or 11 x 17

Paper: 20-lb minimum

Text: Printed data/neatly typed

Drawings: Standard size bound in text; in text-size labeled envelopes

Tabbed Section Dividers

Cover Label: Title

Project name

Building/structure ID

Equipment name

Specification section

Binders: 3-ring

FORM 01 78 23-1 Page 2 of 5
 CONTRACTOR SUBMITTAL FORM

Provided	Not Applicable	Page No.	
3.01 GENERAL CONTENTS			
			A. Section number - one specification only
			B. Title Page
			1. Title
			2. Project title
			3. Building/structure ID
			4. Equipment name
			5. Contractor ID
			6. Subcontractor ID
			7. Purchase order data
			8. Manufacturer ID
			9. Service/parts supplier ID
			C. Product List
			D. Table of Contents
			E. Tabbed Sections
			F. Pertinent data sheets
			1. Annotated as needed
			G. Text
			1. Pertinent to project
			2. Annotated
			H. Drawings
			1. Supplement text
			a. Illustrate product and components
			b. Relations of equipment systems
			c. Control and flow diagrams
			2. Actual drawing of project equipment

FORM 01 78 23-1 Page 3 of 5
 CONTRACTOR SUBMITTAL FORM

Provided	Not Applicable	Page No.	
3.01 GENERAL CONTENTS			
			I. Special Information
			1. Interrelationships of equipment and components
			2. Instructions and procedures provided
			3. Instructions organized in consistent format
			4. Instructions in logical sequence
			5. Glossary
			J. Warranty, Bond, Service Contract
3.02 SPECIFIC CONTENTS (EQUIPMENT/SYSTEMS ONLY)			
			A. For each item of equipment
			1. Complete Form 2 to Section 01 78 23
			2. Description of Unit and Components
			a. Equipment functions
			b. Normal operating characteristics
			c. Limiting conditions
			d. Performance curves
			e. Engineering data
			f. Test data
			g. Replaceable parts list (with numbers)
			h. Nameplate data
			i. P&ID numbers
			3. Operating Procedures
			a. Startup, break-in
			b. Routine/normal operation
			c. Regulation and control
			d. Stopping and shutdown
			e. Emergency

FORM 01 78 23-1 Page 4 of 5
 CONTRACTOR SUBMITTAL FORM

Provided	Not Applicable	Page No.	
3.02 SPECIFIC CONTENTS (EQUIPMENT/SYSTEMS ONLY)			
			3. Operating Procedures (continued)
			f. Seasonal operation
			g. Special instructions
			4. Maintenance Procedures
			a. Routine/normal instructions
			b. Troubleshooting guide
			c. Disassembly/repair/assembly
			d. Alignment, adjusting and checking instructions
			5. Servicing and Lubrication
			a. List of lubricants
			b. Lubrication schedule
			c. Maintenance schedule
			6. Safety Precautions/Features
			7. Sequence of Operation of Controls
			8. Assembly Drawings
			9. Parts List and Illustrations
			a. Predicted life
			b. Spare parts list
			10. Control Diagrams/Schematics
			11. Bill of Materials
			12. Other Data as Required

FORM 01 78 23-1 Page 5 of 5
 CONTRACTOR SUBMITTAL FORM

Provided	Not Applicable	Page No.	
3.02 SPECIFIC CONTENTS (EQUIPMENT/SYSTEMS ONLY)			
			B. Each electrical and electronic system
			1. Description
			a. Equipment functions
			b. Normal operating characteristics
			c. Performance curves
			d. Engineering data
			e. Test data
			f. Replaceable parts list (with numbers)
			g. Nameplate data
			h. P&ID numbers
			2. Circuit and Panel Board Directories
			a. Electrical
			b. Controls
			c. Communications
			3. Instrumentation
			a. Loop Diagrams
			b. Components list each circuit/loop
			4. Operation Procedures
			a. Routine/normal operating instructions
			b. Sequences required
			c. Special operating instruction
			5. Maintenance Procedures
			a. Routine/normal instructions
			b. Troubleshooting guide
			c. Disassembly/reassembly
			d. Adjusting and checking
			6. Safety Precautions/Features
			7. Spare Parts List
			8. Additional Data

FORM 01 78 23-2 Page 1 of 4
EQUIPMENT DATA FORM

PROJECT NAME			
CONTRACT NO.			
CONTRACTOR			
EQUIPMENT NO.		ASSET NO.*	
DESCRIPTION		MAINT. NO.*	
LOCATION			
MANUFACTURER			
PURCHASED FROM			
VENDOR ORDER NO.		PURCHASE \$	
DATE OF PURCHASE			
LOCAL SUPPLIER			
ADDRESS			
PHONE NO.			
MODEL NO.			
NO. OF UNITS		SERIAL NOS.	
*By Owner			

FORM 01 78 23-2 Page 2 of 4
EQUIPMENT DATA FORM

NAMEPLATE DATA			
ELECTRIC MOTOR		PUMP/HVAC UNIT	
MANUFACTURER		MANUFACTURER	
TYPE	<input type="checkbox"/> AC <input type="checkbox"/> DC	TYPE	
HORSEPOWER		SIZE	
RPM		CAPACITY	
VOLTAGE		PRESSURE	
AMPERAGE		ROTATION	
PHASE		IMPELLER SIZE	
FRAME		IMPELLER MATERIAL	
DRIVE/REDUCER		OTHER (I&C)	
MANUFACTURER		MANUFACTURER	
TYPE	<input type="checkbox"/> GEAR <input type="checkbox"/> V-BELT <input type="checkbox"/> CHAIN <input type="checkbox"/> VARIDRIVE	TYPE	
		SIZE	
SERVICE FACTOR		CAPACITY	
RATIO		RANGE	

LUBRICANT/RECOMMENDED SPARE PARTS LIST

EQUIPMENT NO.		ASSET NO.*	
DESCRIPTION		MAINT. NO.*	

LUBRICANT LIST

REFERENCE SYMBOL	LUBRICANT TYPE (MILITARY STANDARD)	RECOMMENDED LUBRICANT AND MANUFACTURER
List symbols in "Maintenance Operation" (Page 3).	List general lubricant type.	List specific lubricant name, viscosity, and manufacturer.

RECOMMENDED SPARE PARTS LIST

PART NO. **	DESCRIPTION	UNIT	QUANTITY	UNIT COST

ADDITIONAL DATA AND REMARKS

* By Owner
 ** Identify parts provided by this contract with two asterisks.
 Note: Attach additional sheets if necessary; identify each sheet at top with equipment number and description.

END OF SECTION

SECTION 02 41 00

DEMOLITION

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide demolition of existing conditions as indicated and in compliance with Contract Documents.

1.02 REFERENCES:

- A. United States Environmental Protection Agency (USEPA):
 - 1. 832: Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.03 SUBMITTALS:

- A. Submit the following in accordance with Section 01 33 00.
 - 1. Demolition Plan.

1.04 QUALITY ASSURANCE:

- A. Comply with the requirements specified in Section 01 43 00.
- B. Demolition Plan: Provide description of sequence, methods, and equipment used for demolition (including disposal).

1.05 DELIVERY STORAGE AND HANDLING:

- A. Comply with the requirements specified in Section 01 66 10.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

3.01 PREPARATION:

- A. Survey Markers and Monuments:

1. Provide three reference points, established by a licensed land surveyor, for each survey marker or monument temporarily removed. Record locations and designations of survey markers and monuments prior to removal.
2. Store removed markers and monuments during demolition work, and replace upon completion of work. Reestablish survey markers and monuments in conformance with recorded reference points. Forward letter to Engineer, signed by a licensed land surveyor, verifying reestablishment of survey markers and monuments.

- B. Burning of demolition debris is prohibited.
- C. Protect existing structures, equipment, and appurtenances to remain.
- D. Obtain permission from Engineer before abandoning or removing existing structures, materials, equipment and appurtenances.
- E. Provide fire extinguishers in areas where demolition work is performed by use of an open flame. Exercise necessary precautions for fire prevention.
- F. Maintain circulation of traffic within area at all times during demolition operations.
- G. Make necessary arrangements with and perform work required by utility companies and municipal departments for discontinuance or interruption of utility services due to demolition work.
- H. Confine apparatus, storage of materials, demolition work, new construction, and operations of workmen to areas that will not interfere with continued use and operation of entire facility. Provide and maintain lights, barriers, and temporary passageways for free and safe access.

3.02 DEMOLITION:

- A. Demolish and remove existing construction, utilities, equipment, and appurtenances.
- B. Provide maximum practicable protection from inclement weather for materials, equipment, and personnel located in partially dismantled structures.
- C. Protect persons and property throughout progress of work. Provide safe working conditions for personnel.
- D. Wet down work during demolition operations to prevent dust from arising. Minimize spread of dust and airborne particles.
- E. Complete demolition work on upper levels before disturbing supporting members on lower levels.
- F. Removed materials, equipment, and appurtenances, not designated for relocation, become property of Contractor and shall be disposed of offsite.

3.03 SALVAGE:

- A. Store equipment to be salvaged or relocated as directed by Engineer. Protect salvaged items from damage during work.

3.04 REPAIR/RESTORATION:

- A. Repair or remove items that are damaged. Repair and install damaged items to condition at least equal to that which existed prior to start of work.

3.05 CLOSEOUT ACTIVITIES:

- A. Provide in accordance with Section 01 77 00.

END OF SECTION

SECTION 09 91 10

SHOP PAINTING

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide shop painting as specified and in compliance with Contract Documents.

1.02 REFERENCES:

A. ASTM International (ASTM):

1. B117: Standard Practice for Operating Salt Spray (Fog) Apparatus.
2. D4541: Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
3. D4585: Standard Practice for Testing Water Resistance of Coatings Using Controlled Condensation

B. The Society for Protective Coatings (SSPC):

1. SP6: Commercial Blast Cleaning
2. SP10: Near-White Blast Cleaning

1.03 SUBMITTALS:

- A. Submit the following shop drawings in accordance with Section 01 33 00.
- B. Manufacturer's specifications and data on the proposed primers and detailed surface preparation, application procedures and dry mil thicknesses, including list of items and surfaces to receive shop painting.

1.04 QUALITY ASSURANCE:

- A. Comply with the requirements specified in Section 01 43 00.

1.05 DELIVERY STORAGE AND HANDLING:

- A. Comply with the requirements specified in Section 01 66 10.
- B. Deliver materials to application area in original, unbroken containers, plainly marked with name and analysis of product, manufacturer's name, and shelf life date. Do not store or use contaminated, outdated, prematurely opened, or diluted materials.

- C. Store coated items to prevent damage or dirtying of coatings. Avoid need for special cleaning, and store coated items out of contact with ground or pavement. Place suitable blocking under coated items during storage.
 - D. Do not expose surfaces to weather for more than six months before being topcoated, or less time if recommended by coating manufacturer.
 - E. Protect surfaces not to receive paint coatings during surface preparation, cleaning, and painting.
 - F. Protect coatings from damage during shipment and handling by padding, blocking, use canvas or nylon slings, and use care when handling.
 - G. At time of delivery of shop painted items to job site, ensure coatings are undamaged and in good condition.
- 1.06 PROJECT/SITE CONDITIONS:
- A. Environmental Requirements:
 - 1. Comply with manufacturer's recommendations as to environmental conditions under which coatings and coating systems can be applied.
 - 2. Do not apply coatings when dust is being generated.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Coatings are divided into the following service types, as determined by conditions:
 - 1. Non-Potable Water:
 - a. All ferrous metals not subject to potable water provide one coat with a dry film thickness of 2.5 to 3.0 mils.
 - b. Manufacturers:
 - (1) Series 1 Prime made by Tnemec Co.
 - (2) Carbozinc 859 by Carboline Co.
 - (3) Multiprime EFD Epoxy Fast Dry Inhibitive Primer 94-109 made by PPG Protective & Marine Coatings (4.0 – 6.0 DFT).
 - c. Performance Data:
 - (1) ASTM- D4541- Adhesion – No less than 1250 psi pull

- (2) ASTM- D4585- Humidity- no effect after 4800 hours with < 1% rust
 - (3) ASTM- B117 Salt Spray- No cracking, delamination or >1/64 creep after 9800 hours
- B. Shop prime with primers guaranteed by the manufacturer to be compatible with their corresponding primers and finish coats specified in Division 09 "Field Painting" Section for use in the field and which are recommended for use together.

PART 3 - EXECUTION

3.01 APPLICATION:

A. Surface Preparation and Priming:

- 1. Sandblast clean in accordance with SSPC-SP-6, Commercial Grade, immediately prior to priming non-submerged components scheduled for priming, as defined above.
- 2. Sandblast clean in accordance with SSPC-SP-10, Near White, immediately prior to priming submerged components scheduled for priming, as defined above.
- 3. Before priming, provide surfaces dry and free of dust, oil, grease and other foreign material.
- 4. Shop prime in accordance with accepted manufacturer's printed recommendations.

B. Non-primed Surfaces: Apply accepted coating in accordance with manufacturer's printed recommendation.

3.02 TOUCH-UP:

- A. Repair or replace damaged or defective coated areas. Resultant shop painting: Paint items as specified.
- B. Remove damaged or defective coatings by specified blast cleaning to meet surface cleaning requirements, just before recoating. When small areas of coating need touch up, surface preparation may be done with suitable power needle gun to match specified blast cleaning.

3.03 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01 77 00.

END OF SECTION

SECTION 26 05 10

ELECTRICAL WORK – GENERAL

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide complete and operational systems for both normal and standby electric power systems, normal and emergency lighting systems, grounding systems and other specified systems, including the installation and wiring of miscellaneous equipment and devices. Perform all work and testing as indicated and in compliance with Contract Documents.
1. Provide conduit, wiring and connections for power, control, lighting, instrumentation and alarms for equipment furnished by others unless otherwise specified and indicated.
 2. Provide temporary circuits, overcurrent devices, conduit and wiring, and other equipment required during construction and change-over from existing to proposed electric system. Perform work at the convenience of the Owner.
 3. Provide electrical system studies including a short circuit and protective device coordination study and an arc-flash study for the electrical distribution system constructed under this contract.
 4. Disconnecting, removing, and relocating existing electrical equipment is a part of this Contract and is specified under Section 02 41 00 and this Section. Make equipment scheduled for removal free of shock hazard.
 5. Provide electrical relocation work associated with the relocation of equipment for the existing and new facilities, including disconnecting all existing wiring and conduits and providing new wiring and conduit to the relocated equipment. Make equipment scheduled for relocation free of electrical shock hazard.
 6. The equipment enclosure classification of the plant areas are indicated on the drawings. Provide all equipment, devices and material meeting the requirements for these area classifications unless otherwise noted or specified.
 7. Review the electrical underground system and the civil yard piping. Install the electrical underground system in a manner that avoids conflicts with manholes, catch basins, etc. provided under other Divisions of the specifications

1.02 REFERENCES:

- A. National Fire Protection Association (NFPA):
1. 70: National Electrical Code (NEC).

1.03 SEQUENCING AND SCHEDULING:

- A. Coordinate electrical equipment installation with structural and mechanical components.
- B. Coordinate installing required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Sequence, coordinate and integrate the installation of electrical materials and equipment for efficient flow of the work.
- D. Coordinate the installation of large equipment prior to installation of decking or access platforms.
- E. Sequencing and scheduling work at existing facilities:
 - 1. Coordinate electrical power outages to the electrical systems and equipment with the Owner. Where duration of proposed outage cannot be allowed by the Owner, phase the work to allow the system or equipment to be re-connected to the electrical power system within the time frame allowed by the Owner or provide temporary power connections as required to maintain service to the systems or equipment. The temporary power can be from a generator or another part of the facility not affected by the outage provided there is sufficient spare capacity.

1.04 QUALITY ASSURANCE:

- A. Provide in accordance with Section 01 43 00 and as specified.
- B. Install electrical work in conformance with latest rules and requirements of National Fire Protection Association Standard No. 70 (National Electrical Code) and in accordance with requirements of State and Local Codes.

1.05 QUALIFICATIONS OF ELECTRICAL SUBCONTRACTOR

- A. The Electrical Subcontractor shall have been engaged in work of a similar nature to this contract for the past 5 years.
- B. The Electrical Subcontractor shall have a minimum of three projects of equal or greater size with the type of equipment specified under this project.

1.06 SUBMITTALS:

- A. Submit the following in accordance with Section 01 33 00:
 - 1. The following defines a minimum for all Division 26 shop drawing and data submittals:
 - a. Submit shop drawings delineated by specification number with all information for one piece of equipment provided as one package.

- b. Partial submittals will be returned without action.
 - c. Submit bills of material: Include a numbered list of all components, with manufacturer's name, catalog number, rating, and other identification. Place item number or similar identification on all other drawings where item appears.
 - d. Submittal shall include:
 - (1) Manufacturer's drawings
 - (2) Panel layout
 - (3) Equipment layout
 - (4) Schematic diagram
 - (5) One line diagram
 - (6) Control sequence diagrams
 - (7) Interconnection diagrams
 - (8) Wiring diagrams
 - (9) Catalog data
 - e. Submit only completed drawings showing all local and remote devices associated with each item.
 - f. Mark shop drawings and data submitted showing only items applicable to specific contract.
 - g. Where additions and modifications are made to existing equipment, provide drawings which include both retained existing equipment and new work.
 - h. Submit time-current characteristic curves for all submitted protection devices such as circuit breakers and fuses.
 - i. Submit other documentary or descriptive information as required for each assembly to demonstrate compliance with the applicable contract documents.
2. Shop drawings and data are required for the following list:
- a. Starting Equipment Data List -Submit blank list initially to verify acceptable format. Submit final list at completion of the project.
 - b. Short Circuit and Coordination Studies Arc-Flash Studies

- c. Conduit and Fittings
 - d. Wire and Cable
 - e. Wiring Devices
 - f. Manholes, Handholes, and Associated Equipment and Devices
 - g. Grounding Equipment and Devices
 - h. Panelboards
 - i. Lighting Fixtures and Accessories
 - j. Lighting Control Panels
 - k. Telephone System
 - l. Engine Generator Set
 - m. Control Stations
 - n. Enclosures
 - o. Control Panels
 - p. Safety Switches
 - q. Electric Heating Units and Accessories
 - r. Automatic Transfer Switches
 - s. Pump Controls / Starters
 - t. Field Acceptance Test Reports
 - u. Record Drawings
3. Submit instruction manuals for installation, operation, and maintenance of equipment, and parts list for equipment listed below. Specifically mark standard publications forming a part of this contract. Cross out, blank out, or otherwise delete non-applicable items. Submittals which do not clearly indicate items and features provided shall be rejected.
- a. Telephone System

1.07 NAMEPLATES AND LABELING:

- A. Provide nameplates and labels as specified in Section 26 05 53 00.

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1.08 INTERFERENCE AND ERRONEOUS LOCATIONS:

- A. Locations of electrical equipment, devices, outlets, and similar items, as indicated, are approximate only. Exact locations shall be determined during construction.
- B. Verify in field, all data and final locations of work installed under other sections of specifications, required for placing of electrical work.
- C. In case of interference with other work or erroneous locations with respect to equipment or structures, furnish all labor and materials to complete the work.

1.09 APPROVAL AND MARKING EQUIPMENT:

- A. Insure that devices and materials are listed and/or labeled by UL, wherever standards have been established by that organization. Where a UL listing is not available for equipment, submit certified test reports of a Nationally Recognized Testing Laboratory (NRTL), approved by the local inspecting authority, indicating that equipment is in conformance with local code requirements or any other applicable requirements. Tests and inspections for approval of equipment shall be performed at no additional cost to Owner.
- B. Clearly mark equipment, devices and material with name or trademark of manufacturer and rating in volts and amperes and other pertinent information on a nameplate.

1.10 ELECTRIC SERVICE:

- A. Electrical power system for the facility operates at 208/120 volt, 3-phase, 4 wire, 60 Hertz.
- B. Earth and rock excavation, backfill, concrete masonry, concrete reinforcement, and construction joints required for electrical work is included under this section and shall conform to requirements specified under applicable sections of Contract for General Construction.

1.11 EQUIPMENT SPECIFIED ELSEWHERE:

- A. Certain items of control equipment and other equipment are indicated on electrical drawings for connection, but are specified in other sections pertaining to plumbing, heating, ventilating and air conditioning, mechanical process, instrumentation, etc. Such items are not furnished as part of electrical work.

1.12 INCOMING SERVICE:

- A. Contact the following organization for coordinating the incoming power requirements for the project:

Dominion Energy
Emily Bailey: 540-280-5265

- B. The organization identified above will furnish and install:
 - 1. See Contract Drawings for division of responsibilities between Utility and Contractor.
- C. The final, complete installation shall comply with all state and local statutory requirements having jurisdiction. The Contractor shall arrange for all necessary permits, pay all fees and arrange for all required inspections by local authorities. In general, all work shall comply with the requirements of the National Electrical Code, all state codes and the codes and ordinances of the city or town in which the work is to be done.

1.13 TELEPHONE SERVICE:

- A. Provide all conduit and wire to service pole, extend conduit up pole as required by telephone company. Connections at pole will be made by the telephone company. Perform work at service pole in accordance with telephone company's requirements.

PART 2 - PRODUCTS

2.01 METERING EQUIPMENT:

- A. Power Company: Secondary metering equipment furnished by power company as follows: As indicated on Drawings

PART 3 - EXECUTION

3.01 METERING EQUIPMENT:

- A. Install metering equipment as follows:
 - 1. Ensure that metering equipment installation shall be in accordance with requirements of power company by submitting drawings, sketches, catalog information and other appropriate material for power company approval.

3.02 REMOVAL AND RELOCATION OF MATERIAL AND EQUIPMENT:

- A. Remove from site and dispose of material and equipment not indicated for reuse unless otherwise noted on Drawings.

3.03 WORK IN EXISTING STRUCTURES:

- A. In general, any or all existing electrical equipment and services are to remain in operation and shall not be disturbed unless otherwise noted in these Specifications and/or on the drawings or as required for the proper execution of the work.
- B. In each area of the work, disconnect and carefully remove the existing electrical equipment and devices so noted. With the exception of items indicated as having to be

re-used, all such existing equipment and devices shall be disposed of as specified herein. If not required by the Owner, remove them from the premises and site. All existing electrical equipment and devices indicated as not removed or abandoned are to be maintained in operation and any circuits disturbed by the construction shall be restored.

- C. Maintain existing electrical services and systems to and in the buildings throughout the project and all “down-time” shall be scheduled at least two weeks in advance with the permission of the **ENGINEER** and such scheduling shall be rigidly adhered to.

3.04 DEMOLITION:

- A. Survey the existing electrical systems and equipment identified for removal with representatives from the other trades prior to performing any demolition work. Identify all conduit and equipment to be removed with tags or paint.
- B. Where a piece of equipment is to be removed all associated ancillary components (e.g. solenoid valves, pressure switches, etc) and associated wiring and conduit shall also be removed.
- C. Equipment, building or structures scheduled for complete demolition shall be made safe from electrical shock hazard prior to demolition. Disconnect all electrical power, communications, alarm and signal system.
- D. Equipment scheduled to be turned over to the Owner shall be carefully disconnected, removed and delivered to the Owner where indicated. Provide labor, hoisting and transportation of the equipment. All other miscellaneous electrical materials, devices, etc., associated with the equipment being turned over shall be demolished and removed from the site.
- E. Remove electrical work associated with equipment scheduled for demolition except those portions to remain or be reused.
- F. Unless otherwise specifically noted, remove unused exposed conduit and support systems back to point of concealment including abandoned circuit above accessible ceiling finishes. Removed unused wiring back to source (or nearest point of usage).
- G. Disconnect abandoned outlets and removed devices. Removed abandoned outlets if conduit services them is abandoned or being removed. Provide blank covers for abandoned outlets which are not removed.
- H. Disconnect and remove abandoned electrical equipment unless otherwise indicated or specified.
- I. Disconnect and remove abandoned luminaries. Remove brackets, stems, hangers and other accessories.
- J. Repair adjacent construction and finishes damaged during demolition and extension work.

- K. Where electrical systems pass through the demolition areas to serve other portions of the premises, they shall remain or be suitably relocated and the system restored to normal operation.
- L. The electrical and process equipment to be removed or relocated under this contract has been identified on the Drawings.
- M. Trace out existing wiring that is to be relocated, or removed and perform the relocation or removed work as required for a complete operating and safe system.
- N. Remove exposed conduits, wireways, outlet boxes, pull boxes and hangers made obsolete by the alterations, unless specifically designated to remain. Patch surfaces and provide blank covers for abandoned outlets which are removed.
- O. All equipment, materials, controls, motor starters, branch and feeder breakers, panelboards, transformers, wiring, raceways, etc. furnished and installed to the temporarily keep circuits energized shall be removed when the permanent installation is fully operational.

3.05 PROTECTION OF ELECTRICAL EQUIPMENT:

- A. Store equipment in compliance with manufacturer's recommendations and as specified herein.
- B. Protect electrical equipment from the weather, especially from water dripping or splashing upon it, at all times during shipment, storage, and construction.
- C. Do not store equipment outdoors.
- D. Where equipment is installed or stored in moist areas, or unheated buildings, provide acceptable means to prevent moisture damage. Provide uniformly distributed source of heat in electrical equipment to prevent condensation and damage to electrical insulation systems.

3.06 DEFECTIVE OR DAMAGED EQUIPMENT:

- A. Damaged equipment shall not be used. Equipment damaged in shipment, storage, installation or through other means shall be replaced without additional cost to the Owner.
- B. All equipment showing signs of water damage shall be rejected regardless of dielectric test results.
- C. All electrical equipment is considered "in storage" regardless of location until first energized. Manufacturer's recommendations for storage precautions, conditions and care shall be followed.

3.07 STARTING EQUIPMENT DATA LIST:

- A. Obtain data from the equipment supplier shop drawing submittals or equipment nameplates, and prepare a complete tabulation of all motors over 1/3 hp, electric heaters over 3 kW, and starting equipment for both, to be furnished on the project.
 1. Include in tabulation firm the following information:
 - a. Name and identification of equipment.
 - b. Manufacturer.
 - c. Horsepower or kilowatt rating.
 - d. Voltage.
 - e. Phase.
 - f. Speed.
 - g. Full load current.
 - h. Locked rotor current or code letter.
 - i. Type of enclosure (open drip-proof, totally enclosed, fan cooled, etc.).
 - j. NEMA size of starter or contactor.
 - k. Overload heater size.
 - l. Type of starter (full-voltage, reduced-voltage, autotransformer, etc.).
 - m. Breaker trip setting or fuse size.
 - n. Voltage of starter operating coil.
 - o. If starter is at a motor control center, list motor control center number.
 2. Final acceptance of the electrical system is contingent upon submittal of the complete motor and electric heater tabulation.
 3. Arrange tabulation in groups by MCC or building location.
 4. Furnish six copies of the tabulation to the **ENGINEER** when a submission is made.

3.08 DRAWINGS AND SPECIFICATIONS:

- A. Drawings and specifications are typical of work to be done and of the arrangement desired. Provide accessories and appurtenances which the **ENGINEER** deems functionally necessary for a complete installation, whether or not explicitly indicated or described.

3.09 AS-BUILT DRAWINGS:

- A. The Contractor shall maintain a master set of as-built drawings showing the changes and deviations from the contract drawings.

3.10 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01 77 00.

END OF SECTION

SECTION 26 05 20

ELECTRIC WIRES AND CABLES

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide wires and cables for complete electrical systems as indicated and in compliance with Contract Documents.

1.02 REFERENCES:

- A. ASTM International (ASTM):

- 1. B3: Soft or Annealed Copper Wire.
- 2. B8: Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
- 3. B33: Tinned Soft or Annealed Copper Wire for Electrical Purposes.

- B. Insulated Cables Engineers Association, Inc. (ICEA)/National Electrical Mfg's Association (NEMA):

- 1. S-61-4021/WC 5: Thermoplastic Insulated Wire & Cable.
- 2. S-66-524/NEMA WC 7; Cross-Linked-Thermosetting-Polyethylene Insulated Wire and Cable.
- 3. S-68-516/WC 8: Ethylene-Propylene-Rubber-Insulated Wire & Cable.

- C. National Fire Protection Association (NFPA):

- 1. 70: National Electrical Code (NEC).

- D. Underwriters Laboratories, Inc. (UL):

- 1. 44: Thermoset-Insulated Wires and Cables.
- 2. 83: Thermoplastic-Insulated Wires and Cables.
- 3. 854: Service Entrance Cables.

1.03 SUBMITTALS:

- A. Submit shop drawings and manufacturer's product data in accordance with the requirements of Section 26 05 00.

1.04 DELIVERY STORAGE AND HANDLING:

- A. Comply with the requirements specified in Section 01 66 10.
- B. Deliver wire and cables in full reels protected against injury. Deliver reels with factory attached UL approved tags showing the manufacturers name and the type of insulation, size, and length of wire in each coil or reel.
- C. Accept wire and cable on site in manufacturer's packaging. Inspect for damage.
- D. Store and protect in accordance with manufacturer's instructions.
- E. Protect from weather. Provide adequate ventilation to prevent condensation.

1.05 DESIGN CRITERIA:

- A. Wire for lighting, single phase circuits shall be Type XHHW or THWN-THHN.
- B. Wire for three phase circuits shall be Type XHHW.
- C. Single conductor wire for control, indication and metering shall be Type THWN-THHN No. 12 or 14 AWG, stranded.
- D. Multi-conductor control cable shall be used for the underground system and shall be No. 12 or 14 AWG, stranded with overall jacket.
- E. Wire for process instrumentation shall be twisted shielded pairs No. 16 AWG, stranded with overall jacket.
- F. Ground wires shall be Type THW, green. Bare ground wires shall be soft drawn copper, 98 percent conductivity.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

- A. 600V Cable:
 - 1. Okonite.
 - 2. Southwire.
 - 3. American Insulated Wire.
- B. Control and Metering Wire:
 - 1. Belden Wire and Cable.

2. Alpha Wire.
 3. Coleman Cable.
- C. Cable Fireproofing Tape:
1. MAC Products, Inc.
 2. 3M Electrical Products.

2.02 MATERIALS AND COMPONENTS:

- A. Furnish copper conductors. Material and stranding of conductors to conform to ASTM B3, ASTM B33, and to ASTM B8, for the appropriate class.
- B. Uncoated, soft or annealed copper wire conforming to ASTM B3.
- C. Wires and Cables for Maximum 600-Volt Power Circuits: For No. 8 AWG gauge and smaller provide type THWN/THHN. Where used in lighting or receptacle branch circuits provide No. 12 AWG gauge and No. 10 AWG gauge as solid conductor. Provide other wire with Class C stranding. Provide No. 6 AWG gauge and larger as XHHW-2 with Class B stranding. Provide wires and cable conforming to UL 83.
- D. Wires and Cables for Control, Indicating, Metering, or Alarm Circuits: Single and multi-conductor control cable, copper conductors, Class B or C stranding. Insulation; 600-volt polyethylene, polyvinylchloride, or EPR. Continuous rating of 90C dry and 75C wet. Color coding conforming to Table K-2, ICEA/NEMA S-61-4021/WC 5.
- E. Shielded Cable for Instrumentation Wiring: 7-strand copper conductors, size No. 16 AWG. Insulate conductors individually with color coded polyethylene or polyvinylchloride. Twist pairs with varying lay (if more than one pair) and cover with cable tape and copper or aluminum coated Mylar shielding tape and tinned copper drain wire. Jacket: polyvinylchloride. Cables: rated 600 volts and 90 degrees C.
- F. Category 5e Cable: Category 5e cable shall consist of 4 twisted pairs of different lay and ground wires, enclosed by an overall conductive mylar backed aluminum foil shield. This shall be enclosed by an overall thermoplastic jacket. The cable shall meet the applicable requirements of ANSI/TIA/IEA-568-B.

PART 3 - EXECUTION

3.01 GENERAL:

- A. Perform work in accordance with the National Electrical Code.
- B. Provide power cable identification as follows:

System Voltage	Neutral	Phase A	Phase B	Phase C
208/120V	White	Black	Red	Blue

- C. Use green to identify insulated ground conductors.

NOTE: Colored insulation, tapes or sleeves may be used to provide color coding. Insulated ground conductors must have green covering.

- D. Permanently post means of identification of grounded and ungrounded conductors for each nominal voltage system at each panelboard and motor control center.

3.02 INSTALLATION OF WIRING:

- A. Unless otherwise indicated, use no conductor smaller than No. 12 AWG for power, No. 14 AWG for control, and No. 16 AWG for shielded applications.
- B. Install conductors continuous from outlet to outlet and make no splices except within outlet or junction boxes.
- C. Install cable in underground raceway system without splices. There shall be no splices between connection points unless otherwise indicated.
- D. Draw all conductors contained within a single conduit at the same time.
- E. Apply wire pulling compound to conductors being drawn through conduits. Use pulling compound, Minerallac No. 100, Y-er-Eas, Yellow 77, High Performance Polywater Cable Lubricant or acceptable equivalent.
- F. Use no cable bend with radius of less than eight times its diameter.
- G. Wires and cables installed without prior submittal review are subject to removal at no additional expense.

3.03 CONDUCTOR IDENTIFICATION:

- A. Label each wire at both termination points. Carry individual conductor or circuit identification throughout, with circuit numbers or other identification clearly stamped on terminal boards and printed on directory cards in distribution cabinets and panelboards.
- B. Identify each wire in junction boxes, cabinets, and terminal boxes where total number of control, indicating, and metering wires is three or more and no terminal board is provided, including all power wire. Where no termination is made use a plastic-coated, self-adhesive, wire marker and where termination is made use a, plastic, pre-printed sleeve wire marker.

- C. In cases similar to above where terminal boards are provided for the control, indicating, and metering wires, identify all wires including motor leads and other power wires too large for connection to terminal boards, by sleeve wire markers as specified above.
- D. In manholes and handholes, identify each power wire by laminated plastic tag located so it is easily seen. Control wires to be bundled and marked as listed in conduit and wire schedule.

3.04 CONNECTORS, TERMINAL LUGS AND BOARDS:

- A. For wiring of circuits consisting of No. 10 or No. 12 AWG solid wires, such as for lighting branch circuits, use self-insulated pressure type connectors for all splices or joints.
- B. Terminate all wires connected to terminal boards, terminal blocks, or to other similar terminals by means of ring and tongue, nylon self-insulated, tin-plated copper pressure terminals.
- C. Terminal boards shall be 600 volts and rated for 125 percent of the ampacity of the connected circuit. They shall have screw terminals, with white marking strips for wire identification, of the 4-, 6-, 8-, or 12-pole type, as necessary.
- D. Wire connections for which terminals are not supplied, for example, at solenoids or motor terminal junction boxes:
 - 1. 10 AWG and smaller: Use self insulated pressure-type connectors.
 - 2. 8 AWG and larger: Use insulated, mechanical type with set screw or follower bearing directly on the wire. Split bolt connectors are not acceptable.
- E. Clearly and permanently mark terminal strips with ink or indelible pencil. Mark each wire consistently throughout entire system, using notation of wires given on manufacturer's wiring diagrams wherever possible.

3.05 FIELD TESTING:

- A. Submit results of all cable tests on forms indicating cable size, voltage, and date with name of tester and witness.

3.06 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01 77 00.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide a single, complete, integrated grounding system, including conductors, raceways, and connections, as indicated and in compliance with Contract Documents, and in accordance with the National Electrical Code Article 250 and the [National Electrical Safety Code](#).
- B. Include grounding conductors completely inter-connecting ground rods, equipment grounding conductors, metallic piping systems, and electrical equipment enclosures.

1.02 REFERENCES:

- A. [American National Standards Institute \(ANSI\)/Institute of Electrical and Electronics Engineers \(IEEE\)](#):
 - 1. [ANSI/IEEE C2: National Electrical Safety Code](#).
- B. [ASTM International \(ASTM\)](#):
 - 1. B3: Standard Specification for Soft or Annealed Copper Wire.
 - 2. B8: Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
 - 3. B33: Standard Specification for Tinned Soft or Annealed Copper Wire for Electrical Purposes.
- C. [Institute of Electrical and Electronics Engineers \(IEEE\)](#):
 - 1. Standard 81: Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potential of a Ground System.
- D. [National Fire Protection Association \(NFPA\)](#):
 - 1. 70: National Electrical Code.
- E. [Underwriters Laboratories \(UL\)](#):
 - 1. 467: Standard for Grounding and Bonding Equipment.

1.03 SUBMITTALS:

- A. Submit the following shop drawings in accordance with Section 01 33 00:
- B. Submit shop drawings and manufacturers' product data in accordance with requirements of Section 26 05 10.
- C. Submit catalog and dimensional data for the following:
 - 1. Ground rods
 - 2. Exothermic welding
 - 3. Connecting hardware
- D. Submit grounding system test results.

PART 2 - PRODUCTS

2.01 MANUFACTURER'S COMPLIANCE:

- A. Manufacturer's acceptance contingent upon products' compliance with the specifications.

2.02 MANUFACTURERS:

- A. Ground Rods:
 - 1. ERICO Products Inc.
 - 2. Galvan Electrical Products.
 - 3. Nehring Electrical Works.
- B. Exothermic Welding:
 - 1. ERICO Products, Inc.
 - 2. American Brass Mfg. Co.
 - 3. Orgo-Thermit, Inc.
- C. Connecting Hardware:
 - 1. American Brass Mfg. Co.
 - 2. Thomas and Betts
 - 3. Anderson Electric Corp.

2.03 MATERIALS AND COMPONENTS:

A. Conductors:

1. Provide copper grounding conductors bare or insulated, sized as indicated. When not indicated on the drawing provide in accordance with the NEC. Provide protection of conductors in locations where physical damage would result from direct exposure.
2. Ground and bond wires for main panels, distribution points, and ground rod connections shall be annealed bare copper conforming to ASTM B3, stranded, with 98 percent conductivity.
3. Equipment **ground** conductors run with circuit conductors and grounding electrode conductor shall be 600 volt with green insulation, unless noted otherwise on the Contract documents.
4. Unless noted otherwise, all conductors No. 8 AWG and larger shall be stranded, Class B in accordance with ASTM B8.
 - a. Uninsulated conductors shall be bare copper in accordance with ASTM B3, tinned in accordance with ASTM B33.
 - b. Use tinned-coated in corrosive environments including when buried in earth or embedded in concrete.

B. Connectors and Fasteners:

1. Provide ground clamps which are **UL listed** for use on copper or brass pipes.
2. Provide ground clamps, for use on iron pipes, of galvanized or malleable iron, or of standard noncorrosive material for use on iron pipes.
3. Provide ground clamps, for use on pipes, with rigid metal base providing good contact by proper seating on the pipe. Do not use strap type clamps.

C. Ground Rods:

1. Ground rods shall conform to the requirements of **NFPA 70** and **UL Standard 467**.
2. Ground rods shall be copper-clad steel rods not less than 3/4 inch (19 mm) in diameter and not less than 10 feet (3 m) long per section.
3. Ground rods shall be clean and smooth with the following characteristics:
 - a. Cone-shaped point on the first section.
 - b. Die-stamped near the top with the name or trademark of the manufacturer and the length of the rod in millimeters or feet.

PART 3 - EXECUTION

3.01 EXOTHERMIC WELDING:

- A. Welding shall be by the exothermic process.
- B. Within the welding procedure, include the proper mold and powder charge and conform to the manufacturer's recommendations.
- C. Welding processes shall be the exothermic fusion type that will make a connection without corroding or loosening.
- D. The welding process shall join all strands and not cause the parts to be damaged or weakened.
- E. Completed connection or joint shall be equal or larger in size than the conductors joined and have the same current-carrying capacity as the largest conductor.
- F. Paint buried ground connection with a bitumastic paint.

3.02 INSTALLATION OF GROUNDING CONDUCTORS:

- A. Install grounding conductors so that they will not be exposed to physical damage. Install connections firm and tight. Arrange conductors and connectors so no strain on connections.
- B. Run grounding conductors associated with direct burial cables in common trenches above cables except as indicated otherwise.
- C. Bury equipment **grounding** conductors 30 inches deep. Bring loops or taps up for connection to equipment or other items to be grounded.
- D. Where raceways are used to contain and protect grounding conductors, install in accordance with Sections 26 05 33 and 26 05 43.
- E. Where bare grounding conductors are contained within metallic raceways, bond ends of raceways to conductors.
- F. Install loop type, low impedance, grounding system interconnecting all components so at least two grounding connections are provided for each major item of electrical equipment. Ensure that severing of any single grounding conductor in this system does not remove grounding protection on any major item.
- G. Connect structural steel to the external perimeter loop of grounding conductors installed around all sides of building foundation, buried at least 30 inches below grade. Connect to each vertical column by loop or tap. Connect two opposite points on external loop to two different points on grounding system.
- H. Buried and concealed ground connections shall use exothermic welding.

- I. Make accessible connections to structural members by exothermic welding process or by bolted connector. Connections to equipment or ground bus by bolted connectors.

3.03 INSTALLATION OF GROUND RODS:

- A. Install ground rods where indicated. Install the top of the rod 12 inch (300 mm) below the ground surface.
- B. Make connection to overall grounding system as indicated.
- C. Ensure that final resistance of interconnected ground system is 25 ohms, or less. Measure ground resistance in normally dry conditions, and not less than 48 hours after rainfall.

3.04 EQUIPMENT GROUNDING:

- A. **Ground** each piece of electrical equipment by means of a **grounding** conductor installed in raceway feeding that piece of equipment. **Grounding** conductors installed in conduit with insulated conductors to be furnished with green, 600 volt insulation. **Ground** conductors are in addition to and not to be considered as the neutral wire of the system.
- B. Connect a **grounding** conductor between panelboard and grounding system. Where a grounding bar is furnished with panelboard, connect **grounding** conductor to bar.
- C. Conduits entering metal enclosures shall utilize bonding type locknuts and grounding bushings. Locknuts that gouge into the metal enclosures are not acceptable.
- D. Where conduits are not effectively grounded by firm contact with a grounded enclosure, apply grounding bushings on at least one end of conduit run. Conduit connections shall be wrench tight.
- E. Connect **grounding** conductors from equipment in area where ground bus is required to ground bus. Connect ground bus to grounding system. Mount ground bus on 600 volt pedestal insulators.
- F. Connect generator neutral to grounding system by a grounding conductor. Connect **grounding** conductor to generator disconnect enclosure and generator neutral on generator side of disconnect. **Ground** generator frame with two separate independent connections, so removal of one connection will not impair continuity of other.
- G. Connect individual ground rods to the grounding triangle using the direct burial grounding cable.

3.05 SIGNAL GROUNDING:

- A. Ground signal surge protection and shields of twisted, shielded cable using a signal bonding conductor. The signal bonding conductor shall be a continuous path from the instrument surge protection or shield to the grounding electrode conductor. The signal

bonding conductor shall be isolated from the equipment grounding conductor for its entire path.

B. Where convenient several signal bonding conductors may be combined, providing that all the following conditions are met:

1. The combined signal bonding conductor shall have the equivalent cross section of the conductors that it was combined from or three times the cross section of the largest conductor that it was combined from, whichever is less.
2. The combined signal bonding conductor shall be isolated from the equipment grounding conductor.
3. Where two signal bonding conductors are combined use a three port insulated splice.
4. Where three or more signal bonding conductors are combined, use a copper bus mounted on 600 volt insulators. Attach each conductor to the bus using an insulated ring tongue lug and screw terminal.

3.06 COMMERCIAL GROUNDING:

A. Telephone:

1. Install one No. 2 insulated ground conductor to ground bus in telephone equipment cabinet.

3.07 FIELD TESTING:

- A. Perform ground resistance testing of the grounding electrode system in accordance with IEEE Standard 81.
- B. Measure the resistance to earth of the interconnected ground rod system.
- C. The resistance to earth of the grounding electrode system shall not exceed 25 ohms.
- D. Submit test results for review.
- E. Perform continuity test on all power receptacles to ensure that the ground terminals are properly grounded to the facility ground system.

3.08 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01 77 00.

END OF SECTION

Ground and Bonding for Electrical Systems
Section No. 26 05 26-6

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide supports from building structures, concrete pads, decks, and other structural elements for electrical items by means of hangers, supports, anchors, sleeves, inserts, seals, and associated fastenings as indicated and in compliance with Contract Documents.

1.02 REFERENCES:

A. ASTM International (ASTM):

1. A123/A123M: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
2. A653/A653M: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
3. A924/A924M: Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

B. FM Global (FM):

1. Approval Guide, A Guide to Equipment, Materials & Services Approved By Factory Mutual Research For Property Conservation.

C. National Fire Protection Association (NFPA):

1. 70: National Electrical Code (NEC).

1.03 SUBMITTALS:

- A. Submit the following shop drawings in accordance with Section 01 33 00.
- B. Submit shop drawings and manufacturers' product data in accordance with the requirements of Section 26 05 10.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Steel or malleable iron.

- B. Aluminum where indicated.
- C. Stainless steel where indicated.

2.02 COATINGS:

- A. Protect steel and malleable iron supports, support hardware, and fasteners with zinc coating.
- B. Provide products for use outdoors.
- C. Use PVC coating where indicated on Drawings.

2.03 MANUFACTURED SUPPORTING DEVICES:

- A. Raceway Supports: Clevis hangers, riser clamps, conduit straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps.
- B. Fasteners: Types, materials, and construction features as follows:
 - 1. Expansion Anchors: Carbon steel wedge or sleeve type.
 - 2. Toggle Bolts: All steel springhead type.
 - 3. Powder-Driven Threaded Studs: Heat-treated steel, designed specifically for intended service.
 - 4. Nuts, Washers, and Bolts: Stainless steel.
- C. Conduit Sealing Bushings: Factory-fabricated watertight conduit sealing bushing assemblies suitable for sealing around conduit passing through concrete floors and walls. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, pressure clamps, and cap screws.
- D. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Provide plugs with number and size of conductor gripping holes as required to suit individual risers.
- E. U-Channel Systems: Channels, with 9/16 inch (14 mm) diameter holes, at minimum of 8 inch (200 mm) on center, in top surface. Provide fittings and accessories that mate and match with U-channel and are of same manufacture.

2.04 U-CHANNEL SYSTEMS:

- A. Manufacturers, Stainless Steel/Galvanized Steel Channel.
 - 1. Unistrut Corp.

2. Power-Strut.
 3. B-Line Systems, Inc.
- B. Manufacturers, Fiberglass Channel.
1. Omnistrut, Champion Fiberglass.
 2. Durostrut, Enduro Composite Systems.
 3. Struttech, Entrum Industries.
- C. Provide Type 316 stainless steel channel or fiberglass channel with corresponding accessories.
- D. Channels, with 9/16 inch (14 mm) diameter holes, at minimum of 8 inch (200 mm) on center, in top surface.
- E. Provide fittings and accessories that mate and match with U-channel and are of same manufacture.
- F. Provide hot-dipped galvanized after fabrication for steel channel and accessories.
- G. Provide channel of the proper material to match equipment classifications.
- 2.05 FABRICATED SUPPORTING DEVICES:
- A. Shop or field fabricate supports or manufacture supports assembled from U-channel components.
- B. Brackets: Fabricated of angles, channels, and other standard structural shapes. Connect with welds and machine bolts to form rigid supports.
- C. Pipe Sleeves: Provide pipe sleeves using one of the following:
1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from following gage metal for sleeve diameter noted:
 - a. 3 inch (75 mm) and smaller: 20 gage (0.9 mm).
 - b. 4 inch (100 mm) to 6 inch (150 mm): 16 gage (1.5 mm).
 - c. Over 6 inch (150 mm): 14 gage (1.9 mm).
 2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe.
 3. Plastic Pipe: Fabricate from Schedule 80 PVC plastic pipe.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Install supporting devices to fasten electrical components securely and permanently in accordance with NEC requirements.
- B. Coordinate with structural system and with other electrical installation.
- C. Raceway Supports: Comply with NEC and 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 safety factor of at least 4. Where this determination results in safety allowance of less than 200 lbs (890 N), provide additional strength until there is minimum of 200 lbs (890 N) safety allowance in 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 inch (25 mm) and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings only. For hanger rods with spring steel fasteners, use 1/4-inch (6 mm) diameter or larger threaded steel. Use spring steel fasteners that are specifically designed for supporting single conduits or tubing.
 - 6. In vertical runs, arrange support so load produced by weight of raceway and enclosed conductors is carried entirely by conduit supports with no weight load on raceway terminals.
- D. Vertical Conductor Supports: Install simultaneously with installation of conductors.
- E. Sleeves: Install in concrete slabs, walls, and other structural elements for raceways and cable installations.
- F. Conduit Seals: Install seals for conduit penetrations of slabs below grade and exterior walls below grade and where indicated. Tighten sleeve seal screws until sealing grommets have expanded to form watertight seal.
- G. Fastening: Unless otherwise indicated, fasten electrical items and their supporting hardware securely to building structure, including but not limited to conduits, raceways,

cables, cabinets, panelboards, boxes, disconnect switches, and control components in accordance with following:

1. 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 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.
2. Holes cut in concrete shall not cut main reinforcing bars. Fill holes that are not used.
3. Load applied to any fastener shall not exceed 25 percent of proof test load. Use vibration and shock resistant fasteners for attachments to concrete slabs.

3.02 CHANNELS:

- A. Support electrical components as required to produce same structural safety factors as specified for raceway supports.
- B. Install metal U-channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices.
- C. Install Type 316 stainless steel for mounting of electrical equipment in outdoor areas and on below grade, outside building and structure walls.
- D. Install galvanized steel channels for interior building mounting of electrical equipment except for those locations listed above and unless otherwise indicated.

3.03 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01 77 00.

END OF SECTION

SECTION 26 05 33

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide complete raceway systems, with matching accessories, fittings, boxes, and other hardware, as indicated and specified. When non-metallic raceway systems are specified, provide green insulated grounding conductor sized per National Electrical Code (NEC) requirements.
- B. All raceway runs are indicated diagrammatically to outline general routing of raceway. Unless specifically identified for installation in concrete walls or slabs, raceways shall be run exposed with raceway supporting systems. Avoid interfering with pipes, structural members, equipment, and access clearances. Any installation deviations from the contract requirements shall be corrected at no cost to Owner.
- C. Provide raceway systems in accordance with the following:
 - 1. In NEMA 12 or NEMA 1 areas, use **galvanized rigid steel** raceway systems.
 - 2. In NEMA 4 areas, and where subject to wetting or wash down, use **galvanized rigid steel** raceway systems.
 - 3. In exterior applications, use **PVC coated rigid steel, galvanized rigid steel, or PVC Schedule 80** raceway systems.
 - 4. In chemical areas and those areas designated NEMA 4X, use **PVC coated rigid steel, PVC Schedule 80, or Rigid Non-Metallic Conduit** raceway systems.
 - 5. Inside concrete slabs or walls, use **galvanized rigid steel or PVC Schedule 40** raceway systems.
- D. All raceway systems shall be installed in accordance with the criteria described in this section. Any proposed deviations from these requirements shall be submitted to the **ENGINEER** in writing for review and disposition.
 - 1. Use Type **316** stainless steel support systems for exterior application and in NEMA 4 and NEMA 4X areas.
 - 2. Use **PVC coated** support systems in NEMA 4X and chemical areas.
 - 3. All NEMA 1 and NEMA 12 areas shall use hot dipped galvanized steel support systems.
- E. Aluminum conduit and boxes are not acceptable products.

1.02 REFERENCES:

- B. National Electrical Manufacturers Association (NEMA):
 - 1. RN-1: Polyvinylchloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
 - 2. TC-2: Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80)
 - 3. TC-3: Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing
- C. National Fire Protection Association (NFPA):
 - 1. 70: National Electrical Code (NEC).
- D. Occupational Safety & Health Act (OSHA).
 - 1. Regulation 1910.7
- E. Underwriter's Laboratories, Inc. (UL):
 - 1. 1: Electrical Flexible Metal Conduit
 - 2. 6: Rigid Metal Electrical Conduit
 - 3. 6A: Rigid Metal Electrical Stainless Steel Conduit
 - 4. 94: UL Standard for Safety Tests for Flammability of Plastic Materials for Parts in Devices and Appliances
 - 5. 360: Electrical Liquid-Tight Flexible Steel
 - 6. 651: Schedule 40 and 80 PVC Conduit

1.03 SUBMITTALS:

- A. Submit the following shop drawings in accordance with Section 01 33 00:
- B. Submit shop drawings and manufacturers' product data in accordance with the requirements of Section 26 05 10.

1.04 QUALITY ASSURANCE:

- A. Provide in accordance with Section 01 43 00 and as specified.
- B. Items provided under this section shall be **listed and labeled** by **UL** or other Nationally Recognized Testing laboratory (NRTL).

1. Term “NRTL” shall be as defined in OSHA Regulation 1910.7.
 2. Terms “listed” and “labeled” shall be as defined in NFPA 70, National Electrical Code, Article 100.
- C. Regulatory requirements:
1. National Electrical Code (NEC): Components and installation shall comply with National Fire Protection Association (NFPA) 70.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

- A. Rigid Metal Conduit, and polyvinylchloride-coated rigid steel conduit.
1. Triangle/PWC, Inc.
 2. Perma-Cote Industries.
 3. Republic Steel Corporation.
 4. Robroy Industries.
 5. Atkore - Allied Tube and Conduit.
 6. Atkore - Calbond
 7. Atkore - Calbrite
- B. Polyvinylchloride (PVC) Conduit:
1. Triangle/PWC, Inc.
 2. Robroy Industries.
 3. Carlon Electrical Sciences, Inc.
- C. Rigid Non-Metallic (RNC) Conduit:
1. Champion Fiberglass, Inc.
 2. Atkore - FRE Composites
- D. Flexible Conduit:
1. American Flexible Conduit Company.
 2. Anamet, Inc.

3. Electri-Flex Company.
4. International Metal Hose Company.

E. Boxes and Fittings:

1. O.Z./Gedney Company.
2. Crouse-Hinds Electrical Construction Materials.
3. Appleton Electric Company.

F. Fiberglass-Reinforced Polyester Boxes:

1. Crouse-Hinds Electrical Construction Materials.
2. Fibox.
3. Hoffman Engineering Company.
4. Vynckier Enclosure Systems.

G. Support Systems:

1. Michigan Hanger Co., (O-Strut).
2. Thomas & Betts (Superstrut).
3. Unistrut Corp.

2.02 MATERIALS AND COMPONENTS:

A. Rigid Metal Conduit:

1. Provide galvanized rigid metal conduit, each with a coupling on one end and thread protector on other end.
2. Hot-dip galvanized rigid steel conduit over entire length, along interior and exterior surfaces, including threads. Conduit shall conform to [UL 6](#).

B. Flexible-Metal Conduit:

1. Provide flexible-metal conduit for use in dry areas and match fittings, size, and material to rigid conduit to which it is connected. Flexible-metal conduit shall conform to [UL 1](#).
2. Provide liquid-tight flexible-metal conduit for use in damp areas consisting of flexible-metal conduit, with liquid-tight, sunlight-resistant jacket extruded over the conduit. Provide stainless steel, braided flexible conduit in NEMA 4X, corrosive

areas. On larger than 1-1/4 inch (30 mm), furnish separate external ground wire. Liquid-Tight flexible-metal conduit shall conform to [UL 360](#).

C. Polyvinylchloride (PVC) Conduit:

1. Provide PVC conduit, Schedule 40 and Schedule 80 conforming to NEMA Standard TC-2 and [UL-651](#).
2. Fittings and Conduit Bodies: NEMA TC 3 as recommended by the conduit manufacturer.

D. Polyvinylchloride-Coated Rigid Steel Conduit:

1. Provide polyvinylchloride-coated (PVC-Coated), rigid steel conduit [conforming to NEMA Standard RN-1](#) consisting of hot-dipped galvanized rigid steel conduit, as specified hereinbefore, with a polyvinylchloride jacket bonded to the outside of all conduit surfaces with a nominal thickness of 40 mils [meeting the requirements of NEMA RN-1, 3.1](#). The adhesive strength of the bonding to equal or exceed tensile strength of the coating. Provide couplings and fittings for this [conduit conforming to the requirements of NEMA RN-1, 3.5](#). Be ETL PVC-001 Verified
2. A two-part urethane coating shall be applied to the interior of all conduit and fittings at a two mil thickness. The interior coating shall be flexible to allow field bending without cracking or flaking.

E. Boxes:

1. In NEMA and NEMA 12 areas, provide standard, sheet-metal, outlet and junction boxes constructed of code-gauge, galvanized sheet steel. Size each box as required by the [NEC](#).
2. Provide boxes containing fixture studs for hanging fixtures. Use concrete-tight boxes for installation in concrete. Do not use shallow boxes unless building construction is such that it is impossible to use standard-depth boxes.
3. Provide boxes and covers for polyvinylchloride-coated steel conduit made of **or galvanized cast metal, with a polyvinylchloride factory-applied coating over the galvanizing. Provide coating thickness of 40 mil (1.0 mm) minimum.** Boxes shall have hubs with extruded sleeves extending beyond the hub in the same manner as specified for conduit couplings. Provide cover screws of stainless steel.
4. Provide boxes with covers or device plates suitable for the area classification and environmental conditions. Use stainless steel or high-brass cover screws for metallic boxes.
5. Provide polyvinylchloride boxes for use as junction boxes and provide high impact strength fiberglass-reinforced polyester boxes for use as device boxes, pull boxes,

and terminal boxes for use with polyvinylchloride conduit. Size each box as required by the NEC.

6. Provide stainless steel boxes and covers for stainless steel conduit

F. Fittings:

1. Provide cast-iron fittings of malleable iron or a mixture of gray iron and cast steel.
2. Provide stainless steel fittings for stainless steel conduit.
3. Provide suitable expansion fittings where conduits cross expansion joints. Equip these fittings with grounding straps, clamps, and copper bonding jumpers.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Perform all work in accordance with the NEC.
- B. Use no conduit less than 3/4-inch (20 mm) in diameter, unless otherwise indicated.
- C. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's printed instructions.

3.02 INSTALLATION OF FITTINGS:

- A. Install expansion fittings wherever conduits cross structural expansion joints. Keep the fittings in line with conduit, and install with regard to temperature so that full working range of expansion is available.
- B. Do not install fittings to replace elbows and pull boxes, unless space or other problems make use of fittings necessary. Use oversize fittings whenever large cable is installed, in order to maintain proper bending radius.
- C. Terminate ends of all floor conduits installed for future use with couplings and readily removable plugs set flush with finished floor surface. Cap spare wall conduits at wall where they enter building.
- D. Equip ends of all conduits with conduit fittings. Fit conduits terminating at motor control center or power distribution equipment, or in box above or below, with grounding type bushings, or solidly ground by locknuts or other acceptable fittings. Connect each grounding bushing to ground bus by a bare or green-covered copper wire. Do not use ground wire smaller than 12 AWG. Install ground wire larger than 12 AWG when required by NEC. Where conduits terminate in unprotected areas or where bonding is required over expansion joint, flexible conduit or equivalent; use ground wires 6 AWG. copper or larger.

- E. Terminate conduits entering gasketed sheet-metal boxes or gasketed sheet-metal equipment enclosures with gasketed hubs.
- F. Terminate conduits entering nongasketed sheet-metal boxes or enclosures with double locknuts and insulated bushings, or with acceptable equivalent.
- G. Join raceways with fittings listed for the purpose. Make joints tight. Use raceway fittings compatible with raceway and suitable for use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings, except as otherwise indicated.
 - 1. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.
 - 2. Use insulating bushings to protect conductors.
 - 3. Tighten set screws of threadless fittings with suitable tool.

3.03 INSTALLATION OF RACEWAYS:

- A. Install exposed raceways parallel or at right angles to walls and ceiling beams. Make all changes in directions with listed bends, elbows, and pull boxes. Space parallel runs uniformly throughout. Secure in place by hangers and fasteners. **Ground** raceways by connection to properly grounded enclosures, bonding, or other means, to obtain permanent low resistance path to ground throughout installation. Ensure that raceway sections in single run and in parallel runs are of same type and finish.
 - 1. Run parallel or banked raceways together, on common supports where practical.
 - 2. Install raceways level and square and at proper elevations. Provide minimum 7 feet (2 m) headroom.
- B. Provide cast-in-place inserts in concrete to support all runs, unless otherwise permitted. Use stainless steel sleeve type concrete anchors for installing boxes, and conduit supports. Provide Type 316 stainless steel nut, bolts, and washers, for use with concrete anchors.
- C. Support conduits by hangers or pipe straps spaced according to **NEC**, but in no case more than 10 feet (3 m) on centers.
- D. Provide hot-dipped galvanized supports for galvanized conduit.
- E. When specified on the Contract Drawings, install conduits in slabs as close to middle of concrete slabs as practicable without disturbing reinforcement. Do not use conduit with outside diameter exceeding one-third of slab thickness. Do not place conduits closer than three diameters on centers, except at cabinet locations where slab thickness is increased as permitted by **ENGINEER**.

- F. Where conduits are concealed in bottom floor slab, place in concrete slab and not in fill below slab. Install in middle third of the slab thickness where practical, and leave at least 4 inches (100 mm) of concrete cover.
1. Secure raceways to reinforcing rods and to prevent sagging or shifting during concrete placement.
 2. Space raceways laterally to prevent voids in the concrete.
 3. Run conduit larger than 1-inch (25 mm) trade size parallel to or at right angles to main reinforcement. When at right angles to reinforcement, place conduit close to slab support.
- G. 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 rigid steel conduit. Flexible metal conduit may be used 6 inches (150 mm) above the floor. Where equipment connections are not made under this Contract, terminate ends of floor conduits installed for future use with couplings and readily removable plugs 8 inch (250 mm) above finished floor surface. Cap spare wall conduits at wall entrance to building.
- H. Do not use dissimilar metals in conjunction with each other. Use an insulation between adjoining surfaces so as to eliminate direct contact and any resultant electrolysis. Maintain electrical continuity of system. Use bituminous impregnated felt, heavy bituminous coatings, nonmetallic separators or washers, or other acceptable materials as insulation.
- I. Install fittings to match raceway being used.
- J. Provide separate raceways for all low voltage instrumentation raceways (50 volts and below) from control and power raceways.
- K. 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; use two locknuts, one inside and one outside the box.
- L. 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.
- M. Install pull wires in all empty raceways. Use 14 AWG zinc-coated steel or monofilament plastic line having not less than 200 lb (890 N) tensile strength. Leave not less than 12 inches (300 mm) of slack at each end of the pull wire.
- N. Complete raceway installation before beginning conductor installation.

- O. Use temporary closures to prevent foreign matter from entering raceway.
 - P. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.
- 3.04 BENDS:
- A. Make all bends carefully to prevent distortion of circular cross section. Field bend conduit shall have an inside radius of not less than nine diameters.
 - B. Where bends of less than nine diameters are necessary, use standard factory elbows. Size conduit to permit cable-bending radius within the factory elbow of at least eight times cable diameter.
 - C. Allow no conduit greater than 50 feet (15.2 meters) to have more than two 90 degree bends or equivalent thereof between pulling points. For conduits less than 50 feet (15.2 meters) in length, allow only three 90 degree bends between pulling points.
- 3.05 CUTTING, THREADING AND CONNECTING:
- A. Make all field cuts in conduits squarely, file cut ends, ream to remove rough edges and thread in accordance with NEC. No running thread permitted. Make all connections mechanically strong and tight, and with acceptable connectors. Where conduit surface coating is damaged or removed in the cutting, threading or reaming process, restore the surface to its original condition.
- 3.06 CONDUIT CLEANING:
- A. Clean all conduit carefully before and after installation, ream ends free of burrs, and free inside surfaces from all imperfections likely to injure cable.
 - B. After installation of each complete new conduit run, snake the run with band to which is attached a tube cleaner with cylindrical mandrel of a diameter not less than 85 percent of nominal diameter of conduit. Remove and replace all conduit through which mandrel will not pass.
 - C. Use a sponge with steel brush to clean steel conduit and use a sponge with nylon brush to clean PVC conduits.
 - D. After cleaning, protect ends of all conduit with standard caps to prevent entrance of water, concrete, debris, or other foreign substance.
- 3.07 CONDUIT DRAINAGE:
- A. Where practicable, pitch conduit to drain to outlet boxes, or install so as to avoid trapping moisture. Where dips are unavoidable in exposed conduits, install fitting with drain hole at low point.

3.08 INSTALLATION OF BOXES:

- A. Unless otherwise indicated, install sheet metal boxes only in dry, accessible locations. Install cast-metal boxes in exterior concrete or masonry walls, in floor slabs, in basements, all other below grade locations and elsewhere as indicated. Cast metal boxes shall be used (unless otherwise indicated) where vapor-tight fixtures are required, for all surface mounting of wall switches and receptacles and for all outdoor use. Install pull boxes for motor control centers and large ceiling hung boxes where indicated.
- B. Install boxes in conformance with all the requirements of NEC. Install boxes designed for type of construction involved. Support boxes in same manner as required for conduit. Size boxes to provide bending radius for wire or cable of at least eight times diameter or in accordance with NEC, whichever is larger.
- C. Center all outlets in panels, or spaces and adjust to structural finish. Where specific locations are not indicated, locate outlets with respect to equipment served.
- D. Place all outlet boxes, junction boxes and pull boxes, in accessible locations when they are installed above or behind plastered ceilings, furred spaces, or suspended ceilings. Install access panels of suitable size. Mark all access panels for all boxes so panels can be readily located in future. Mark, using metal tabs or plastic buttons which cannot mark ceilings or walls, appropriate for type of construction being used.
- E. Assemble cast-metal boxes with threaded conduit hubs in such manner that conduit connections and gasketed covers are watertight. Close all unused threaded openings with pipe plugs and compound.
- F. Provide cast boxes with covers and device plates suitable for the area classification. Install screws of stainless steel or high brass for iron boxes.

3.09 FLEXIBLE CONNECTIONS TO MOTORS AND EQUIPMENT:

- A. At all motors and electrically operated equipment to which conduit connections are made, install with a complete connection between end of conduit and terminal box of motor or other equipment.
- B. Install the conduits in locations permitting direct connection to motors.
- C. Make connections between rigid raceway and motor or equipment subject to vibration and adjustment using flexible conduit. Make each connection with at least one quarter bend so that no vibration can be transmitted beyond flexible connection.
- D. Install flexible metal conduit, fittings, and accessories in dry areas in accordance with requirements of NEC.
- E. Install liquid-tight flexible metal conduit in damp and corrosive areas. Locate conduit to reduce the possibility of damage to the exterior coating. Use fittings that screw into flexible conduit and provide gaskets.

- F. Use maximum of 6 feet (2 m) of flexible conduit for recessed and semirecessed lighting fixtures and; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use liquid tight flexible conduit in wet or damp locations. Install liquid-tight flexible metal conduit in areas subject to wetting due to fire protection sprinklers or broken or ruptured water line. Locate conduit to reduce the possibility of damage to the exterior flexible conduit jacket. Use fittings that screw into flexible conduit and provide gaskets. Install separate ground conductor across flexible connections.

3.10 TELEPHONE RACEWAY INSTALLATION:

- A. Install conduit system between all telephone outlets, terminal boxes, and cabinets. Provide pull cable and leave in conduit for telephone system cable.
- B. Telephone and Signal System Raceways: Install in maximum lengths of 150 feet (60 m) and with a maximum of two 90 degree bends or equivalent. Install pull or junction boxes to comply with these requirements. Route signal system raceways a minimum of 12 inch (300 mm) separation from power raceways.

3.11 PROTECTION:

- A. Provide protection and install in accordance with manufacturer printed instructions. The conduit and raceway equipment manufacturers, to ensure that coatings, finishes, and enclosures are without damage or deterioration at completion of project.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC or paint finishes with matching touch-up coating recommended by the manufacturer.

3.12 FINAL SYSTEM ACCEPTANCE:

- A. Upon completion of installation of system, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions and at no additional cost to the Owner.
- B. Label all raceways and boxes in accordance with the requirements of Section 26 05 10.

3.13 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01 77 00.

END OF SECTION

SECTION 26 05 43

UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide complete underground distribution system as indicated and in compliance with Contract Documents.
- B. Conform to lines, grades, elevations, and dimensions. Resolve interferences with other underground conduit, piping or equipment, either new or existing with the **ENGINEER**. Match components suitable for proper installation.
- C. Provide concrete encasement of duct system where indicated. Include forms and reinforcing in installation. Perform work in accordance with Section 26 05 10.
- D. Provide manholes and handholes complete with ground rods, windows, ladders, frames, covers, cable racks, supports, pulling irons, and other inserts. Use reinforced concrete. Perform work in accordance with Section 26 05 10.
- E. Provide Schedule 40 polyvinylchloride (PVC) conduit for underground power, control, instrumentation, and communication circuits, except where otherwise indicated on the Drawings.

1.02 REFERENCES:

- A. National Fire Protection Association (NFPA):
 - 1. 70: National Electrical Code (NEC).

1.03 SUBMITTALS:

- A. Submit shop drawings and manufacturers' product data in accordance with requirements of Section 26 05 10.
- B. Provide "Record" drawings.

PART 2 - PRODUCTS

2.01 MANUFACTURER'S COMPLIANCE:

- A. Manufacturer's acceptance contingent upon products' compliance with specifications.

2.02 MANUFACTURERS:

A. Polyvinylchloride (PVC) Conduit:

1. Specified in Section 26 05 33.

B. Rigid Steel Conduit, Galvanized:

1. Specified in Section 26 05 33.

C. Manhole Waterproofing Material:

1. Heavy Duty Black, No. 46-449, by Tnemec Company, Inc., No. Kansas City MO.
2. Hi-Build Bituminous Coating, No. 64-J-5, by Valspar Corporation, Baltimore, MD.
3. Bitumastic Super Service Black, by Kop-Coat, Inc., Pittsburg, PA.

2.03 MATERIALS AND COMPONENTS:

A. Conduit Spacers: Furnish conduit spacers made of plastic to maintain spacing between conduits.

B. Concrete: Minimum compressive strength, 3,000 psi (20 MPa).

C. Manhole Frames and Covers:

1. Heavy duty gray cast iron.
2. Conform to details indicated on the drawings and as specified.
3. Provide machine-finished seat.
4. Mark "ELECTRICAL" on cover of manhole.

PART 3 - EXECUTION

3.01 INSTALLATION OF CONDUITS:

A. Lay conduits, indicated to be direct buried in the ground, in trench on 3 inch (75 mm) bed of sand and cover with an equivalent 3 inch (75 mm) bed of sand. Ensure that no rocks come in contact with conduit during backfilling. Dig trenches to depth and location indicated.

B. Provide minimum separation of power and control conduits of 3 inch (75 mm) both vertically and horizontally.

- C. Separate power and control ducts from instrument ducts by a minimum of 12 inches (300 mm).
- D. Backfill ductbank in layers and tamp or "puddle" as directed by the **ENGINEER**. Provide yellow ductbank marker tapes, reading "Caution - Electrical Lines Below", over entire length of ductline. Locate tapes 12 inches (300 mm) below grade. Provide a tape for every 12 inches (300 mm) of width of ductline.
- E. Install conduit, indicated to be encased in concrete with spacers and reinforcing, as specified and as indicated.
- F. Install conduit runs following routing on drawing and running in straight lines. Where deviation from a straight line becomes necessary, install bends of radius which allow for rodding and installation of cable.
- G. Accomplish changes in direction of runs exceeding total of 10 degrees, either vertical or horizontal, by long sweep bends having minimum radius of curvature of 25 feet (8 m). Manufactured bends can be used at ends of short runs of 100 feet (30 m) or less, and then only at or close to the end of run. Provide long sweep bends made up of one or more curved or straight sections and/or combinations thereof. Install manufactured bends with minimum radius of 36 inch (1,000 mm) where larger radius cannot be used.
- H. Lay ductlines to minimum slope of 4 inch (100 mm) per 100 feet (30 m) and slope to manholes and handholes, as indicated. Ductlines are to slope away from buildings.
- I. Install spacers at intervals of approximately 4 feet (1200 mm) and stagger between tiers of ducts to provide not less than 12 inches (300 mm) of longitudinal separation. Install base spacers to provide at least 3 inches (75 mm) between bottom of trench and underside of bottom conduits. Completely fill space with concrete. Firmly wire conduits and spacers together before concrete is placed.
- J. Ductbanks are to be formed, unless trench conditions allow for neat placement of concrete with specified clearances.
- K. Prior to placing of concrete, remove all dirt, sand, and any other debris from between conduits and from trench bottoms. Hold conduits in place to prevent floating or accidental movement.
- L. Stagger joints in conduits at least 6 inches (150 mm). Do not allow couplings to rest on bottom of trench. Install couplings for plastic conduit in accordance with manufacturer's recommendations.
- M. Install concrete encasements so minimum clearance of 12 inches (300 mm) from concrete to parallel pipes, lines, structures, etc., is maintained. Where ducts cross, minimum clearance of 6 inches (150 mm) is required. Do not allow the top of concrete to be less than 30 inches (750 mm) below finished grade or paving. Submit special conditions which may require lesser clearances or special conditions which may require greater than 30 inches (750 mm) depth to **Engineer** for acceptance.

- N. Do not use power-driven vibrators for spading of concrete around ducts.
- O. Roll and grade backfill, and restore surface to condition equal to the site finish grade, or as otherwise indicated.
- P. Install markers 6 inches (150 mm) square or round section by 3 feet (1 m) long made of Class B concrete. Imprint the letter "D" or cast it on top of the marker. Install top of duct markers flush in paved areas, protruding no more 2-inches above finished grade in unpaved areas. In finished lawns, allow marker to protrude 1/2-inch (12 mm).
- Q. Keep conduits clean of concrete, dirt, and other substances during the course of construction. After the ductlines have been completed, pull a standard flexible mandrel not less than 12 inches (300 mm) long, having a diameter approximately 1/4-inch (6 mm) less than the inside diameter of the conduit, through each conduit, after which pull a brush with stiff bristles through each conduit to make certain that no particles of earth, sand, or gravel have been left in the line. Replace conduit runs that do not allow the passage of the mandrel at no additional cost to the Owner. Pneumatic rodding may be used to draw in the lead wire. Install in spare conduits a pull wire or rope, and plug and seal spare conduits after cleaning.

3.02 MANHOLES AND HANDHOLES:

- A. Construct manholes and handholes of 3,000 psi (20 MPa) concrete cast in place, as indicated.
- B. Install manholes with cable racks, hooks, insulators, and other features, as indicated.
- C. Place a 6 inch (150 mm) crushed-stone base under each manhole and handhole.
- D. Construct cast-in-place manholes and handholes with forms, complete with centering cores and molds, to conform to shape, form, line, and grade required and maintain sufficiently rigid to prevent deformation under load. Make all joints leakproof and arrange horizontally or vertically. Place forms on successive units for continuous surfaces and fit to accurate alignment, assuring a smooth completed surface, free from irregularities.
- E. At convenient point close to wall, drive a ground rod into earth as indicated. Extend ground rod approximately 6 inches (150 mm) above finished manhole floor. After completion of manhole or handhole, connect 6 foot (2 m) length of No. 4 bare copper ground wire to ground rod and coil it within manhole or handhole for connection to steel supports and cover.
- F. Size, space, and place reinforcing bars as indicated and as specified.
- G. Set manhole and handhole frames to the required grade, in full bed of concrete mortar to make watertight connection.

- H. Install tops of manhole and handhole covers in unpaved areas approximately 1/2-inch (12 mm) above finished grade, and in paved areas install flush with finished surface of paving.
- I. Install galvanized corrosion-resistant channel support, with continuous slot and required fittings designed for concrete encasement.
- J. Install inserts in the manholes as indicated.
- K. Install two cable pulling irons in wall opposite each ductbank entrance into manhole, one 6 inch (150 mm) above floor and one 6 inch (150 mm) below the roof of manhole. Where indicated on drawings, install additional features such as openings in manhole walls for future conduit entrances. Seal future entrances with required courses of brick.
- L. Where ductlines enter manholes, terminate conduits in end bells. Terminate steel conduit entering manholes and handholes in grounding bushing.

3.03 MANHOLE AND HANDHOLE WATERPROOFING:

- A. Apply two coats of bituminous waterproofing material to exterior surfaces of manholes and handholes. Apply by brush or spray, in accordance with manufacturer's printed instructions. Allow time between coats to permit sufficient drying.
 - 1. Two coats applied with a minimum dry film thickness of 12 to 14 mils (0.30 to 0.36 mm) per coat.

3.04 RECORD DRAWINGS OF UNDERGROUND WORK:

- A. Furnish one set of marked copies of contract drawings, showing exact routing and depths of all underground conduit, duct handholes and manholes. Furnish scaled plot plans, showing principal outline of buildings and structures. Reference conduits, ducts, and manholes, and all bends deviating from straight line, dimensionally from fixed objects or structures.

3.05 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01 77 00.

END OF SECTION

SECTION 26 05 53

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.01 SUMMARY:

A. Section Includes:

1. Identification of electrical materials, equipment, and installations as indicated and in compliance with Contract Documents.

1.02 REFERENCES

A. American Society of Mechanical Engineers (ASME):

1. A13.1: Scheme for the Identification of Piping Systems

B. Institute of Electrical and Electronics Engineers (IEEE):

1. ANSI/IEEE C2: National Electrical Safety Code.

C. National Fire Protection Association (NFPA):

1. 70: National Electrical Code (NEC).

1.03 SUBMITTALS:

A. Submit manufacturer's Product Data:

B. Submit for each type of product specified.

C. Miscellaneous: Schedule of identification nomenclature to be used for identification signs and labels.

1.04 QUALITY ASSURANCE:

A. Comply with the requirements specified in Section 01 43 00.

PART 2 - PRODUCTS

2.01 RACEWAY AND CABLE LABELS:

- ###### A. Manufacturer's Standard Products: Where more than one type is listed for specified application, selection is Installer's option, but provide single type for each application category. Use colors prescribed by ASME A13.1, NFPA 70, or as specified elsewhere.

- B. Components and installation shall comply with [NFPA 70](#).
- C. Conform to ASME A13.1, Table 3, for minimum size of letters for legend and minimum length of color field for each raceway or cable size.
 - 1. Color: Black legend on orange field.
 - 2. Legend: Indicates voltage.
- D. Adhesive Labels: Preprinted, flexible, self adhesive vinyl. Legend is over-laminated with clear, wear and chemical resistant coating.
- E. Pre-tensioned, Wraparound Plastic Sleeves: Flexible, preprinted, color coded, acrylic bands sized to suit diameter of line it identifies and arranged to stay in place by pre-tensioned gripping action when placed in position.
- F. Underground Line Warning Tape: Permanent, bright colored, continuous printed, vinyl tape with following features:
 - 1. Size: Not less than 6 inch wide by 4 mils thick (152 mm wide by 0.102 mm thick).
 - 2. Compounded for permanent direct burial service.
 - 3. Embedded continuous metallic strip or core.
 - 4. Printed Legend: Indicates type of underground line.
- G. Tape Markers: Vinyl or vinyl cloth, self adhesive, wraparound type with preprinted numbers and letters.
- H. Plasticized Card Stock Tags: Vinyl cloth with preprinted and field printed legends. Orange background, except as otherwise indicated, with eyelet for fastener.
- I. .
- J. Brass or Aluminum Tags: Metal tags with stamped legend, punched for fastener. Dimensions: 2 by 2 inch (51 by 51 mm) by 0.05 inch (1.3 mm).
- K. Comply with IEEE C2.

2.02 ENGRAVED NAMEPLATES AND SIGNS:

- A. Manufacturer's Standard Products: Where more than one type is listed for specified application, selection is Installer's option, but provide single type for each application category. Use colors prescribed by ASME A13.1, [NFPA 70](#), or as specified elsewhere.
- B. Engraving stock, melamine plastic laminate, 1/16-inch (1.6 mm) minimum thick for signs up to 20 square inches (129 sq cm), 1/8 inch (3.2 mm) thick for larger sizes.

1. Engraved Legend: Black letters on white face.
 2. Punched for mechanical fasteners.
- C. Baked Enamel Signs for Interior Use: Preprinted aluminum signs, punched for fasteners, with colors, legend, and size as indicated or as otherwise required for application. 1/4 inch (6.4 mm) grommets in corners for mounting.
- D. Exterior, Metal Backed, Butyrate Signs: Wear resistant, non-fading, preprinted, cellulose acetate butyrate signs with 0.0396 inch (1 mm), galvanized steel backing, with colors, legend, and size appropriate to application. 1/4-inch (6.4 mm) grommets in corners for mounting.
- E. Fasteners for Plastic Laminated and Metal Signs: Self tapping stainless steel screws or No. 10/32 stainless steel machine screws with nuts, flat washers and lock washers.
- 2.03 MISCELLANEOUS IDENTIFICATION PRODUCTS:
- A. Cable Ties: Fungus-inert, self extinguishing, 1 piece, self locking, Type 6/6 nylon cable ties with following features:
1. Minimum Width: 3/16-inch (5 mm).
 2. Tensile Strength: 50 lb (222 N) minimum.
 3. Temperature Range: -40 to 185 degrees F (-40 to 85 degrees C).
 4. Color: As indicated where used for color coding.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Install identification devices according to manufacturer's written instructions.
- B. Install labels where indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment.
- C. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and or designations used for electrical identification with corresponding designations used in Contract Documents or required by codes and standards. Use consistent designations throughout Project.
- D. Sequence of Work: Where identification is to be applied to surfaces that require finish, install identification after completion of finish work.
- E. Self Adhesive Identification Products: Clean surfaces of dust, loose material, and oily films before applying.

- F. Install Circuit Identification Labels on Boxes: Label externally as follows:
1. Exposed Boxes: Pressure sensitive, self adhesive plastic label on cover.
 2. Labeling Legend: Permanent, water proof listing of panel and circuit number or equivalent.
- G. Identify Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communications lines, install continuous underground plastic line marker located directly above line at **6 to 8 inch (150 to 200 mm) below** finished grade. Where multiple lines installed in common trench or concrete envelope do not exceed an overall width of 16 inch (400 mm), use single line marker.
1. Install line marker for underground wiring, both direct buried and in raceway.
- H. Color Code Conductors: Secondary service, feeder, and branch circuit conductors throughout secondary electrical system.
1. Field applied, color coding methods may be used in lieu of factory coded wire for sizes larger than 10 AWG.
 - a. Colored, pressure sensitive plastic tape in half lapped turns for distance of 6 inch (150 mm) from terminal points and in boxes where splices or taps are made. Apply last 2 turns of tape with no tension to prevent possible unwinding. Use 1 inch (25 mm) wide tape in colors as specified. Adjust tape bands to avoid obscuring cable identification markings.
 - b. Colored cable ties applied in groups of 3 ties of specified color to each wire at each terminal or splice point starting 3 inch (76 mm) from terminal and spaced 3 inch (76 mm) apart. Apply with special tool or pliers, tighten to snug fit, and cut off excess length.
 2. 208/120 Volt System: As follows:
 - a. Phase A: **Black**.
 - b. Phase B: **Red**.
 - c. Phase C: Blue.
 - d. Neutral: White.
 - e. Ground: Green.
- I. Apply identification to conductors as follows:
1. Conductors to Be Extended in Future: Indicate source and circuit numbers.

2. Multiple Power or Lighting Circuits in Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color coding for voltage and phase indication of secondary circuit.
3. Multiple Control and Communications Circuits in Same Enclosure: Identify each conductor by its system and circuit designation. Use consistent system of tags, color coding, or cable marking tape.

J. Install identification as follows:

1. Apply equipment identification labels of engraved plastic laminate on each major unit of equipment, including central or master unit of each system. This includes communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Except as otherwise indicated, provide single line of text with 1/2-inch (13 mm) high lettering on 1-1/2 inch (38 mm) high label; where 2 lines of text are required, use lettering 2 inch (51 mm) high. Use black lettering on white field. Apply labels for each unit of following categories of equipment.
 - a. Panelboards, electrical cabinets, and enclosures.
 - b. Access doors and panels for concealed electrical items.
 - c. Motor starters.
 - d. Power transfer equipment.
 - e. Contactors.
 - f. Control devices.
 - g. Power generating units.
 - h. Telephone switching equipment.
2. Apply designation labels of engraved plastic laminate for disconnect switches, breakers, push buttons, pilot lights, motor control centers, and similar items for power distribution and control components above, except panelboards and alarm/signal components where labeling is specified elsewhere. For panelboards, provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual breaker.

3.02 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01 77 00.

END OF SECTION

SECTION 26 05 70

ELECTRICAL SYSTEM STUDIES

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide electrical system studies as indicated and in compliance with Contract Documents.
 - 1. Provide a short circuit and arc-flash study for the electrical distribution system constructed under this contract. The study shall consider the electrical system from the secondary of the service transformer. The study shall include calculations used to verify the short circuit ratings of the electrical distribution equipment to be provided under this contract.
- B. Changes and additions of equipment characteristics, based on the actual equipment supplied may be suggested by the results of the short circuit study. Submit suggested changes and additions as a part of the study. Minor modifications to equipment that are required to accomplish conformance with the accepted short circuit and protective device coordination studies shall be provided at no additional cost.

1.02 REFERENCES:

- B. Institute of Electrical and Electronics Engineers (IEEE):
 - 1. 1584: IEEE Guide for Performing Arc-Flash Hazard Calculations
- C. National Fire Protection Association (NFPA):
 - 1. 70E: Standard for Electrical Safety Requirements for Employee Workplaces.
 - 2. 70: National Electrical Code (NEC)

1.03 SUBMITTALS:

- A. Submit the following in accordance with Section 01 33 00.
 - 1. Short circuit and arc-flash hazard analysis for review and acceptance, concurrent with the preliminary shop drawing submission for the main electrical distribution system equipment. Submit an initial study for comment and a final study, with all electronic files, at the completion of the project.
 - a. The study shall be performed using the latest edition of one of the following commercial software program.
 - (1) EasyPower

(2) SKM System Analysis

- b. The study shall include cable sizes, cable lengths and raceway types required to accurately model system impedance for the short-circuit and arc-flash analysis.
 - c. The maximum available fault contribution at the service transformer secondary shall be documented via correspondence from the authority responsible for this source.
 - d. Obtain generator reactance values and data necessary for short-circuit and arc-flash modeling.
 - e. Submittals of electrical distribution equipment shall not be approved until short-circuit ratings have been verified by the short-circuit study.
2. This study shall consider starting when the system is powered from the utility and from the standby generator sources.
3. Qualifications of specialty testing and/or study firm, as specified.

1.04 QUALIFICATIONS OF SPECIALTY FIRM:

A. Submit evidence of the following:

- 1. Firm's experience:
 - a. Specialty firm shall have been in the business of the type of work specified, for at least the past five years.
 - b. The firm shall have a minimum of **five** projects of equal or greater size, service, and the type of equipment specified.

B. Firm shall have a licensed Professional Electrical Engineer supervise all work and seal all reports.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

3.01 SHORT CIRCUIT STUDY:

- A. Perform a short circuit study in accordance with the latest edition of IEEE standards and NEC requirements..

- B. The study shall address the case when the system is being powered from the utility source as well as from the on-site generating facilities. Minimum and maximum possible fault conditions shall be covered in the study.
- C. Include the fault contribution of all motors. Horsepower shown in the Contract Documents may be used to calculate fault contribution of motors.
- D. Calculate short-circuit momentary duties and interrupting duties on the basis of an assumed bolted 3-phase short circuit at each bus. The short circuit tabulations shall include X/R ratios, asymmetry factors, kVA and symmetrical fault-current. Where ground fault protection is specified, provide a ground fault current study for the same system areas, including the associated zero sequence impedance diagram. Include in tabulation form, fault impedance, X/R ratios, asymmetry factors, motor contribution, short circuit kVA, and symmetrical and asymmetrical fault currents.
- E. The studies shall include representation of the site power system, the base quantities selected, impedance source data, calculation methods and tabulations, one-line diagrams, conclusions and recommendations.

3.02 ARC FLASH HAZARD ANALYSIS:

- A. Perform arc flash hazard analysis for the following items:
 - 1. Panelboards
 - 2. Control panels with voltage over 50 Volts
 - 3. Automatic transfer switches
- B. Methods of performing analysis:
 - 1. Use [NFPA 70E article 130](#) tables if the short circuit study shows that the condition for those tables are met.
 - 2. Otherwise use [IEEE 1584](#) calculations.
 - a. If the conditions fall within the IEEE 1584 parameters use the IEEE 1584 calculations based on actual OCPD curves and settings.
 - b. If the conditions do not fall within the 1584 parameters, use the Lee method.
- C. Label each item for which the calculations were performed with the following information:
 - 1. Limited approach boundary
 - 2. Information required by [NFPA 70E, 130.2\(D\)\(2\)](#).
 - 3. Restricted approach boundary

4. Personal protective equipment required within restricted approach boundary
5. Flash protection boundary
6. Personal protective equipment required within flash protection boundary
7. Prohibited approach boundary

3.03 FIELD TESTING:

- A. Provide in accordance with Section 01 78 25 and as specified.
- B. Integrate results of this study with functional testing of the contract electrical equipment in accordance with Section 26 05 10.

3.04 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01 77 00.

END OF SECTION

SECTION 26 05 90

ELECTRICAL CONTROLS AND MISCELLANEOUS ELECTRICAL EQUIPMENT

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide and connect the electrical control equipment and miscellaneous electrical equipment, including such instruments and devices indicated and specified. Device enclosures for electrical equipment as indicated and in compliance with Contract Documents.
- B. Control panel enclosures and devices specified herein are provided under those specification sections which invoke this section for control panel requirements or as indicated on electrical drawings.

1.02 REFERENCES:

- A. ASTM International (ASTM):
 - 1. D178: Standard Specification for Rubber Insulating Matting
- B. National Electrical Manufacturers Association (NEMA):
 - 1. 250: Enclosures for Electrical Equipment (1000 volts maximum).
 - 2. ICS 1: Industrial Control and Systems General Requirements
 - 3. ICS 2: Industrial Controls and Systems Controllers, Contactors, and Overload Relays Rated 600 Volts.
 - 4. ICS 4: Terminal Blocks for Industrial Use.
- C. National Fire Protection Association (NFPA):
 - 1. 70: National Electrical Code (NEC).
- D. Underwriter's Laboratories, Inc. (UL):
 - 1. 467: Standard for Grounding and Bonding Equipment.
 - 2. 486A: UL Standard for Safety Wire Connectors and Soldering Lugs for Use with Copper Conductors.
 - 3. 486B: UL Standard for Safety Wire Connectors for Use with Aluminum Conductors.

4. 489: Standard for Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures.

1.03 SUBMITTALS:

- A. Submit the following shop drawings in accordance with Section 01 33 00.
- B. Submit shop drawings and manufacturers' product data in accordance with the requirements of Section 26 05 10.
- C. Wiring diagrams to show control interface points provided with other equipment.
- D. Shop drawings to include:
 1. Outline drawings with elevations.
 2. Equipment arrangement drawings.
 3. Electrical schematics and wiring diagrams.
 4. Electrical fuse/circuit breaker characteristic.
 5. Bill of installation/assembly materials.
 6. Equipment weights.
 7. Completed manufacturer's data sheets.

1.04 QUALITY ASSURANCE:

- A. Comply with the requirements specified in Section 01 43 00.

1.05 DELIVERY STORAGE AND HANDLING:

- A. Comply with the requirements specified in Section 01 66 10.

PART 2 - PRODUCTS

2.01 MANUFACTURERS FOR ELECTRICAL DISTRIBUTION EQUIPMENT:

- A. Siemens.
- B. General Electric Company.
- C. Eaton/Cutler-Hammer.
- D. Square D Company.
- E. Appleton Electric Company.

Electrical Controls and Miscellaneous Electrical Equipment
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F. Crouse-Hinds Company.

G. O-Z/Gedney.

2.02 SAFETY DISCONNECT SWITCHES:

A. Provide heavy duty type, safety switches, with external operating handles, 3 PST, rated 600 volt, 60 Hertz with ampere rating as indicated, and having provisions for padlocking.

B. Provide fuses for safety switches as indicated.

C. Heavy duty safety switches to be UL listed, File E 2875 and 154828, and meet or exceed NEMA Standard KS1.

2.03 CONDUIT AND WIRING:

A. Provide conduit and wiring necessary to make connections between instrument panels, consoles, cabinets and external equipment and devices.

2.04 WALL MOUNTED COMBINATION STARTERS:

A. Unless otherwise indicated, provide each combination starter with motor circuit protector and full voltage magnetic starter. Provide starters in an enclosure that meets the requirements of the enclosure schedule. Provide motor circuit protectors and starters as specified in Section 26 24 19 .

B. Provide control transformer of adequate VA capacity for control circuit operation.

C. Provide control transformer with current limiting primary fuses and secondary fuse.

D. Provide LED cluster type indicating lights of heavy duty, oiltight unit rated at 120 volts.

E. Provide heavy duty, oiltight type pushbuttons to provide momentary contacts or maintained contacts for starting and stopping the motor.

2.05 RUBBER MATS:

A. Provide rubber mats conforming to ASTM D-178 Type I, Class I: Mats shall be at least 4 feet (1200 mm) wide and have a length at least equal to the panelboard, switchboard motor control center, or switchgear before which they are to be placed. Furnish two spare mats, each 4 feet (1200 mm) long as spares.

B. Place mats in front of switchboards, panelboards, motor control centers and switchgear. Place mats behind electrical assemblies with rear access.

2.06 CONTACTORS AND RELAYS:

- A. Provide mechanically held, heavy duty type contactors (relays) for lighting control, rated 30 amps, 600 volts, with number of poles as indicated.
- B. Provide contactor in the required NEMA enclosure suitable for wall mounting. Provide circuit breaker or fuse protection on each ungrounded pole. Provide contactor similar to Square D Company, Class 8903, Type LX or approved equal.
- C. Provide control power transformer with primary and secondary fuse protection. Control power to be 120 volts, single phase.
- D. Provide timing relays by Allen Bradley, Series 700 or equal.
- E. Provide industrial grade relays, NEMA rated, Square D Company, Class 8501 or equal.

2.07 NAMEPLATES:

- A. Provide nameplates for equipment (including pushbutton and selector switch stations) listed in this section and other controls furnished under this contract, to designate the equipment controlled and their function.
- B. Nameplates shall be laminated black bakelite with 1/4-inch (6 mm) high, white, recessed letters. Securely attach to the equipment with Type 316 stainless steel screws, or rivets. Adhesives, glue or cements will not be permitted.
- C. Provide all junction boxes, pull boxes, disconnect switches and control panels with a nameplate to designate the system wiring contained within.
- D. Install nameplates in a location near or on the equipment or devices.

PART 3 - EXECUTION

3.01 WIRING OF MISCELLANEOUS DEVICES:

- A. Make electrical connections required for recording and indicating instruments, and miscellaneous devices. Provide electrical supplies to metering, instrumentation, control, and alarm systems.
- B. Connect HAND-OFF-AUTO switches, safety switches, and other accessory devices as indicated or necessary for control of motors and other electrical equipment or devices.
- C. Install conduit and wiring and make electrical connections between all instrument panels, consoles, cabinets, and external equipment and devices. Panels, cabinets, etc., are indicated.

3.02 WIRING OF EQUIPMENT FURNISHED UNDER OTHER SECTIONS:

- A. As specified in Section 26 05 00, install conduit, wiring, and connections for equipment and devices furnished under other Sections of specifications, and as indicated.

3.03 CLOSEOUT ACTIVITIES:

- A. Provide in accordance with Section 01 77 00.

END OF SECTION

SECTION 26 20 20

SUBMERSIBLE MOTORS

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. This section describes materials, testing, and installation of submersible electric motors for lift station pumps as indicated and in compliance with Contract Documents.

1.02 REFERENCES:

- A. Institute of Electrical and Electronics Engineers (IEEE).
 - 1. 112: Test Procedures for Polyphase Induction Motors and Generators.
 - 2. 1017: Recommended Practice for Field Testing Electric Submersible Pump Cable.
 - 3. 1018: Recommended Practice for Specifying Electric Submersible Pump Cable Ethylene-Propylene Rubber Insulation.
 - 4. 1019: Recommended Practice for Specifying Electric Submersible Pump Cable Polypropylene Insulation.
- B. National Electric Manufacturer's Association (NEMA):
 - 1. MG-1: Motors and Generators.
- C. National Fire Protection Association (NFPA):
 - 1. 70: National Electrical Code (NEC).

1.01 SUBMITTALS:

- A. Submit the following shop drawings in accordance with Section 01 33 00.
- B. Submit shop drawings and manufacturers' product data in accordance with the requirements of Section 26 05 00.
- C. Descriptive literature and motor characteristics.
- D. Show ratings, performance data, type, frame, speed, voltage, phase, cycles, enclosure, temperature rise, service factor, mounting arrangements, accessories or special features, and guarantees.
- E. Submit copies of certified test reports for factory no load current and speed and locked rotor current tests.

1.02 QUALITY ASSURANCE:

- A. Provide in accordance with Section 01 43 00 and as specified.
- B. Motors to comply with the latest reference standards listed below.
 - 1. National Electrical Code (NEC).
 - 2. Underwriters Laboratories, Inc. (UL).

1.03 DELIVERY, STORAGE AND HANDLING:

- A. Provide in accordance with Section 01 66 10 and as specified.
- B. Shipping:
 - 1. Ship motors assembled to driven equipment complete except where partial disassembly is required by transportation regulations or for protection of components.
 - 2. Pack spare parts in containers bearing labels clearly designating contents and pieces of equipment for which intended.
 - 3. Deliver spare parts at same time as pertaining materials. Delivery to Owner after completion of work.
- C. Receiving and Storage:
 - 1. Inspect and inventory items upon delivery to site.
 - 2. Store and safeguard equipment and material in accordance with manufacturer's recommendations and Section 01 66 10.
 - 3. Protect motors from moisture at all times.
- D. Prolonged Storage:
 - 1. For extended outdoor storage, remove motors from equipment and store separately.
 - 2. If storage is anticipated to be longer than two months, store in accordance with the manufacturer instructions including the following additional steps.
 - 3. Maintain motor space heaters energized.

PART 2 - PRODUCTS

2.01 GENERAL:

- A. Motor shall be the completely sealed type for continuous duty operation. Motor shall be submersible squirrel-cage induction type. Motor rating shall be selected so that the load at design is not greater than the nameplate rating at 1.0 service factor, and at no point on the curve shall the load exceed the nameplate rating. Service factor shall be 1.10 minimum. Motor shall operate on a **208 volt, 60 Hz, 3-phase** AC power supply.
- B. Motor shall meet, as minimum requirements, the published standards, rules, and regulations of ANSI, NEMA, and the IEEE, as applicable.
- C. Motor performance data shall specify guaranteed minimum efficiencies including thrust bearing losses with no external thrust applied, power factor, operating current, rpm, kilowatt power at 50 percent, 75 percent, 100 percent, and 115 percent load. Performance data shall also specify full load torque, breakdown torque, locked rotor torque, locked rotor current, and code letter.

2.02 WATER WELL PUMP MOTOR:

- A. Motor shall be rated for a combination of a maximum water temperature of 77 degrees F (25 degrees C) and minimum velocity of 0.5 fps (0.15 m/s) past the motor. Motor diameter shall suit the well casing.
- B. Motors shall have an all-metal corrosion-resistant coating. Shafting and accessory hardware shall be stainless steel. Nitrile rubber, Hydrin, or equal shall be used for components such as diaphragms, slingers, and O-rings. Shafts shall be splined.
- C. The stator windings shall be the hermetically sealed, canned type consisting of a core and winding within an all-metal enclosure with seams welded and watertight. Both the inner and outer liners shall be stainless steel, completely sealing the windings from the surrounding water. The inside of this can shall be impregnated with a special thermosetting resin including anti-tracking agents. Copper magnet wire shall be utilized with Class F insulation. Motor shall operate within Class A temperature limits.
- D. Design motor for water lubrication. The inner bore of the motor, including the rotor assembly and all bearings, shall be completely filled at the factory with a solution of water and propylene glycol or other nontoxic, USDA/FDA-approved anti-rust and anti-freeze fluid. The bearings shall have access to water from the well for lubrication and shall require no other lubricant.
- E. Radial bearings located in the top and bottom of the motor shall be sleeve type consisting of carbon sleeves and stainless steel shaft journals. The sleeves and the journals shall be microfinished to facilitate water lubrication.
- F. Provide a thrust bearing suitable for pump downthrust, designed for continuous submersible service.

- G. Provide an upthrust bearing to support short-term upthrust during starting or low head operation.
- H. Provide a diaphragm to allow for freezing and to equalize the pressure between the inner bore and the outside of the motor. If some internal lubricant is lost and the diaphragm cannot equalize the pressure, a check valve shall allow filtered fresh well water to enter the motor to maintain pressure equalization.
- I. Pressure test motor before shipment to prove the integrity of all welded seams in the stator assembly, assuring that no water can leak into the windings from submergence pressures.
- J. Motors shall be rated for a minimum average number of starts per hour of four (12 for motors rated 5 horsepower or less) where it shall be allowed to start a motor after a shutdown with no time delay.
- K. Motor shall be manufactured by Franklin Electric or equal.

2.03 CABLES:

- A. Manufacture cables from Hypalon or Protolon synthetic rubber-jacketed, Type SPC multiconductor cable, suitable for submersible pump application and heavy mechanical stresses.
- B. Power cable shall be field replaceable if damaged. When the lead jam nut is tightened, the lead's connection to the motor shall be made watertight by the compression of a rubber bushing. Design the internal connections of the lead to eliminate any possibility that water entering a damaged portion of the lead or supply wires will wick down into the motor.
- C. Size the power cable such that the voltage drop will not exceed 3 percent at the motor rated full-load current and voltage. Cables shall be designed specifically for submersible pump service and shall consist of either three single conductors individually insulated or three individual conductors individually insulated, all covered with an outer jacket.
- D. **The control cable shall have the necessary number of conductors for the functions indicated on the schematic diagrams. Design cable specifically for submersible applications. Cable shall consist of conductors individually insulated and covered with an outer jacket.**

2.04 OVERLOAD/UNDERLOAD PUMP CONTROLLER:

- A. Controller shall be solid-state type and shall have the following features:
 - 1. When a-c voltage is initially applied to the controller, the output contacts shall transfer for approximately two seconds completing the motor control circuit and allowing the motor to come up to speed. If the power being used is above the preset threshold, the contacts shall remain energized and the motor shall continue

to run. If the power drops below the preset threshold and the trip delay is "off," the contacts shall open and the motor shall shut off. If the trip delay is "on," the controller shall delay, then open its contacts. If the restart timer is "off," the controller shall reset when the reset push button is activated. If the restart timer is "on" at the end of the restart delay, the controller shall automatically reenergize its contacts for approximately 10 seconds. This cycle shall continue until the motor runs correctly or the a-c voltage is disconnected.

2. Controller shall provide protection against instant restarts, overload, and underload. The overload and underload trip points shall be field adjustable.
3. The inputs shall be gathered by sensor coils or current transformers.
4. Provide controller with underload, overload, tripped, and restart timing indicating lights.
5. Protect controller against voltage transients in accordance with manufacturer's standard design.
6. The controller shall be Time Mark Model 422, Pump Saver Model SP3, or equal.
7. Provide the controller with accessories as recommended by the manufacturer, including control circuit fuse block with fuses, suppressor module, and lightning arrester. Provide the controller with complete installation and maintenance instructions.

2.05 NAMEPLATES:

- A. The motor shall have a stainless steel nameplate which shall provide the following information: manufacturer's type and frame construction, insulation system, temperature rise, horsepower output, rated load amperes, rpm, voltage, time rating, "continuous" frequency, number of phases, NEMA code letter for locked rotor kVa, NEMA design letter, service factor, thrust bearing load capacity, full-load efficiency and power factor at full load, and essential bearing information such as bearing type and bearing numbers.

2.06 FACTORY TESTS:

- A. Motor shall be given routine factory tests to determine that it is free from electrical or mechanical defects and to provide assurance that it meets the design specifications.
- B. Tests shall be as follows and a certified test report provided to the Owner's Representative:
 1. No load readings of current and speed at rated voltage and frequency.
 2. Current at rated frequency with rotor at standstill.
 3. High potential.

4. Stator winding resistance.
5. Bearing inspection.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Where motors are provided with heaters and installed in outdoor or unheated areas, verify heaters are energized on motors.
- B. After motor installation but before connection to power wiring, test motor winding insulation in accordance with the applicable Division 26 requirements.
- C. After connection to power wiring, check for operating temperature, correct rotation, vibration, alignment and operating current drawn under load.
- D. Submit all motor test results for review and record.

3.02 FIELD TESTS:

- A. Motor shall be subjected to a field test as follows:
 1. Megger test before installation.
 2. Run motor with its control as nearly as possible under operating conditions to demonstrate correct rotation direction, wiring capacity, and satisfactory operation. Test interlocks and control features to verify correct wiring and operation.
 3. Record current in each phase and submit to Owner's Representative. Repair or replace motor or driven equipment if current exceeds motor nameplate current.

3.03 CLOSEOUT ACTIVITIES:

- A. Provide in accordance with Section 01 77 00.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide panelboards rated 600 volts or less and 1200 amperes or less.
- B. Provide with circuit breakers and cabinets complete, as indicated and in compliance with Contract Documents.

1.02 REFERENCES:

- A. National Electrical Manufacturers Association (NEMA):
 - 1. 250: Enclosures for Electrical Equipment (1000 volts maximum)
 - 2. AB 1: Molded Case Circuit Breakers
 - 3. PB 1: Panelboards
- B. National Fire Protection Association (NFPA):
 - 1. 70: National Electrical Code (NEC)
- C. Underwriter's Laboratories, Inc. (UL):
 - 1. 50: Cabinets and Boxes
 - 2. 67: Panelboards
 - 3. 86A: Wire Connectors and Soldering Lugs for Use with Copper Conductors
 - 4. 489: Circuit Breakers, Molded Case and Circuit Breaker Enclosures

1.03 SUBMITTALS:

- A. Submit the following shop drawings in accordance with Section 01 33 00:
- B. Submit shop drawings and manufacturer's product data.

1.04 QUALITY ASSURANCE:

- A. Provide in accordance with Section 01 43 00 and as specified.
- B. All panelboards shall be designed, manufactured and assembled in accordance with the referenced standards.

- C. Listing and Labeling: All panelboards shall be listed and labeled by Underwriter's Laboratories, Inc. (UL), or other nationally-recognized testing laboratory (NRTL).
- D. Service Entrance panelboards shall be UL/NRTL-labeled as suitable for that purpose.
- E. Single-source Responsibility: Provide panelboards products that are new, and from the same manufacturer for each building or job. Panelboard components shall be from the same manufacturer, or listed as an assembly thereof.

PART 2 - PRODUCTS

2.01 PANELBOARD MANUFACTURERS:

- A. Manufacturers acceptable contingent upon products' compliance with the specifications:
 - 1. Cutler-Hammer Products.
 - 2. General Electric Company.
 - 3. Siemens Corp.
 - 4. Schneider Square D.

2.02 PANELBOARDS:

- A. Factory assembled deadfront type panelboards.
- B. Furnish panelboards complete with branch circuit breakers and a main circuit breaker or main lugs only as indicated.
- C. Furnish panelboards with full capacity separate ground bus, separate insulated neutral bus and furnish panelboards connected to a 3 phase, 4 wire service or single phase, 3-wire service as indicated.
- D. Provide panelboards with the voltage, frequency and current ratings as indicated conforming to NEMA Standard PB1, Federal Specification W-P-115A. U.L. 67, and the NEC.
- E. Furnish the panelboard main and neutral buses of copper, sized for the panelboard rating, with bolted type lugs as necessary.
- F. Prevent terminal lugs from turning per NEMA standard PB 1 and ensure they are suitable for the conductor material and size.
- G. Provide main bus-bracing for each panel board suitable for the available fault current at the point of installation.

- H. Where the word “space” occurs on panel schedules, provide all necessary hardware in the space to permit future breaker installation.

2.03 CIRCUIT BREAKERS:

- A. Each circuit breaker shall be bolted into position in the panelboard, whether by direct bolted connection to the bus or by being bolted to the panelboard frame. Each circuit breaker shall be replaceable without disturbing adjacent units. Plug-on circuit breakers held in place only by spring force of the bus lug and the pressure of the deadfront are not acceptable.
- B. Furnish frame sizes, trip settings and number of poles as indicated. Clearly and visibly mark circuit breakers with ampere trip rating. Furnish breakers listed to UL 489 and complying with NEMA AB1.
- C. Furnish all breakers with quick-make, quick-break, toggle mechanisms and thermal-magnetic, inverse time-limit overload and instantaneous short circuit protection on all poles, unless otherwise indicated. Automatic tripping indicated by the breaker handle assuming a clearly distinctive position from the manual ON and OFF position. Furnish breaker handle that is trip-free on overloads.
- D. Do not use single pole breakers with handle ties or bails in lieu of multi-pole breakers.
- E. Ensure that voltage and interrupting rating of all breakers in a panelboard is not less than voltage and short circuit rating of the panelboard main buses, as indicated. Furnish breakers suitable to operate satisfactorily at the frequency indicated.
- F. Furnish ground fault interrupter (GFI) circuit breakers for certain circuits as indicated on the drawings.
- G. Furnish single pole breakers with full module size. Do not install two pole breakers in a single module.

2.04 CABINETS:

- A. Provide cabinets with NEMA enclosure type as indicated.
- B. Finish cabinet fronts, trims and surface-mounted boxes in ANSI No. 61 or 49, light-gray enamel over a rust-inhibitive primer. Attach the fronts (exterior trims) to the boxes or interior trims, by quarter-turn, indicating trim clamps. Design cabinets for surface or flush mounting as indicated.
- C. Unless otherwise specified, construct panelboard cabinets of code-gauge galvanized, sheet steel and equip with gutters of ample size for the risers and outgoing circuits. Ensure that the cabinets do not exceed 78 inch (1980 mm) in height.
- D. Trims for branch circuit panelboards shall be supplied with a hinged door over all circuit breaker handles. Doors in panelboard trims shall not uncover any live parts. Doors shall

have a semi flush cylinder lock and catch assembly. Door-in-door trim shall be provided. Both hinged trim and trim door shall utilize three point latching. No tools shall be required to install or remove trim. Trim shall be equipped with a door-actuated trim locking tab. Equip locking tab with provision for a screw such that removal of trim requires a tool, at the Owner's option. Installation shall be tamper resistant with no exposed hardware on the panelboard trim.

- E. Provide enclosure with the following side gutter dimensions:
 - 1. Left side minimum 4-1/2 inch (114 mm) measured from inside lip of the box to the installed deadfront.
 - 2. Right side; minimum 4-1/2 inch (114 mm) measured from inside lip of the box to the installed deadfront. With the door-in-door cover in place; minimum 3-1/4 inch (83 mm) from installed outer door hinge to the installed deadfront.

2.05 FACTORY TESTING:

- A. Standard factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with the latest version of NEMA and UL standards.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Mount panelboards, plumb and rigid without distortion of the box. Mount such that the height of the top operating handle does not exceed 6 feet 7 inches (2 m) from the floor.
- B. Hang each door of the cabinet on semi- or fully-concealed hinges with a combination catch and lock.
- C. On cabinets 48 inch (1200 mm) high and over, install a 3 point catch assembly latching at top, bottom and approximate middle.
- D. Verify all panelboard locks are keyed alike.
- E. Provide typed directory card filled-out to clearly indicate the load served.
- F. Door hinge to be on the side opposite escape route if applicable.

3.02 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01 77 00.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide field test, and place in operating condition, wiring devices as indicated and in compliance with Contract Documents.

1.02 REFERENCES:

- A. National Electrical Manufacturers Association (NEMA):
 - 1. WD 1: General Requirements for Wiring Devices
 - 2. WD 6: Wiring Devices – Dimensional Requirements
- B. National Fire Protection Association (NFPA):
 - 1. 70: National Electrical Code (NEC).
- C. Underwriters' Laboratories, Inc. (UL):
 - 1. 20: General Use Snap Switches.

1.03 SUBMITTALS:

- A. Submit manufacturer's product data in accordance with requirements of Section 26 05 10.

PART 2 - PRODUCTS

2.01 MANUFACTURER'S COMPLIANCE:

- A. Manufacturer's acceptance contingent upon products compliance with specifications.
- B. Provide all devices with UL label.

2.02 MANUFACTURERS:

- A. Allen-Bradley Co.
- B. Appleton Electric Co.
- C. Cooper Wiring Devices.

- D. Eaton-Cutler Hammer, Inc.
- E. Crouse-Hinds Co.
- F. Hubbell Electrical Products.
- G. Pass & Seymour, Legrand.
- H. OZ Gedney.
- I. Nelson Electric.

2.03 MATERIALS AND COMPONENTS:

A. Wall Switches:

1. Provide alternating current, general-use, snap switches, in flush device boxes or on outlet box covers, totally enclosed in composition case, with insulated mounting yoke and sidewired, binding screw-type terminals. Single-pole, 2-pole, 3-way, or 4-way switches rated 20 amperes at 120/277 volts a.c. Switch to UL-20.
2. Switches for controlling lighting:
 - a. Cooper Wiring Device
 - b. Hubbell
 - c. Bryant Electric
 - d. Pass & Seymour

B. Watertight Switches:

1. Provide watertight switches consisting of flush mounting switches in NEMA Type 4 gasketed cast metal boxes. Switch operable through shaft in matching cast metal cover, twenty-ampere, 120/277-volt switch enclosures:
 - a. Crouse-Hinds Type MC or MCC.
 - b. Appleton Cat. No. WDM 175 and WVG1
 - c. OZ Gedney Cat. No. WSP and WCT120

C. Flush Receptacles:

1. Provide 20-ampere, 125-volt flush receptacles constructed in flush device boxes, and of grounding type in composition case with insulated mounting yoke, side-wired, binding screw-type terminals.

2. Duplex receptacles:
 - a. Cooper Wiring Devices
 - b. Hubbell
 - c. Bryant Electric
 - d. Pass & Seymour
 3. Duplex GFCI Type Receptacles:
 - a. Harvey Hubbell, Inc.
 - b. Cooper Wiring Devices
 - c. Leviton Manufacturing Company
 4. Single receptacles:
 - a. Cooper Wiring Devices
 - b. Hubbell
 - c. Pass & Seymour
- D. Special Receptacles:
1. Provide weatherproof devices rated 20 ampere, 125-volt, consisting of single receptacles with spring-loaded, soft-gasketed hinged covers with stainless steel spring. Covers as follows:
 - a. Hubbell
 - b. Bryant Electric
 - c. Crouse-Hinds
- E. Outlet Boxes and Enclosures:
1. Provide outlet boxes and enclosures conforming to Section 26 05 33 and enclosure schedule on the drawings unless otherwise indicated.
- F. Device Plates:
1. Provide device plates suitable for type of outlet boxes and enclosures used. Plates for flush-mounting by device manufacturer. Plates for surface-mounting boxes by either device manufacturer or box manufacturer.

2. Provide flush device plates of material and finish indicated, in certain designated areas.

PART 3 - EXECUTION

3.01 GENERAL:

- A. Perform all work in accordance with the NEC.

3.02 CONNECTION:

- A. Securely and rigidly attach wiring devices in accordance with regulating agency, and as indicated, avoiding interference with other equipment.
- B. Securely fasten nameplates using screws, bolts, or rivets and centered under or on the device, unless otherwise indicated.

3.03 GROUNDING:

- A. Ground all devices in accordance with NEC.
- B. Ground switches and their metal plates through switch mounting yoke, outlet box, and raceway system.
- C. Ground flush receptacles and their metal plates through positive ground connection to outlet box and grounding system. Maintain ground to each receptacle by spring-loaded grounding contact to mounting screw, or by grounding jumper, both making positive connection to outlet box and grounding system at all times.

3.04 LABELING:

- A. All wall plates to be engraved with the panelboard alpha-numeric identifier and circuit breaker number.
 1. Characters to be 5/16 inch (8 mm) in size and black in color.
 2. All engravings to match panelboard typed circuit breaker directories.

3.05 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01 77 00.

END OF SECTION

SECTION 26 29 13

ENCLOSED CONTROLLERS

PART 1 - GENERAL

1.01 SUMMARY:

- A. Section Includes: AC motor control devices rated 600 volts and less that are supplied as enclosed units as indicated and in compliance with Contract Documents.

1.02 REFERENCES:

- A. National Fire Protection Association (NFPA):
 - 1. 70: National Electrical Code (NEC).
- B. National Electrical Manufacturers Association (NEMA):
 - 1. 250: Enclosures for Electrical Equipment (1000 Volts Maximum).
 - 2. ICS 2: Industrial Control and Systems Controllers, Contactors, and Overload Relays Rated 600 Volts.
 - 3. MG 1: Motors and Generators.

1.03 SUBMITTALS:

- A. Submit the following shop drawings in accordance with Section 01 33 00.
- B. Shop Drawings: Submit shop drawings and manufacturers' product data in accordance with the requirements of Section 26 05 00.
- C. For each controller center specified in this Section. Include dimensioned plans, elevations, and component lists. Show ratings, including short-time and short-circuit ratings.
 - 1. Schedule of features, characteristics, ratings, and factory settings of individual units.
 - 2. Wiring Diagrams: Interconnecting wiring diagrams pertinent to class and type specified for and schematic diagram of each type of controller unit indicated.
- D. Product Data: Include dimensions, ratings, and data on features and components.
- E. Operation and Maintenance Data (O&M): Maintenance data for motor controllers.
- F. Miscellaneous:

1. Load-Current and Overload-Relay Heater List: Compile after motors have been installed and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.
 2. Certificates for Field Testing Agency: Signed by Contractor, certifying that agency complies with requirements specified in “Quality Assurance” Article below.
- G. Acceptance of equipment specified in this section is contingent upon acceptance of coordination study specified in Section 26 05 73.

1.04 QUALITY ASSURANCE:

- A. Provide in accordance with Section 01 43 00 and as specified.
- B. Source Limitations: Obtain similar motor-control devices through one source from single manufacturer.
- C. Items provided under this section shall be listed or labeled by UL or other Nationally Recognized Testing Laboratory (NRTL).
 1. Term “NRTL” shall be as defined in OSHA Regulation 1910.7.
 2. Terms “listed” and “labeled” shall be as defined in National Electrical Code, Article 100.
- D. Regulatory Requirements:
 1. National Electrical Code (NEC): Components and installation shall comply with National Fire Protection Association (NFPA) 70.

1.05 COORDINATION:

- A. Coordinate features of controllers and accessory devices with pilot devices and control circuits to which they connect.
- B. Coordinate features, accessories, and functions of each motor controller with ratings and characteristics of supply circuit, motor, required control sequence, and duty cycle of motor and load.

1.06 EXTRA MATERIALS:

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

- A. Allen-Bradley Co.
- B. Eaton, Cutler-Hammer Inc.
- C. General Electric Company.
- D. Siemens Energy & Automation, Inc.
- E. Square D Company.

2.02 ENCLOSURE:

- A. Meet environmental conditions of installed location.
 - 1. Provide NEMA-250 Type 1 enclosure in electrical equipment rooms and NEMA-250 Type 12 enclosure for other indoor switches locations unless otherwise indicated.
 - 2. Provide NEMA-250 Type 4X for outdoor and wet location switches with watertight hubs and stainless steel Type 304 enclosure.

2.03 MAGNETIC MOTOR CONTROLLERS:

- A. Description: NEMA ICS 2, Class A, full voltage, non-reversing, across line, unless otherwise indicated.
- B. Control Circuit: 120 V; obtained from integral control power transformer, unless otherwise indicated. Include control power transformer with adequate capacity to operate connected pilot, indicating and control devices, plus 100 percent spare capacity.
- C. Combination Controller: Factory-assembled combination controller and disconnect switch with or without overcurrent protection as indicated.
 - 1. Nonfusible Disconnect: NEMA KS 1, heavy-duty, nonfusible switch.
 - 2. Circuit-Breaker Disconnect: NEMA AB 1, motor-circuit protector with field-adjustable short-circuit trip coordinated with motor locked-rotor amperes.
- D. Overload Relay:
 - 1. Electronic solid state type with inverse-time-current characteristic, phase loss and phase unbalance protection for size 2 and larger.

2. Provide NEMA Class 20 heaters or sensors in each phase matched to nameplate full load current of specific motor to which connected with appropriate adjustment for duty cycle.
 3. Enhanced Protection Overload Relay: Provide overload relays with NEMA Class 10 or better tripping characteristics for submersible equipment or where indicated. Select to protect motor against voltage unbalance and single phasing.
- E. Time Delay Restart Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connection.
1. Provide in starter enclosure for Size 2 and larger starters.
 2. Delay initial motor start.
 3. Delay motor restart due to starter dropout caused by undervoltage or starter coil circuit interruption for maintained control circuits.
 4. Adjustable on delay from 0.15 to 30.0 sec set at 10.0 sec.
 5. Connect control relay in motor starter coil circuit.
 6. Coordinate control relay section with motor starter to cause motor starter to drop out at voltage slightly higher than dropout voltage of starter and have dropout time slightly faster than motor starter to ensure if motor starter drops out, relay will drop out.
- F. Self-protection and reliability features include following:
1. Input transient protection by means of surge suppressors.
 2. Snubber networks to protect against malfunction due to system voltage transients.
 3. Motor Overload Relay: Adjustable and capable of NEMA 250, Class 10 performance.
 4. Instantaneous overcurrent trip.
 5. Loss of phase protection.
 6. Reverse phase protection.
 7. Under and overvoltage trips.
 8. Overtemperature trip.
 9. Short-circuit protection.

- G. Automatic Reset/Restart: Attempt 3 restarts after controller fault or on return of power after interruption and before shutting down for manual reset or fault correction. Restarting during deceleration will not damage controller, motor, or load.
 - H. Power-Interruption Protection: Prevents motor from reenergizing after power interruption until motor has stopped.
 - I. Status Lights: Door-mounted LED indicators to indicate following conditions:
 - 1. Power on.
 - 2. Run.
 - 3. Overvoltage.
 - 4. Line fault.
 - 5. Overcurrent.
 - 6. External fault.
 - J. Panel-Mounted Operator Station: Start-stop and auto-manual selector switches.
 - K. Integral disconnect.
 - L. Remote Indicating Circuit Terminals: Mode selection, controller status, and controller fault.
- 2.04 ENCLOSURES:
- A. Description: Flush or surface-mounted cabinets. NEMA 250, Type 1, unless otherwise indicated to meet environmental conditions at installed location.
 - 1. Wet or Damp Indoor and Outdoor Locations: NEMA 250, Type 4X, stainless steel.
- 2.05 ACCESSORIES:
- A. Provide devices when indicated. Factory install in controller enclosure, where indicated.
 - B. Push-Button Stations, Pilot Lights, and Selector Switches: NEMA ICS 2, heavy-duty type.
 - C. Stop and Lockout Push-Button Station: Momentary-break push-button station with factory-applied hasp arranged so padlock can be used to lock push button in depressed position with control circuit open.
 - D. Control Relays: Auxiliary and adjustable time-delay relays.

- E. Elapsed Time Meters: Heavy duty with digital readout in hrs.
- F. Factory mounted with Nationally Recognized Testing Laboratory listed and labeled mounting device.

PART 3 - EXECUTION

3.01 APPLICATIONS:

- A. Select features of each motor controller to coordinate with ratings and characteristics of supply circuit and motor; required control sequence; duty cycle of motor, drive, and load; and configuration of pilot device and control circuit affecting controller functions.
- B. Hand-Off-Automatic Selector Switches: In covers of manual and magnetic controllers of motors started and stopped by automatic controls or interlocks with other equipment where indicated.

3.02 INSTALLATION:

- A. Install independently mounted motor-control devices according to manufacturer's written instructions.
- B. Location: Locate controllers within sight of motors controlled, unless otherwise indicated.
- C. For control equipment at walls, bolt units to wall or mount on lightweight structural-steel channels bolted to wall.

3.03 IDENTIFICATION:

- A. Identify motor-control components and control wiring according to Section 26 05 53.

3.04 CONTROL WIRING INSTALLATION:

- A. Install wiring between motor-control devices according to Section 26 05 12.
- B. Bundle, train, and support wiring in enclosures.
- C. Connect hand-off-automatic switch and other automatic control devices.
 - 1. Connect selector switches to bypass only manual and automatic control devices that have no safety functions when switch is in hand position.
 - 2. Connect selector switches with motor-control circuit in both hand and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.05 CONNECTIONS:

- A. Tighten connectors, terminals, bus joints, and mountings. Tighten field-connected connectors and terminals, including screws and bolts, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in [UL 486A-486B](#).

3.06 FIELD QUALITY CONTROL:

- A. Manufacturer's Field Services:
 - 1. Supplier or manufacturer shall direct services to system and equipment operation, maintenance, troubleshooting, and equipment and system-related areas other than wastewater treatment process.
- B. Testing Agency: Provide services of qualified independent testing agency to perform specified testing.
- C. Testing: After installing motor controllers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
 - 1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Sections 7.5, 7.6, and 7.16. Certify compliance with test parameters.
 - 2. Remove and replace malfunctioning units with new units, and retest.

3.07 CLEANING:

- A. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish. Clean devices internally, using methods and materials recommended by manufacturer.

3.08 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01 77 00.

END OF SECTION

SECTION 26 32 13

ENGINE GENERATORS

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide and test ready for operation, diesel engine-generator set complete with appurtenances as indicated and in compliance with Contract Documents.
- B. The unit shall be provided in an outdoor, weather proof, sound attenuated enclosure. The unit shall be provided with double-walled, sub-base fuel tank.
- C. The unit shall have a 20 KW, 25 KVA power rating, standby, at 80 percent lagging power factor, three-phase, 60-Hertz, 208Y/120 volt, three-phase, four-wire, alternating current generator.
- D. The unit shall be arranged for automatic starting and stopping, and load transfer upon failure of the normal source of power through automatic throw over system. The engine generator set shall exhibit less than 25 percent voltage dip and less than 7 percent frequency dip during starting of the loads identified in Attachment A to this Section.
- E. The engine-generator package shall be complete in all respects and shall include all equipment and controls necessary for a fully operational standby power supply system.

1.02 REFERENCES:

- A. ASTM International (ASTM):
 - 1. D975: Standard Specification for Diesel Fuel Oils.
- B. Electrical Generating Systems Association (EGSA):
 - 1. 101P: Engine Driven Generator Sets.
- C. Institute of Electrical and Electronics Engineers (IEEE):
 - 1. 1: General Principles for Temperature Limits in the Rating of Electric Equipment and for the Evaluation of Electrical Insulation.
 - 2. 43: Recommended Practice for Insulation Testing of Large AC Rotating Machinery
 - 3. 112: Test Procedures for Polyphase Induction Motors and Generators.
 - 4. 120: Master Test Guide for Electrical Measurements in Power Circuits.

- D. National Electrical Manufacturers Association (NEMA):
1. AB 1: Molded-Case Circuit Breakers, Molded Case Switches, and Circuit-Breaker Enclosures.
 2. ICS 2: Standard for Industrial Control and Systems: Controllers, Contractors, and Overload Relays Rated Not More than 2000 Volts AC or 750 Volts DC: Part 8 - Disconnect Devices for Use in Industrial Control Equipment.
 3. ICS 6: Standard for Industrial Controls and System Enclosures.
 4. MG 1: Standard for Motors and Generators.
 5. PB 1: Standard for Panelboards.
 6. SG 6: Standard for Power Switching Equipment.
 7. MW36-C: Magnet wire.
- E. National Fire Protection Association (NFPA):
1. 30: Flammable and Combustible Liquids Code.
 2. 37: Installation and Use of Stationary Combustion Engines and Gas Turbines.
 3. 70: National Electrical Code (NEC).
 4. 110: Standard for Emergency and Standby Power Systems.
- F. Society of Automotive Engineers International (SAE):
1. ARP892: DC Starter-Generator, Engine.
 2. J537: Storage Batteries
- G. Underwriters Laboratories (UL):
1. 142: Steel Aboveground Tanks for Flammable and Combustible Liquids.
 2. 489: Standard for Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures.
 3. 508A: Industrial Control Panels.
 4. 1236: Standard for Safety Battery Charges for Charging Engine-Starter Batteries.
 5. 1446: Systems of Insulations Materials.
 6. 2200: Stationary Engine Generator Assemblies.

1.03 SUBMITTALS:

- A. Submit the following shop drawings in accordance with Section 01 33 00 and as specified:
- B. Submit shop drawings and manufacturers' product data in accordance with the requirements of Section 26 05 00.
- C. A copy of this specification section with addenda and all referenced specification sections with addenda, with each paragraph check-marked to indicate specification compliance.
 - 1. Failure to include a copy of the marked-up specification sections will result in return of the entire submittal without further review and consideration until the marked-up specification are resubmitted with the entire package.
- D. Outline equipment and enclosure drawings, equipment catalog cuts, wiring and connection diagrams and other documents required to completely describe the systems and equipment being furnished. Elevation drawings with shipping splits and estimated weights identified.
- E. Identification, description and dimensions.
- F. Engine-generator skid base drawings including spring vibration isolators. Drawings shall indicate size and location of anchor bolts, and conduit electrical device locations.
- G. Performance specifications of all items of equipment.
- H. Control panel layout drawings, dimensions, and component bill of materials. Outline drawings showing conduit entry areas and anchoring information. Description of control including operation of interface equipment.
- I. Complete electrical, instrumentation, control and wiring diagrams in sufficient detail to allow installation of instrumentation and controls and electrical components.
- J. Provide certificate of conformance to UL Standard 2200, Stationary Engine Generator Assemblies.
- K. Attenuation curve for the silencing equipment as offered to accomplish the required silencing for this installation.
- L. Information on the proposed jacket water treatment and procedures for flushing of the cooling systems.
- M. Operations and Maintenance Manuals, covering all equipment furnished, annotated to reference only the specific model numbers supplied. Include parts lists and parts prices current to the date of submittal; include information relevant to part supply and ordering.

Submit prior to the startup and testing of the engine/generator units. Submit in accordance with Sections 01 33 00, 01 78 36 and as specified herein.

- N. Manufacturer's certified shop test record of complete engine driven generator unit.
- O. As-built drawings and material summary shall be shipped with the equipment.
- P. Engine generator loading calculation, per the requirements of Attachment A to this section.
- Q. Data to be provided by engine generator system supplier:
 - 1. Submit generator loading calculations and data for engine, generator, and accessories: (for rated kW capacity).
 - a. Engine Data:
 - (1) Manufacturer.
 - (2) Model.
 - (3) Number and arrangement of cylinders:
 - (a) RPM.
 - (b) Bore X stroke.
 - (c) Maximum power at rated RPM.
 - (d) BMEP at rated kW (including any parasitic loads and generator efficiency).
 - (e) Piston speed, feet per minute.
 - (f) Make and model of governor.
 - (g) Make and model of overspeed shutdown device.
 - b. Generator Data:
 - (1) Manufacturer.
 - (2) Model.
 - (3) Rated kVA.
 - (4) Rated kW.

- (5) Voltage.
 - (6) Temperature rise above 40 degrees C ambient. Stator by thermometer and field by resistance in degrees C.
 - (7) Class of insulation.
 - (8) Generator efficiency including excitation losses at 80 percent PF:
 - (a) Full load.
 - (b) Three quarters load.
 - (c) Half load.
 - (9) Generator subtransient reactance in ohms and Per Unit value.
 - c. Guaranteed maximum fuel consumption rate at generator terminals at 138,000 BTU/gallon (38.5 MJ/L) of No. 2 diesel fuel:
 - (1) Full load, gal/hr (L/hr).
 - (2) Three-quarters load, gal/hr (L/hr).
 - (3) Half load, gal/hr (L/hr).
 - d. Generator unit and accessories.
 - e. Weight of complete unit, with break down by engine-generator set, base tank, and fuel.
 - f. Exhaust gas emissions data, maximum values at full load, 3/4 load, 1/2 load, and 1/4 load:
 - (1) Temperature in degrees F (degrees C).
 - (2) Flow in ACFM (mass and volume) (L/s).
 - g. Combustion air requirement in CFM (L/s).
 - h. Cold cranking amperes rating of engine starting batteries (CCA) at 0 degrees F (-18 degrees C).
- R. Provide manufacturer's printed installation instructions including anchoring details to meet earthquake requirements as specified and indicated.
- S. Performance Test Reports: Upon completion of installed system, submit in booklet form all field tests performed to prove compliance with specified performance criteria including final settings of devices.

1.04 SEISMIC REQUIREMENTS:

- A. Contractor shall conform to the seismic requirements as indicated and as specified in Section 01 41 20.
- B. The Contractor shall conform to the seismic design requirements for this project and for the work of this specification section.
- C. Provide all equipment bases, anchorage, supports and foundations designed in accordance with the seismic requirements indicated and specified.
- D. Additionally, provide with the Certificate of Unit Responsibility, certification for all equipment signed by a registered structural engineer stating that computations were performed and that all components have been sized for the seismic forces specified and indicated.

1.05 QUALITY ASSURANCE:

- A. Provide in accordance with Section 01 43 00 and as specified.
- B. Contractor to ensure that conduit size and wire quantity, size, and type are suitable for the equipment supplied. Contractor to review the proper installation of the equipment and of each type of device with the equipment supplier prior to installation.
 - 1. Services of Service Engineer, specifically trained on type of equipment specified. Person-day requirements listed exclusive of travel time.
 - a. Assist in location of devices, methods of mounting, field erection, etc.
 - (1) 1 person-day
 - b. Start-up and testing.
 - (1) 1 person-day
 - c. Service-inspections during first year of operation, for use at Owner's request, and exclusive of repair, malfunction or other trouble-shooting service calls:
 - (1) 0.5 person-day
 - d. Person-day is defined as one 8-hour day, excluding travel time.

1.06 DELIVERY, STORAGE AND HANDLING:

- A. Provide in accordance with Section 01 66 10 and as specified.
- B. Protect all equipment placed into storage from weather, humidity and temperature variations, dirt, dust, and other contaminants.

1.07 REGULATORY REQUIREMENTS:

- A. Local State and City Air Pollution Control Laws.
- B. Provide all required data and information for a Title V local air pollution control district operating permit.
- C. Federal Clean Air Act (42 United States Code (U.S.C.) 7401 et. seq.)
- D. Federal Air Pollution Control Regulations: 40 Code of Federal Regulations (CFR) Parts 50-99, as amended by the Federal Register.
- E. Furnish to the Owner, within 15 working days of the date of any request, all documents and other information required to verify compliance with permit and applicable air pollution control laws and regulations, including EPA Tier 2 emission requirements in effect at the bid date of the project.

1.08 WARRANTY AND SERVICE:

- A. Provide in accordance with Section 01 78 36.
- B. Guarantee all components, parts, and assemblies supplied by manufacturer against defects in materials and workmanship for a period of 12 months.
- C. Ensure that equipment manufacturer has local branch office staff with trained, full-time employees who are capable of performing testing, inspecting, repair, and maintenance services.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

- A. Cummins Power Generation Inc., Onan Products
- B. Caterpillar Inc.
- C. Kohler Co.
- D. Generac Inc.

2.02 GENERAL:

- A. Engine-generator set shall be a factory-assembled unit that is a standard production unit with existing torsional analysis data. Mixing and matching engine and generator by a third party supplier is not acceptable. The engine and generator shall be directly connected with a flexible coupling, shall be free from injurious torsional or other vibration.

- B. The engine and generator shall be directly connected.
- C. The engine-generator set shall allow easy access to the various parts for maintenance purposes.
- D. The engine-generator set shall be pre-piped and pre-wired.
- E. The complete engine-generator unit shall be free from harmful torsional or other vibration throughout the entire operating range of speed and load. The engine manufacturer shall provide an analysis of the complete engine-generator unit, which shall show where any critical speed will be encountered, together with the order, the frequency and magnitude of any critical speed.
- F. The engine-generator set operating in an ambient temperature of 40 degrees C shall have a standby power capacity of not less than that indicated at 0.80 power factor, and shall operate at a speed not to exceed 1,800 rpm. It shall be rated 208/120 volt, as indicated, 3-phase, 4 wire, 60 Hertz.
- G. Frequency regulation shall not exceed 3 Hertz for step load from no load to rated load. Frequency variation shall not exceed plus or minus 0.3 Hertz for constant loads from no load to rated load.
- H. Voltage regulation for step load from no load to rated load shall be within +/- 4 percent of rated voltage for units up to and including 25 kW and within +/- 5 percent or percent of rated voltage for units rated 30 kW or higher. Voltage variation shall be within +/- 1 percent of the mean value for constant loads from no load to rated load.
- I. The engine generator set shall be mounted on a heavy steel sub-base with spring type vibration isolators.

2.03 GENERATOR:

- A. Generator shall be rated for continuous duty; shall be rotating field, engine-driven, direct-connected, synchronous type with amortisseur winding. Generator frame shall be dripproof with all openings guarded. Bearings shall be sleeve or sealed ball type. The generator shall be mechanically and torsionally matched to the engine driver and shall be provided to withstand inherent pulsating torques of the engine. Full load efficiency of the combined generator, exciter and regulator shall be not less than 95 percent. The generator windings, insulation and excitation system shall be braced to withstand any possible short-circuit stresses.
- B. Generator insulation shall be Class H or F in accordance with NEMA Standard MG1-1.65. Temperature rise shall be in accordance with NEMA Standard MG1-22.40 for continuous duty at all output ratings.
- C. Voltage regulator shall be an automatic, temperature compensated, solid-state type with a manual adjustment range of plus or minus 5 percent of rated voltage. The generator

windings, insulation and excitation system shall be braced to withstand any possible short-circuit stresses.

- D. Exciter shall be **PMG type or brushless rotating type utilizing rotating diode rectifiers**. Minimum rating of exciter shall be as indicated in NEMA Std. MG-1-22.16.
 - E. Components for field flashing and field discharge shall be included, if required. Fast acting fuses or other protective devices shall be incorporated where failure of regulator or exciter components could result in damage to the generator field or exciter windings.
 - F. Voltage regulator and static exciter shall be mounted in generator control panel or elsewhere so as to protect from and isolate from vibration.
 - G. The generator shall conform to the applicable parts of the following standards, unless otherwise specified:
 - 1. NEMA MG1, Motors and Generators.
 - 2. IEEE 43, Recommended Practice for Insulation Testing of Large AC Rotating Machinery.
 - 3. CSA C22.2- No. 100, Motors and Generators.
 - 4. Testing shall be in accordance with IEEE-115 and NEMA MG-1 standards
 - H. The stator frame shall be fabricated bar and plate steel construction.
 - 1. All insulation materials used in the stator shall have a temperature rating of Class H per IEEE Standard 1. The coils shall be of a formed coil construction using a magnet wire meeting NEMA MW36-C specifications.
 - 2. The complete stator shall be wound with a 2/3 stator winding pitch and processed in a vacuum pressure impregnation chamber. Encapsulation of the stator shall be accomplished with a two-part epoxy system.
 - I. Generator lead terminal box shall be of ample size to accept and terminate connecting cables as indicated on the drawings. Generator leads shall be furnished with terminal connectors suitable for the customers connecting cables.
 - J. Provide generator stator winding heater with thermostat wired at 120 VAC to prevent formation of condensation.
- 2.04 DIESEL ENGINE:
- A. Heavy-duty compression-ignition, cold-starting diesel type arranged for direct connection to an alternating current generator. It shall be a current model of a type in a regular production by a manufacturer regularly engaged in building this type of diesel engine. Engine shall have at least a published intermittent brake horsepower rating at

specified generator speed required by generator at rated full load output and shall operate without undue heating, vibration, or wear.

- B. Engine may be a two-cycle or four-cycle and may be naturally aspirated, scavenged, or turbocharged.
- C. Engine shall operate satisfactorily on No. 2 fuel oil.
- D. Performance, materials, and workmanship shall be in accordance with Diesel Engine Manufacturers Association standard practices.

2.05 ENGINE ELECTRICAL SYSTEM:

- A. Electrical system shall include a battery, starting motor, voltage and current-regulated charging generator or alternator, and a separate battery charger. Battery shall be of suitable capacity to start engine at conditions specified and shall be guaranteed for three years.
- B. Battery charger shall be automatic, two rate type providing for equalizing charge and continuous taper charging. Output characteristics shall match requirements of battery furnished. Provide charger suitable for operation on 120 volt, single-phase, 60 Hertz current to be rated not less than 10 amp direct current. Furnish battery charger with following features:
 - 1. Direct current voltage regulation: +/- 2 percent for variations in line voltage of +/- 10 percent.
 - 2. Digital display indicating DC volts and DC amps.
 - 3. Automatic surge suppressor.
 - 4. Automatic current limiting to prevent overloading due to engine cranking, shorted output or reversed battery connections.
 - 5. Alternating current line fusing.
 - 6. Integral protection to prevent battery discharge through charger on loss of alternating current line voltage.
 - 7. Terminal block with terminals for all external connections.
- C. Where wall mounting is indicated, enclosures shall be suitable for conduit connection and ventilating openings shall be guarded.
- D. Provide battery rack to accommodate starting batteries and supporting rack for battery charger. Racks shall be free-standing type and installed adjacent to skid.
- E. Provide 120 VAC battery pad heater with thermostat.

2.06 ENGINE APPURTENANCES:

A. Furnish engine with following appurtenances:

1. Combustion air cleaner of oil bath type or dry replaceable filter type. A tube shall connect crankcase breather with air cleaner to prevent accumulation of objectionable smoke and fumes.
2. Critical grade exhaust silencers complete with drains and flexible stainless-steel connection. The entire exhaust system shall be insulated.

B. Governors:

1. Electronic governor, as manufactured by CAT Model ECM or equal.
2. **Equip governor with means for manual operation and adjustment while the engines are running.**

2.07 CONTROL PANELS:

A. Engine and generator control panels may be separate panels, or a combined panel, and mounted with vibration isolators on the unit. Instruments shall be of direct-reading type, factory mounted and factory connected. Instruments shall be accurate within 3 percent.

B. Provide engine panel with following features and instruments:

C. Three-position engine control switch:

1. Stop/Reset: In this position, the engine shall not be capable of starting and/or running. If the engine was shutdown due to the operation of a protective device, the shutdown malfunction shall be reset when the switch is moved to this position. If the engine is running when the switch is moved to this position, it shall be immediately shutdown. Provide audible alarm when switch is in this position.
2. Automatic: In this position, the engine control shall be in readiness for fully automatic operation upon receipt of a start signal.
3. Test: When placed in this position, the engine shall start and run as if a start signal were received except it shall not be connected to the bus unless a start signal is received. When returned to the automatic position, the engine will shut down.
4. Manual starting switch.
5. Full automatic starting from pilot device initiating start when normal power fails. Automatic cranking shall be interrupted cycle type not affected by ambient temperature with overall time limit. A total of five cranking cycles shall automatically shut down engine after a time delay.

6. Automatic shutdown devices with manual reset and individual indicating lights for:
 - a. Low oil pressure.
 - b. High water temperature.
 - c. Low coolant level.
 - d. Engine overspeed.
 - e. Failure of engine to start.
7. Auxiliary contacts on all aforementioned shutdown devices to operate a remote alarm. In addition, provide the following alarm contacts.
 - a. Sub-base oil tank rupture.
 - b. Low fuel.
 - c. Low battery voltage.
 - d. Common fault alarm.
 - e. Not in automatic.
 - f. Generator run status.
 - g. Low coolant level.
 - h. Fuel tank system leak.
8. Water temperature gauge.
9. Ammeter-charging circuit.
10. Tachometer.
11. Lubricating oil pressure gauge.
12. Fuel pressure gauge.
13. Running time meter.
14. Contacts and relays to operate exhaust fans and dampers specified under Heating and Ventilating.
15. Generator panel shall include following instruments:

- a. Voltmeter, alternating current and phase selector switch with OFF position.
- b. Ammeter, alternating current, and phase selector switch with OFF position.
- c. Voltage-adjusting rheostat.
- d. Three-phase wattmeter.
- e. Frequency meter.
- f. Generator load-break, molded-case magnetic circuit breaker properly sized to protect generator against short-circuit conditions. Molded case circuit breaker shall conform to the provisions of NEMA Standard AB-1 and UL Standard 489.

2.08 TRANSFER SWITCH CONTROL:

- A. Refer to Section **26 36 23** for the technical requirements of power transfer controls.
- B. Automatic transfer switch to be provided under Division 26 and located within in a freestanding NEMA 4X enclosure adjacent to the generator unit, unless otherwise indicated.

2.09 FUEL STORAGE SYSTEM:

- A. Provide necessary suction and return line connections at pipe openings provided.
- B. Tapped openings in storage tank shall be bushed to desired size with single- or double-tapped cast-iron tank bushing.

2.10 ENGINE FUEL SYSTEM:

- A. Diesel fuel system shall consist of an engine-driven fuel supply pump and fuel filters.
- B. Fuel filters shall have elements which may be easily replaced without breaking any fuel line connection or disturbing fuel pumps or any other part of engine. Oil filters shall be conveniently located ahead of injection or circulating pump so that fuel is thoroughly filtered before it reaches injectors. Screens or filters requiring cleaning or replacement shall not be used in injection or circulating pump, or in injection valve assemblies.

2.11 ENGINE COOLING SYSTEM (RADIATOR COOLED):

- A. Provide a unit-mounted radiator with integral jacket water circulating pump, and thermostatic control for cooling system.
- B. Provide radiator of sufficient capacity to operate engine at full rated generator load at 120 degrees F (50 degrees C) ambient temperature.

- C. Provide radiator with flange for connection to exhaust duct specified under Heating and Ventilating.
- D. Provide engine coolant heater rated 120V, single phase, with thermostat.
- E. Engine cooling system shall be charged with inhibited ethylene-glycol solution to provide antifreeze protection to -30 degrees F (-34.4 degrees C).

2.12 ENGINE LUBRICATION:

- A. Provide full pressure system, supplying oil to all surfaces requiring lubrication. Circulation shall be by positive displacement pump. Full flow-type filters or filters with bypass feature shall be included. Filter elements shall be replaceable without disconnecting oil piping. Provide an oil cooler, if recommended by engine manufacturer, to properly lubricate engine at full rated generator load. Provide full charge of new oil after tests have been completed.

2.13 ENGINE GENERATOR SET ENCLOSURE:

- A. Provide **weatherproof, sound attenuated**, factory installed enclosure with internally mounted silencer.

- B. Features:

- 1. Corrosion Resistant Construction
 - a. Black zinc die cast hinges to withstand extreme conditions of corrosion.
 - b. Stainless steel fasteners.
 - c. Body made from **steel** components treated with polyester powder coating.

- C. Access:

- 1. Large cable entry area for installation ease.
- 2. Doors located convenient to controls and service areas.
- 3. Double doors on both sides.
- 4. Vertically hinged doors allow 180 degrees opening rotation.
- 5. Lube oil and coolant drains piped to exterior of enclosure and terminated with drain valves.
- 6. Radiator fill on outside of enclosure.
- 7. "Lift-off" hinges allow doors to be removed if required.

D. Security and Safety:

1. Lockable access doors with keys.
2. Cooling fan and battery charging alternator fully guarded.
3. Fuel fill reached via lockable access doors when exterior fuel tanks is provided.
4. Exhaust silencing system totally enclosed for operator safety.
5. Roof outlet exhaust with sealed roof aperture and rain-cap.
6. Stub-up cover sheets for rodent proofing.

E. Transportability:

1. Lifting points on baseframe.
2. Optional tested and certified single point lifting facility.

F. Sound Attenuation:

- a. Provide **Level 2** sound attenuation for a **25 dBA** noise reduction up to 23 feet (7 m) from the enclosure.

G. Options:

1. Panel Viewing Window.
2. CSB2 External Emergency stop push button (red) mounted flush on exterior enclosure wall.
3. Integral metal fuel base tank, double-walled, and sized for 24 hours continuous operation.
4. Fuel tank level and leak detection alarm contacts.
5. Junction box for all 120V and 208V circuits to power:
 - a. Battery pad heater.
 - b. Jacket water heater.
 - c. Battery charger.
 - d. Generator stator heater.

2.14 PAINT:

- A. Paint for exterior surfaces of equipment shall be two coats of acceptable oil- and heat-resistant paint, applied after surfaces have been thoroughly cleaned and prepared with suitable priming coat.
- B. Provide touch-up paint in a quart container to Owner for use in field.

2.15 SPARE PARTS:

- A. Provide in accordance with Section 01 78 23.
- B. Provide spare parts as recommended by manufacturer for six months of operation for each engine-generator set plus following:
 - 1. Two filter for all services.
 - 2. Two fuse for each rating.
- C. Provide two sets of acoustic hearing protection, ear-muff devices, industrial grade, with acoustic foam filled cushions.
- D. Pack spare parts in suitable containers or boxes bearing labels clearly designating contents and piece of equipment for which they are intended.
- E. Deliver spare parts at same time as equipment to which they pertain. Properly store and safeguard spare parts until completion of the work, at which time deliver them where directed by the Engineer.

2.16 TOOLS:

- A. Provide in accordance with Section 01 78 23.
- B. Provide all special tools required for maintenance and repair of unit in metal box complete with lock and keys.

2.17 SHOP TESTING:

- A. The complete engine-generator set with enclosure shall be shop tested at full load using a 0.8 power factor reactive load bank to simulate a complete and integrated system prior to shipment.
- B. Provide all details of the proposed testing, including arrangements, test instruments and calibration, and procedures to be used to verify controls and alarms. The completed certified test record shall be submitted within 30 days after the completed test.
- C. Tests shall verify that unit will operate successfully and meet all specified operational requirements and verify adequate means of enclosure ventilation is provided.

- D. The shop test shall include four continuous hours of operation at full load and rated power factor. Voltage and frequency regulation and transient response shall be tested and recorded to show full compliance with this specification. During the shop test, readings shall be taken and recorded every thirty minutes for each of the following:
1. Time.
 2. Ambient temperature.
 3. Volts for each phase.
 4. Load:
 - a. Amps for each phase.
 - b. kW.
 - c. Power factor.
 - d. Frequency.
 5. Engine jacket water temperature.
 6. Lubricating oil pressure.
 7. Exhaust gas temperature.
 8. Fuel consumption.
- E. The procedure for the shop test of the diesel engine shall include the engine manufacturer's standard practice.
- F. Make arrangements for factory test witnessing by Engineer. Notify Engineer not less than 30 days prior to scheduled test.

PART 3 - EXECUTION

3.01 COORDINATION:

- A. Coordinate with ventilation, fuel supply, and exhaust, to provide an efficient, well coordinated layout.

3.02 INSTALLATION:

- A. Install unit complete and make operational.
- B. Install muffler horizontally on spring type compensating hangers as close to unit as practical.

- C. Provide 1/2-inch (12 mm) copper drain with draincock from bottom of muffler to nearest floor drain for periodic draining of muffler.
- D. Install engine at sufficient height above base to permit dropping oil pan without removing unit.
- E. Provide vibration isolation of exhaust equipment to prevent transfer of vibration into building components enclosing the standby power system.
- F. External conduit and wiring and transfer switch will be furnished and installed under applicable electrical sections, but all conduit, wiring and connections between the engine and its control panel and generator and its control panel, is included herein.
- G. Mount engine-generator set on a structural steel frame or skid. Provide vibration isolators suitable to prevent transmission of vibration to building structure between set and frame, and securely anchored to the concrete foundation. Obtain from supplier of engine-generator set a drawing giving location and size of foundation bolts for unit proposed, in sufficient time to be available when needed to place foundation. Galvanized anchor bolts shall be furnished by engine-generator set manufacturer.
- H. Sheet metalwork and ventilating controls in connection with engine cooling are specified under Heating and Ventilating. External piping connections to engine shall be made with flexible armored hose furnished with engine.
- I. Electrical equipment and materials shall be listed by UL wherever standards have been established by that agency.

3.03 WIRING AND CONNECTIONS:

- A. Provide conduit, wiring, and connections required and recommended by unit supplier. All conduit shall be terminated with flexible conduit. All wiring shall be multi-stranded.
- B. Connect neutral point of generator and generator frame to ground by green insulated copper conductor of adequate size.
- C. Connect motorized dampers in cooling and exhaust equipment to auxiliary contact on transfer controls to open dampers when unit is energized.

3.04 EQUIPMENT START-UP:

- A. Operate the unit to demonstrate ability to operate continuously without vibration, jamming, leaking or overheating and to perform specified functions, after installation and after manufacturer's representative check of installed equipment.
- B. Comply with manufacturer's operating and maintenance instructions during start-up and operation.

- C. Make all final adjustments necessary to place the equipment in working order. Prior to any testing or operation of the units, the manufacturer's service representative shall inspect the installation, and shall certify, in writing, that the assemblies are, in all ways, ready for operation. Start-up shall not commence without the presence of the manufacturer's representative.

3.05 FIELD TEST:

- A. Upon completion of the installation and as soon as conditions permit, the diesel engine driven generator, including the engine, generator, electrical circuit controls, transfer controls other devices shall be tested in the presence of the Owner by the service representative for the manufacturer of the engine driven generator unit to verify that the system functions as specified.
 - 1. Perform load test with 0.8 power factor reactive load bank connected to the generator for a full load nameplate test. Run the test for a duration of four hours. Take system data readings each 20 minutes.
 - 2. The manufacturers' representatives shall make such changes in wiring or connections and such adjustments, repairs or replacements to make the circuit, device or control system function as specified and comply with the Contract Documents.
 - 3. Acceptance of test will be verified when the unit operates without alarm or abnormal conditions for the duration of the entire test. Retest if this requirement is not met until acceptance criteria has been verified.
- B. Record in 20 minute intervals during four hour test:
 - 1. Kilowatts
 - 2. Amps
 - 3. Voltage
 - 4. Coolant temperature
 - 5. Air temperature
 - 6. Frequency
 - 7. Oil pressure
- C. As part of the field test, each of the automatic shutdown devices shall be tested and the respective values recorded at which the devices will stop engine. Any adjustments required shall be made in the devices to make the operating values correspond to those recommended by the engine manufacturer and as recorded during the stop test.

- D. Take and record octave band sound pressure level readings while the engine driven generator is operating using the station load. These readings shall be within the limits identified in the engine generator data submittals for acceptable sound level.
- E. After completion of testing, provide additional fuel, as required, to fill the fuel system tank.

3.06 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01 77 00.

END OF SECTION

ATTACHMENT A
TO SECTION 26 32 13

Loads to be powered up by the engine-generator for engine generator load calculation. The Generator shall be capable of picking up the loads in order shown when operated manually.

<u>Equipment</u>	<u>Total Quantity</u>	<u>Quantity Operating</u>	<u>HP/AMPS/KVA/KW</u>
<u>STEP 1:</u> Pump #1 & Lighting/Rcpt	1	1	7.5 HP* & 0.5 kVA
<u>STEP 2:</u> Pump #2	1	1	7.5 HP*

* Motor is across-the-line starting.

SECTION 26 36 23

AUTOMATIC TRANSFER SWITCHES

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. This section includes materials and installation of automatic transfer switches as indicated and in compliance with Contract Documents.

1.02 REFERENCES:

- A. National Fire Protection Association (NFPA):
 - 1. 70: National Electrical Code (NEC).
- B. National Electrical Manufacturers Association (NEMA):
 - 1. ICS 2: Industrial Controls and Systems Controllers, Contactors, and Overload Relays Rated 600 Volts.
- C. Underwriters Laboratories (UL):
 - 1. 1008: Automatic Transfer Switches.

1.03 SUBMITTALS:

- A. Submit the following shop drawings in accordance with Section 01 33 00.
- B. Submit shop drawings and manufacturers' product data in accordance with the requirements of Section 26 05 00.
- C. Submit manufacturer's descriptive data including ratings, circuit diagrams, dimensional data, conduit entry restrictions, and a list of accessories.

1.04 OPERATION AND MAINTENANCE MANUALS:

- A. Submit operation and maintenance manuals in accordance with Section 26 05 10.

1.05 MANUFACTURER'S SERVICES:

- A. Provide manufacturer's technical support as required for proper installation, start-up, and testing of the automatic transfer switch.

PART 2 - PRODUCTS

2.01 TRANSFER SWITCH:

- A. Transfer switch shall be **wall-mounted inside of a free-standing NEMA 4X enclosure**. Transfer switch shall have number of poles, amperage, and voltage ratings as shown in the drawings. Withstand current rating shall not be less than **30,000** ampere rms symmetrical.
- B. Switch shall be listed per UL 1008 as a recognized component for emergency systems and be rated for all classes of loads.
- C. Transfer switch shall be electrically operated and mechanically held in each direction by a single operating mechanism momentarily energized from the source to which the load shall be transferred. Accomplish mechanical locking in each direction without the aid of latching solenoids, toggle mechanisms, or gear arrangements. Total operating transfer time shall not exceed one-sixth of a second.
- D. **Operation shall allow for an adjustable delay with load not connected to either source.** An overload or short circuit shall not cause the switch to go to a neutral position. Do not use main contact structures not originally manufactured for transfer switch service (molded case circuit breakers or contactors). Inspection and replacement of all contacts (stationary and arcing) shall be possible from the front of the switch without any disassembly of operating linkages or power conductors. Provide a handle to permit no-load manual operation.
- E. **Transfer switches with neutral controls shall have fully rated neutral transfer contacts that momentarily interconnect the neutrals of the two sources during the transfer/retransfer operations. The neutrals shall remain interconnected until the power source contacts close on the source to which the load is being transferred.**

2.02 ACCESSORIES:

- A. Provide a solid-state sensing and control logic panel. Include the following operational characteristics:
 1. Adjustable (0.5 to 6.0 seconds) time delay on engine starting to override momentary dips in normal source, set at 1 second.
 2. Full phase voltage relay supervision of the normal source with at least one close differential relay to detect "brownout" condition, set at 70 percent dropout and 90 percent pickup.
 3. Voltage/frequency lockout relay to prevent premature transfer, set at 90 percent voltage and 90 percent frequency.
 4. Engine starting control contacts (one normally open and one normally closed).

5. Adjustable (2 to 25 minutes) time delay on retransfer to normal, set at 20 minutes.
 6. Unloaded running time delay for generator cool down (adjustable 0.1 to 10 minutes), set at 5 minutes.
 7. Transfer to emergency time delay (adjustable 1 to 300 seconds), set at 1 second.
- B. Provide a system test switch (momentary type) on the front of the enclosure.
 - C. Manual push button to bypass the time delay on retransfer.
 - D. Indicating lights to indicate source to which the load is connected.
 - E. Indicating light to indicate presence of normal power source.
 - F. Auxiliary contacts for remote indication of switch position, one normally open and one normally closed contact for normal and emergency position.
 - G. Where required for motor load coordination, provide auxiliary contacts to interrupt control power during transfer.

2.03 MANUFACTURERS:

- A. The transfer switch shall be as manufactured by:
 1. Automatic Switch Company.
 2. Russelectric Co.
 3. Zenith (ZTS).
 4. Eaton Electrical.
 5. Thomson Technology.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Install transfer switch as a **wall-mounted enclosed unit**, securely anchored to inside of NEMA 4X enclosure as indicated on Drawings in accordance with manufacturer's instructions.

3.02 FIELD TESTING:

- A. **Field test per manufacturer's recommended standard test procedure.**

B. **Field test and calibrate timing and monitoring logic. All adjustments shall be within 5 percent of the previously specified set points.**

3.03 CONTRACT CLOSEOUT:

A. Provide in accordance with Section 01 77 00.

END OF SECTION

SECTION 26 43 00

SURGE PROTECTION DEVICES

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide Surge Protection Devices (SPDs) components in combination with the electrical distribution system equipment as indicated and in compliance with Contract Documents. The distribution system includes switchboards, motor control centers, 480V distribution panels and 120V panelboards.
- B. The components shall provide protection for electrical and electronic devices against the damaging effects of surges, transients and electrical line noise.
- C. Where indicated on the electrical contract drawings, provide separate, modular components from the electrical distribution equipment enclosures. Provide conduit, cable and all associated components for a complete SPD system installation. It shall be the Electrical Contractor's responsibility to verify adequate space for locating modular SPD equipment adjacent to associated electrical distribution equipment.

1.02 REFERENCES:

- A. American National Standard Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE):
 - 1. C62.41.1: IEEE Guide on the Surges Environment in Low-Voltage (1000V and Less) AC Power Circuits
 - 2. C62.45: Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits
- B. National Electrical Manufacturers Association (NEMA):
 - 1. 250: Enclosures for Electrical Equipment (1000 volts maximum)
 - 2. LS 1: Low Voltage Surge Protection Devices
- C. National Fire Protection Association (NFPA):
 - 1. 70: National Electrical Code (NEC).
- D. Underwriters Laboratory (UL):
 - 1. 1449: Standard for Safety, Surge Protective Devices - Third Edition.
 - 2. 1283: Standard for Safety, Electromagnetic Interference Filters

1.03 SUBMITTALS:

- A. Submit the following in accordance with Section 01 33 00:
 - 1. Shop drawings, manufacturer's product data, and component ratings in accordance with this section and the requirements of Section 26 05 10.
 - 2. SPD type, model number, system voltage, phases, modes of protection, Maximum Continuous Operating Voltage (MCOV) Voltage Protection Rating (VPR), Short Circuit Current Rating (SCCR), and Nominal Discharge Current (In).
 - 3. Provide outline drawings and internal wiring diagrams.
 - 4. List all required installation criteria including circuit breaker trip rating to meet UL 1449, Third Edition.
 - 5. Identify all cable sizes, distance limits and accessory devices when SPD units are to be provided in separate enclosures, where applicable.
 - 6. For informational/purposes only, submit installation instructions and separate from all other submittals.
 - 7. UL 1449 listing and summary of factory test data.

1.04 QUALITY ASSURANCE:

- A. SPD units and all components shall be designed, manufactured, and tested in accordance with the latest applicable UL Standard ANSI/UL 1449 Third Edition.

1.05 DELIVERY, STORAGE AND HANDLING:

- A. Provide in accordance with Section 26 05 10 and as specified.
- B. Shipping:
 - 1. Ship equipment and materials, except where partial disassembly is required by transportation regulations or for protection, complete with identification and quantity of items.
 - 2. Pack spare parts in containers bearing labels clearly designating contents and pieces of equipment for which intended.
 - 3. Deliver spare parts after installation but before start-up of system as specified. Deliver to Owner after completion of work.
- C. Storage:
 - 1. Inspect and inventory items upon delivery to site.

2. Store and safeguard equipment, materials, and spare parts.

1.06 WARRANTY AND SERVICE:

- A. Provide in accordance with Section 01 78 36 and as specified.
- B. The Surge Protection Device (SPD) manufacturer is to warranty the components against defective materials and workmanship for a period of five years following delivery from the manufacturer.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

- A. Surge Protection Device components.
 1. Eaton/Cutler-Hammer.
 2. Phoenix Contact.
 3. Siemens.
 5. ABB Inc.

2.02 PROVISIONS:

- A. Environmental Requirements:
 1. Operating Temperature: minus 40 degrees C to 60 degrees C.
 2. Relative Humidity: 5 to 95 percent.
 3. Operating Altitude: 0 to 12,000 Feet (0 to 3,660 meters).
 4. Audible Noise: Less than 35 dBA at 3 feet (1 m).
- B. Electrical Requirements:
 1. The maximum continuous operating voltage of all suppression components utilized is not to be less than 115 percent of the nominal operating voltage at the installed location.
 2. ANSI/UL 1449 3rd Edition Voltage Protection Rating (VPR) – The maximum ANSI/UL 1449 3rd Edition VPR for the device shall not exceed the following:

<u>Volts</u>	<u>L-N</u>	<u>L-L</u>	<u>N-G</u>
208Y/120	460V	1000V	700V

3. The ANSI/IEEE C62.41.1-1991 Category C3 let through voltages shall not exceed the following

<u>Volts</u> 208Y/120	<u>L-N</u> 550V	<u>N-G</u> 470V
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4. The SPD components are to be rated as follows:

120/208Y/120V Service Entrance 120 kA per phase
60 kA per mode

5. The mode of operation is to protect against surges and transients as follows:

<u>System Configuration</u> Three Phase, Four Wire (Wye) + Ground	<u>Protection Mode</u> L to L, L to G, L to N, and N to G
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2.03 OPERATION:

- A. The suppression system shall incorporate a hybrid designed Metal-Oxide Varistors (MOV) surge suppressor. The system shall not use silicone avalanche diodes, air gaps or other methods of suppression.
- B. Each unit shall include a high-performance EMI/RFI noise rejection filter. Noise attenuation for electric line noise shall be 50 dB at 100 kHz.
- C. SPD shall provide surge current diversion between each phase conductor and the neutral conductor, between each phase conductor and ground and between the neutral conductor and ground. For delta systems, the SPD shall have components directly connected between each phase conductor and between each phase conductor and ground.
- D. The SPD shall provide a low impedance path for surge current using over sized conductors with equal impedance paths to each suppression element. Plug-in style connections or printed circuit boards for use in the path of surge current shall not be used.
- E. Operating Parameters:
 1. The maximum response time shall not exceed 1 nanosecond.
 2. Provide with a noise filtering system capable of managing noise levels produced by electro-magnetic interference and radio frequency interference. The noise filtering system shall reject a minimum of 50db at 100 kHz as measured by the 50 Ohm Insertion Loss Method (Military Standard 220A).
 3. The parallel system components shall operate over a minimum frequency range of 47 Hertz to 63 Hertz.

4. The SPD components shall limit total harmonic distortion produced to less than one percent.
5. SPD component ratings to be per UL 1449.
6. Each unit shall be factory tested at the maximum continuous operating voltage and short circuit tested, prior to delivery.

F. Product Components:

1. Protection and Filtering Elements:

- a. The SPD components shall consist of replaceable protection modules designed to suppress and divert transient voltages and surge currents. Each protection module shall contain one or more individually fused metal oxide varistors capable of withstanding over 1000 surges of Category C (IEEE/ANSI C62.41.1) current rated at 10,000 amperes.
 - b. Each protection module shall contain filtering elements capable of providing noise attenuation.
 - c. The SPD components shall substantially limit transient waveform rise-time characteristics. The components are to be configured as parallel connected, current carrying elements designed to enhance the surge suppression and diversion performance of the protection modules.
2. Provide individual fusing to allow the SPD to be isolated during fault conditions.
 3. Provide red and green solid-state status lights which indicate operational status of each unit and visual diagnostic monitoring of each component and module. Provide audible alarm to activate on fault condition, with a silence switch and push-to-test alarm switch.
 4. Provide surge counter with battery backup to retain memory upon loss of AC power.
 5. Provide remote status monitoring with form C dry contacts monitoring all phases.

2.04 SHOP TESTING:

- A. Perform factory performance testing on each unit. The test to consist of the following:
 1. High voltage impedance test.
 2. Current test.
- B. Tests shall be in accordance with the following standards:
 1. ANSI/IEEE C62.41.1 Cat. A, B, & C.

2. ANSI/IEEE C62.45.

3. Underwriters Laboratory UL 1449.

C. Submit certified documentation of all factory tests performed.

D. Perform above tests in addition to standard factory tests.

2.05 SPARE PARTS:

A. Provide in accordance with Section 01 78 23 and as specified.

B. Provide one spare protection module of each type for on-site spare parts purposes.

PART 3 - EXECUTION

3.01 INSPECTION:

A. Visually inspect delivered unit(s) and accessories for conformance with drawings and specifications. Replace all components found to exhibit defects.

3.02 INSTALLATION:

A. Install unit in compliance with the manufacturers printed instructions. All electrical installation work shall be in accordance with UL Listing Requirements and applicable National or Local Electrical Codes.

B. For units mounted adjacent to electrical distribution equipment, verify conduit and wire for the SPD components are as specified by the SPD manufacturer and installed in strict accordance with the National Electrical Code.

C. Verify UL 1449, third edition, label is provided on each unit.

3.03 CONTRACT CLOSEOUT:

A. Provide in accordance with Section 01 77 00.

END OF SECTION

SECTION 26 56 00
EXTERIOR LIGHTING

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide complete outdoor lighting systems as indicated and in compliance with Contract Documents.
- B. Light fixture schedules are provided on the Contract Drawings. These Specifications are to be considered supplementary to the information contained in the light fixture schedule. In areas of conflict the scheduled items shall be provided.
- C. Fixtures shall be high-efficiency LED luminaires complying with applicable energy code requirements.

1.02 REFERENCES:

- A. ASTM International (ASTM):
 - 1. A500/A500M: Cold Formed Welded and Seamless Carbon Steel Structural Tubing.
 - 2. B209/B209M: Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
 - 3. B429/B429M: Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube
- C. Institute of Electrical and Electronics Engineers (IEEE):
 - 1. C62.41.1: IEEE Guide on the Surges Environment in Low-Voltage (1000V and Less) AC Power Circuits
 - 2. C62.41.2: IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits
 - 3. C136.20: Roadway Lighting Equipment - Fiber-Reinforced Plastic (FRP) Lighting Poles
- D. National Fire Protection Association (NFPA):
 - 1. 70: National Electrical Code (NEC).
- E. Underwriters' Laboratories, Inc. (UL):

1. 773: UL Standard for Safety Plug-In Locking Type Photocontrols for Use with Area Lighting-Fourth Edition

2. 1598: UL Standard for Safety Luminaires

1.03 DEFINITIONS:

- A. Fixture: Complete lighting device. Fixtures include lamp or lamps and parts required to distribute light, position and protect lamps, and connect lamps to power supply.
- B. Lighting Unit: Fixture or assembly of fixtures with common support, including pole or bracket plus mounting and support accessories.
- C. Luminaire: Fixture.

1.04 SUBMITTALS:

- A. Submit the following shop drawings in accordance with Section 01 33 00.
- B. Submit shop drawings and manufacturer's product data with installation instructions in accordance with the requirements of Section 26 05 10.
- C. Submit manufacturer's shop drawings including photometric laboratory test data to show that luminaires proposed are of same type, construction and quality as those indicated. Luminaires are to be listed and labeled by Underwriters' Laboratories.
- D. Product Data:
 - 1. Submit product data for luminaires, drivers, poles, mounting hardware, and integral photocells.
 - a. Outline drawings indicating dimensions and principal features of fixtures and poles.
 - b. Electrical Ratings and Photometric Data as published by manufacturer.
- E. Shop Drawings:
 - 1. Detail nonstandard fixtures and poles and indicating dimensions, weights, method of field assembly, components, and accessories.
 - 2. Anchor-Bolt Templates: Keyed to specific poles and certified by manufacturer.
- F. Operating and Maintenance Data (O&M): Maintenance data for products to include operation and maintenance information.

1.05 QUALITY ASSURANCE:

- A. Comply with IEEE C2.

- B. Items provided under this section shall be listed or labeled labelled by UL or other Nationally Recognized Testing Laboratory (NRTL).
 - 1. Term “NRTL” shall be as defined in OSHA Regulation 1910.7.
 - 2. Terms “listed” and “labeled” shall be as defined in National Electrical Code (NEC), Article 100.
- C. Regulatory Requirements:
 - 1. National Electrical Code (NEC): Components and installation shall comply with National Fire Protection Association (NFPA) 70.

1.06 STORAGE AND HANDLING OF POLES:

- A. Metal Poles: Retain factory applied pole wrappings until just before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

PART 2 - PRODUCTS

2.01 FIXTURES AND FIXTURE COMPONENTS:

- A. Metal Parts: Free from burrs, sharp edges, and corners.
- B. Sheet Metal Components: Corrosion resistant aluminum, except as otherwise indicated. Form and support to prevent warping and sagging.
- C. Housings: Rigidly formed, weather and light tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed fixtures.
- D. Doors, Frames, and Other Internal Access: Shall permit maintenance without use of special tools.
- E. Exposed Hardware Material: Stainless steel.
- F. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
- G. Lenses and Refractors: Materials as indicated. Use heat- and aging-resistant, resilient gaskets to seal and cushion lens and refractor mounting in fixture doors.
- H. Photoelectric Relays: Conform to UL 773.
 - 1. Photoelectric control shall be integral to luminaire, arranged to fail in ON position, and factory set for dusk-to-dawn operation.
 - 2. Relay Mounting: In fixture housing.

2.02 LED FIXTURES

- A. Provide fixtures on the DesignLights Consortium (DLC) Qualified Products List.
- B. Thermal Management: Liquids or other moving parts shall be clearly indicated in submittals, and shall be consistent with product testing.
- C. Color Rendering Index (CRI): >70.
- D. Correlated Color Temperature: 3000K.
- E. Minimum luminaire efficacies: 85 lumens per watt. Nominal input wattage shall account for nominal applied voltage and any reduction in driver efficiency due to sub-optimal driver loading.
- F. Fully enclosed wiring and LED diodes enclosed to prevent penetration of dust, insects, and other debris into the lamp and driver compartment.
- G. Driver/LED combined system shall have rated life based on IESNA LM-80-2008 (or latest) of 50,000 hrs at 70 percent lumen maintenance.
- H. Driver is high efficiency type with THD < 20 percent and power factor > 0.90.
- I. Outdoor fixtures capable of reliable operation in temperature range of -30 degrees C to +40 degrees C minimum.

2.03 FIXTURE SUPPORT COMPONENTS:

- A. Pole-Mounted Fixtures: Conform to AASHTO LTS-6.
- B. Wind-load strength of total support assembly, including pole, arms, appurtenances, base, and anchorage, is adequate to carry itself plus fixtures indicated at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of 100 mi./h (160 km/h) with gust factor of 1.3.
- C. Arm, Bracket, and Tenon Mount Materials: Match poles' finish.
- D. Mountings, Fastenings, and Appurtenances: Corrosion-resistant items compatible with support components. Use materials that will not cause galvanic action at contact points. Use mountings that correctly position luminaire to provide indicated light distribution.
- E. Pole Shafts: **Round, tapered.**
- F. Pole Bases: Anchor type with galvanized steel hold-down or anchor bolts, leveling nuts, and bolt covers.
- G. Poles: Steel tubing conforming to ASTM A500/A500M, Grade B, carbon steel with minimum yield of 46,000 psi (317 MPa). Poles are 1 piece construction up to 40 feet (12 m) in length and have access handhole in wall.

- H. Aluminum Poles: ASTM B429/B429M, 6063-T6 alloy. Provide access handhole in pole wall.
- I. Metal Pole Grounding Provisions: Welded 1/2 inch (12 mm) threaded lug, accessible through handhole.
- J. Metal Pole Brackets: Designed to match pole metal. Provide cantilever brackets without under-brace, in sizes and styles indicated, with straight tubular end section to accommodate fixture.
- K. Pole Top Tenons: Fabricated to support fixture or fixtures and brackets indicated and securely fastened to pole top.
- L. Concrete for Pole Foundations:
 - 1. Comply with Section 03 30 00.
 - 2. Use 3000 psig (20 MPa) strength, 28 day concrete.

2.04 FINISHES:

- A. Metal Parts: Manufacturer's standard finish, except as otherwise indicated, applied over corrosion resistant primer, free of streaks, runs, holidays, stains, blisters, and similar defects.
- B. Other Parts: Manufacturer's standard finish, except as otherwise indicated.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Set units plumb, square, level, and secure according to manufacturer's written instructions and accepted submittals.
- B. Concrete Foundations: Construct according to Section 03 30 00.
 - 1. Comply with details and manufacturer's recommendations for reinforcing, anchor bolts, nuts, and washers. Verify anchor bolt templates by comparing with actual pole bases furnished.
 - 2. Finish: Trowel and rub smooth parts exposed to view.
- C. Embedded Poles: Set poles to indicated depth, but not less than 1/6 of pole length below finish grade. Dig holes large enough to permit use of tampers the full depth of hole. Backfill in 6 inch (150 mm) layers and thoroughly tamp each layer so compaction of backfill is equal to or greater than that of undisturbed earth.
- D. Pole Installation: Use web fabric slings (not chain or cable) to raise and set poles.

- E. Fixture Attachment: Fasten to indicated structural supports.
- F. Fixture Attachment with Adjustable Features or Aiming: Attach fixtures and supports to allow aiming for indicated light distribution.
- G. Lamp fixtures with indicated lamps according to manufacturer's written instructions. Replace malfunctioning lamps.

3.02 GROUNDING:

- A. Ground fixtures and metal poles according to Section 26 05 26.
 - 1. Poles: Install 10 feet (3 m) driven ground rod at each pole.
 - 2. Nonmetallic Poles: Ground metallic components of lighting unit and foundations. Connect fixtures to grounding system with No. 6 AWG conductor.

3.03 FIELD QUALITY CONTROL:

- A. Inspect each installed unit for damage. Replace damaged fixtures and components.
- B. Tests and Observations:
 - 1. Give advance notice of dates and times for field tests.
 - 2. Provide instruments to make and record test results.
 - 3. Verify normal operation of lighting units after installing fixtures and energizing circuits with normal power source. Include following:
 - a. Photometric Tests: Measure light intensities at night at locations where specific illumination performance is indicated. Use photometers with calibration referenced to National Institute of Standards and Technology (NIST) standards.
 - b. Check for intensity of illumination.
 - c. Check for uniformity of illumination.
 - d. Check for excessively noisy ballasts.
 - e. Prepare written report of tests indicating actual illumination results.
 - 4. Replace or repair damaged and malfunctioning units, make necessary adjustments, and retest. Repeat procedure until units operate properly.

3.04 ADJUSTING AND CLEANING:

- A. Clean units after installation. Use methods and materials recommended by manufacturer.
- B. Adjust aimable fixtures to provide required light intensities.

3.05 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01 77 00.

END OF SECTION

SECTION 31 23 00

EXCAVATION AND FILL

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide excavation and fill as indicated and in compliance with Contract Documents.
- B. Section includes:
 - 1. Excavation and fill for: Foundations, structures, site drainage, and features.
 - 2. Controlled fill using materials from imported and on-site sources.
 - 3. Soil and aggregate materials.
 - 4. Compaction and testing.

1.02 REFERENCES:

- A. American Association of State and Highway Transportation Officials (AASHTO):
 - 1. M147: Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base, and Surface Courses.
- B. ASTM International (ASTM):
 - 1. C33: Specification for Concrete Aggregates.
 - 2. C136: Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
 - 3. D421: Practice for Dry Preparation of Soil Samples for Particle Size Analysis and Determination of Soil Constants.
 - 4. D422: Test Method for Particle-Size Analysis of Soils.
 - 5. D698: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³)).
 - 6. D1556: Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
 - 7. D1557: Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/ft³ (600 kN-m/m³)).

8. D2167: Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
9. D2487: Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
10. D2940/D2940M: Standard Specification for Graded Aggregate Material For Bases or Subbases for Highways or Airports.
11. D4318: Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
12. D6938: Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

C. Occupational Safety and Health Administration (OSHA) Standards and Regulations:

1. 29 CFR 1926, Subpart P: Safety and Health Regulations for Construction, Excavations.

1.03 CLASSIFICATION OF EXCAVATION:

- A. Excavation is part of the lump sum contract price for the entire project.

1.04 DEFINITIONS

- A. Percent Compaction or Compaction Density: The field dry density of compacted material, expressed as a percentage of the maximum dry density.
- B. Field Dry Density or Field Density: In-place density as determined by ASTM D1556 (Sand Cone Method), ASTM D2167 (Rubber Balloon Method), or ASTM D6938 (Nuclear Method).
- C. Maximum Dry Density: Laboratory density as determined by ASTM D698 (Standard Proctor) or ASTM D1557 (Modified Proctor) and occurring at the optimum moisture content of the material being tested.

1.05 SUBMITTALS:

- A. Submit the following in accordance with Section 01 33 00.
 1. Temporary excavation and shoring drawings for worker protection in accordance with the General Conditions.
 2. Gradation analysis.
 3. Materials Sources: Name of source, location, date of sample, sieve analysis, and laboratory compaction characteristics.
 4. Test and Evaluation Reports:

- a. Field density testing reports: Provide results from field density testing of prepared subgrade and compacted fill.
- b. Grain-size analysis.
- c. Laboratory compaction characteristics of soils.
- d. Water content.

5. Geotextile:

- a. At least two weeks prior to shipment, submit manufacturer's certificate of compliance and physical property data sheet indicating that requirements for materials and manufacture are in conformance as specified.
- b. For informational purposes only, submit manufacturer's printed installation instructions.

1.06 QUALITY ASSURANCE:

- A. Comply with the requirements specified in Section 01 43 00.
- B. Sustainability Standards Certifications.
- C. Testing will be provided by the Owner as specified. Contractor shall be responsible for cost of testing and inspection conducted as a result of non-conforming work.
- D. Protect excavations by shoring, bracing, sheet piling, underpinning or other methods required to prevent cave-in of loose soil. Protection shall be in accordance with [OSHA 29 CFR 1926, Subpart P](#).

1.07 DELIVERY STORAGE AND HANDLING:

- A. Comply with the requirements specified in Section 01 66 10.

PART 2 - PRODUCTS

2.01 FILL MATERIALS:

- A. Suitable Material: Material from on-site excavation or permitted off-site sources that meets all of the specified requirements for its intended use and is not unsuitable. Wet subgrade material which meets other requirements for suitable material is suitable.
- B. Unsuitable Material: Material that fails to meet requirements for suitable materials; or contains any of the following:
 - 1. Organic clay, organic silt, or peat; as defined in ASTM D2487.

2. Vegetation, wood, roots, leaves, and organic, degradable material.
 3. Stones or rock fragments over 6 inches in any dimension.
 4. Porous biodegradable matter, excavated pavement, construction debris, rubbish, or refuse.
 5. Ice, snow, frost, or frozen soil particles.
- C. General Fill: Suitable, unclassified material.
- D. Structural Fill: Suitable material that is classified by the Unified Soil Classification System (USCS) in accordance with ASTM D2487 as GW, GP, GM, GC, SW, SP, SM, SC, CL. Verify that the largest particles in the fill are no greater in dimension than one-half the thickness of the compacted lift thickness.
- E. Granular Fill:
1. Densely Graded: VDOT No. 21A or 21B, Type I or II.
 2. Open Graded: ASTM C33, coarse aggregate, No. 57. VDOT No. 57, Type I or II.
 3. Open Graded: Screened Gravel or Crushed Stone: ASTM C33, Coarse Aggregate, No. 67. Soil particles shall conform to the physical property requirements of ASTM C33.

2.02 EQUIPMENT:

- A. Compaction equipment shall be capable of consistently achieving the specified compaction requirements.

PART 3 - EXECUTION

3.01 EXAMINATION:

- A. Verify that dewatering support systems are in place before commencing with excavation.
- B. Verify that excavation safety and support systems meeting the requirements of OSHA 29 CFR 1926, Subpart P are in place before commencing with excavation.
 1. Minimum slopes for laying back excavations or materials are contained in OSHA 29 CFR 1926, Subpart P; Appendices A and B.
 2. Minimum requirements for shoring and bracing are contained in OSHA 29 CFR 1926, Subpart P; Appendix C.
- C. Verify that fill materials submittals have been accepted by Engineer before commencing with work requiring the use of these materials.

- D. Verify that erosion and sediment control measures are in place and functioning properly.
- E. Immediately notify the ENGINEER if unexpected subsurface facilities or suspected hazardous materials are encountered during excavation. Discontinue affected work in area until notified to resume work.
- F. Test Pits:
 - 1. Comply with the requirements in Section 01 14 14.
 - 2. Excavate test pits to field verify the locations of existing underground utilities at crossings and at tie-in points before ordering materials or commencing excavation. Immediately notify the ENGINEER if conflicts are encountered.

3.02 PREPARATION:

- A. Underpin adjacent structures that could be damaged by excavation work.
- B. Cut pavement with saw or pneumatic tools to prevent damage to remaining pavement. Dispose of large pieces of demolished pavement before proceeding with excavation.
- C. Remove subsurface structures and related obstructions as indicated.
- D. Remove boulders within excavation limits.

3.03 PROTECTION OF IN-PLACE CONDITIONS:

- A. Comply with the requirements specified in Section 01 14 14.
- B. Support and protect from damage – existing pipes, poles, wires, fences, curbs, property line markers, and other features or structures which must be preserved in place to avoid being temporarily or permanently relocated.
- C. Excavation Near Existing Structures:
 - 1. Discontinue digging by machinery when excavation approaches pipes, conduits, or other underground structures. Continue excavation by use of hand tools. Include such manual excavation in work to be done when incidental to normal excavation and under items involving normal excavation.
 - 2. Excavate test pits near, or at intersection with, existing utilities or underground structures to determine the exact location of existing features.
- D. Excavation Near Private Property:
 - 1. Enclose uncut tree trunks adjacent to work in wooden boxes of such height necessary to protect tree from injury due to piled material, equipment, or operations. Operate excavating machinery and cranes so as to prevent injury to overhanging branches and limbs.

2. Protect cultivated hedges, shrubs, and plants which would otherwise be damaged by the work.
3. Where protection of vegetation is not possible, dig up, temporarily transplant, and maintain. After active construction operations in the area have ceased, transplant vegetation to the original positions and provide water and nursery care until growth is re-established.
4. Do not use or operate tractors, bulldozers, or other power-operated equipment on paved surfaces. Provide protection on pavement or tracks if construction traffic is unavoidable.

3.04 RESTORATION:

- A. Restore private property and structures promptly. Begin restoration work within 24 hours of when damage occurred.
- B. Existing surfaces, features, or utilities that are to remain but are damaged during construction shall be repaired or replaced to at least the condition in which they were found immediately before work began, unless noted otherwise.
- C. Damaged Trees To Remain: Cut all damaged branches, limbs, and roots smoothly and neatly without splitting or crushing. Neatly trim, cut the injured portions and cover with an application of grafting wax or tree healing paint. Replace damaged trees which subsequently die or continue to show lack of growth due to damage.
- D. Cultivated Vegetation: Includes, but is not limited to: hedges, shrubs, and plants. Vegetation that is damaged shall be replaced with equal kind and of at least the quality before work began.

3.05 EXCAVATION:

- A. Excavate to accommodate new structures and construction operations.
- B. Excavate to lines and grades necessary to provide finish grades.
- C. Excavations that are not shored and deeper than 4 feet (1.2 m) shall have banks laid back to a minimum stable slope matching the angle of repose of the excavated material.
- D. Workers shall have an adequate means of exit from excavations that are 4 feet (1.2 m) or greater in depth. The means of exit shall not require more than 25 feet (7.5 m) of lateral travel.
- E. Establish limits of excavation to allow adequate working space for installing forms and for safety of personnel.

- F. Carry out program of excavation, dewatering, and excavation support systems to eliminate possibility of undermining or disturbing foundations of existing structures or the work.
- G. Preserve material below and beyond the lines of excavations.
- H. Locate stockpiled excavated material at least 3 feet from edge of excavations to prevent cave-ins or bank slides.
- I. Excavate for depressed mat foundations so that adjacent sections of foundation mat will rest on undisturbed ground.

3.06 SUBGRADE PREPARATION:

- A. The exposed surface shall be examined by an engineering geologist or soils engineer to determine that the proper bearing material has been exposed.
- B. Materials which are determined to be unsuitable by visual inspection shall be over-excavated below the foundation subgrade and backfilled with structural fill.
- C. Backfill with compacted open-graded granular fill wrapped with nonwoven geotextile fabric. In no case shall the aggregate be placed directly on the exposed subgrade prior to placing the geotextile fabric.
- D. Compact subgrade and proof roll to identify soft spots or other deficiencies prior to filling operations or placing foundations. Correct deficiencies as specified for AUTHORIZED OVER-EXCAVATION and repeat proof roll procedure until successful.
- E. When subgrade is below controlled fill, scarify subgrade to bond with subsequent material lifts.
- F. Proof roll foundation subgrade prior to filling operation or placing foundation concrete. Continue until successful proof test is attained.

3.07 AUTHORIZED OVER-EXCAVATION:

- A. If proof roll test fails then remove unsuitable material plus an additional 6 inches (150mm), and backfill with structural fill.

3.08 UNAUTHORIZED EXCAVATION:

- A. Contractor is responsible for backfilling unauthorized excavations with structural fill.

3.09 FILL:

- A. Fill to lines and grades necessary to provide finish grades.
- B. Use a placement method that does not disturb or damage other work or existing features.

- C. Maintain fill materials within 3 percent of optimum moisture, to attain required compaction density.
- D. Place and compact material in equal continuous layers.
- E. General fill may be used in open areas, over lot fill, and areas which are not load bearing.
- F. Use structural fill beneath and adjacent to buildings and structures, and beneath pavements.
- G. Use concrete fill where footing bearing surfaces are over-excavated or footing is otherwise not bearing on undisturbed soil.
- H. Maximum compacted depth is 6 inches for aggregate materials and 8 inches for soil materials, unless noted otherwise.

3.10 **COMPACTION:**

- A. Compact to density specified and indicated for various types of material. Control moisture content of material being placed as specified, or if not specified - at a level slightly lower than optimum.
- B. Compaction Density: Provide densities in Table 31 23 00-3. The values listed are minimum percentages, unless noted otherwise.

Table 31 23 00-3	
Area	Percentage of Maximum Dry Density as defined by ASTM D1557 (Modified Proctor)
Scarified subgrades	90
Under pavement, slabs	95
Under structures or within 25 feet (7.5 m) of structures	95
Under exterior concrete slab and sidewalks	90
Open or grassed areas	85
Topsoil	85 (maximum)

3.11 **BACKFILLING AGAINST STRUCTURES:**

- A. Backfill shall not be placed against foundation walls until all interior floors have been placed and the concrete has attained design strength. This includes the floor level at grade or the next level above grade if no floor is within 2 feet (0.6 m) of finished grade.

- B. Backfill shall not be placed against cantilever walls until the concrete has attained design strength.

3.12 EMBANKMENT FILL AND COMPACTION:

- A. Begin filling in lowest section of work area. Grade surface of fill approximately horizontal but provide with sufficient longitudinal and transverse slope to allow for runoff of surface water from every point.
- B. Install temporary dewatering sumps in low areas during filling operation where excessive amounts of rain runoff collect.
- C. Reduce moisture content of fill material, if necessary, in source area by aerating it over during warm and dry atmospheric conditions. A large disc harrow with two to three foot diameter disks may be required for working soil in a drying operation.
- D. Compact uniformly throughout. Keep fill surfaces sufficiently smooth and free from humps and hollows to allow for proper and uniform compaction. Do not permit hauling equipment to follow a single track on the same layer but direct equipment to spread out to prevent over compaction in localized areas. Take care in obtaining thorough compaction at edges of fill.
- E. Slightly slope surface of fill to ensure drainage during periods of wet weather. Do not place fill while rain is falling or after a rain-storm until the ENGINEER considers conditions satisfactory. During such periods and upon suspension of filling operations for periods in excess of 12 hours, roll smooth the surface of fill using a smooth wheel static roller to prevent excessive absorption of rainfall and surface moisture. Prior to resuming compaction operations, remove muddy material off surface to expose firm, compacted material, as determined by the ENGINEER.
- F. When fill is placed against an earlier fill or against in-situ material under and around structures, including around piping beneath structures or embankments, slope junction between two sections of fill at 1.5 to 1 (horizontal to vertical). Bench edge of existing fill 24 inches to form a serrated edge of compact stable material against which to place the new fill. Ensure that rolling extends over junction between fills.
- G. Clean debris, remove loose material, and proof roll previously placed fill which has had time to become desiccated or littered with debris.
- H. After spreading each loose lift to the required thickness and adjusting its moisture content, roll with sufficient number of passes to obtain the required compaction. One pass is defined as the required number of successive trips which by means of sufficient overlap will insure complete coverage and uniform compaction of an entire lift. Do not make additional passes until previous pass has been completed.
- I. Fill surface shall be firm and hard when rolled. Reduce moisture content when fill material sinks and weaves under rollers and equipment. Spread out rolling operations over the maximum practicable area to minimize condition of sinking and weaving.

Suspend fill operations on portions of embankment where inundations produce surface cracks.

- J. Remove material which fails testing requirements and replace work.

3.13 GEOTEXTILE:

- A. Install geotextile fabric in accordance with manufacturer's printed instructions.
- B. Place geotextile fabric on the foundation subgrade prior to placing aggregate material.
- C. Overlap geotextile fabric 18 inches minimum for unsown lap joint. Overlap fabric 6 inches at seam for sewn joint.
- D. Do not permit traffic or construction equipment to travel directly on geotextile fabric.
- E. Place geotextile fabric in relatively smooth condition to prevent tearing or puncturing. Lay geotextile fabric loosely but without wrinkles or creases so that placement of the backfill materials will not stretch or tear geotextile fabric. Leave sufficient slack in geotextile fabric around irregularities to allow for readjustments.
- F. Patch all tears in geotextile fabric by placing additional section of geotextile fabric over tear with a minimum of 3 feet overlay.
- G. Extend the geotextile fabric and wrap around aggregate material along the perimeter of the foundation.

3.14 FIELD QUALITY CONTROL:

- A. See Section 01 40 00 for general requirements for field inspection and testing.
- B. Perform inspection at least once daily to confirm lift thickness and compaction effort for entire fill area.
- C. Perform particle size distribution and gradation analyses using ASTM D422 and following standard practices in ASTM D421. Perform 1 test for every source and submit results to Engineer for acceptance. Repeat the moisture density test for every 5,000 cubic yard of material used.
- D. Perform field density testing in accordance with ASTM D1556, ASTM D2167, or ASTM D6938.
- E. Evaluate field density test results in relation to maximum dry density as determined by testing material in accordance with ASTM D1557 (Modified Proctor).
- F. Perform tests in accordance with ASTM D4318 to determine Liquid Limit, Plastic Limit and Plasticity Index and submit test results to Engineer for acceptance. Minimum of one test per 5,000 cubic yard of soil for use as fill material and whenever classification of material is in doubt as determined by the Engineer.

- G. Location of field density tests shall be mutually acceptable to testing laboratory and the Engineer.
- H. In the event compacted material does not meet specified in-place density, re-compact material and re-test area until specified results are obtained.
- I. Frequency of field density tests:

Table 31 23 00-4	
Area	Frequency
Open Areas	1 per lift for each 25,000 square feet of fill placed
Isolated Footing Perimeter	1 per alternate lift for each 25 linear feet
Footing and Wall Backfill	1 per alternate lift for each 50 linear feet (both sides of wall)
Regardless of the minimum testing frequency specified, field density tests shall be performed by the Contractor in sufficient number for the Contractor's quality control purposes to ensure that specified density is obtained.	

3.15 ADJUSTING:

- A. Shrinkage:
 1. Build embankments or backfill to a height above finished grade which will, in the opinion of the Engineer, allow for the shrinkage or consolidation of material. Initially, provide at all points, an excess of at least one percent of total height of backfill measured from stripped surface to top of finished surface.
 2. Supply specified materials to build up low places when embankment or backfill settles below the finished grade at any time before substantial completion.

3.16 TOLERANCES:

- A. Construct finished surfaces to plus or minus 1 inch of the elevations indicated.
- B. Grade areas of cut and fill to plus or minus 0.20 foot of the grades indicated.
- C. Complete embankment edges to plus or minus 6 inches of the slope lines indicated.
- D. Provide the Engineer with adequate survey information to verify compliance with above tolerances.

3.17 PROTECTION:

- A. Formulate excavation, backfilling, and filling schedule and procedures to eliminate possibility of undermining or disturbing foundations of partially and completed structures, pipelines and embankments or existing structures and pipelines.

3.18 CLOSEOUT ACTIVITIES:

- A. Provide in accordance with Section 01 70 00.

END OF SECTION

SECTION 40 23 19.04

DUCTILE IRON PIPE AND FITTINGS

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide and test ductile iron pipe, fittings and appurtenances as indicated and in compliance with Contract Documents.
- B. Options:
 - 1. For piping exposed as in the wet well, provide flanged or rigid-joint, grooved-coupled pipe and fittings.
 - 2. Cast iron pipe and fittings are not acceptable.

1.02 REFERENCES:

- A. American Society of Mechanical Engineers (AMSE):
 - 1. B16.1: Cast-Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.
 - 2. B16.21: Nonmetallic Flat Gaskets for Pipe Flanges.
 - 3. B16.42: Ductile Iron Pipe Flanges and Flanged Fittings.
 - 4. B31.1: Power Piping.
- B. ASTM International (ASTM):
 - 1. A240: Specification for Heat Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels.
 - 2. A307: Carbon Steel Bolts and Studs, 60,000 psi Tensile.
 - 3. A380: Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment and Systems.
 - 4. A530: Specification for General Requirements for Specialized Carbon and Alloy Steel Pipe.
 - 5. A774: Specification for As-Welded Wrought Austenitic Stainless Steel Fittings for General Corrosive Service at Low and Moderate Temperatures.
 - 6. A778: Specification for Welded, Unannealed Austenitic Stainless Steel Tubular Products.

C. American Water Works Association (AWWA):

1. A21.4: Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
2. A21.10: Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in., for Water and Other Liquids.
3. A21.11: Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe Fittings.
4. A21.15: Flanged Ductile-Iron Pipe with Threaded Flanges.
5. A21.50: Thickness Design of Ductile-Iron Pipe.
6. A21.51: Ductile-Iron Pipe, Centrifugally Cast in Metal Molds, or Sand-Lined Molds, for Water or Other Liquids.
7. A21.53: Ductile-Iron Compact Fittings, 3-in through 16-in. for Water and Other Liquids.
8. C105/A21.5: Polyethylene Encasement for Ductile Iron Pipe Systems.

D. ISO:

1. 8179-1: Ductile Iron Pipes – External Zinc-Based Coating – Part 1: Metallic zinc with finishing layer. Second edition 2004-06-01.

E. Fluid Sealing Association: Technical Handbook.

1.03 SUBMITTALS:

A. Submit the following in accordance with Section 01 33 00:

1. Pipe manufacturer's technical specification and product data.
2. Certified shop and erection drawings. Contractor shall submit electronic files of the piping layout including the following.
 - a. Pipe layouts in full detail.
 - b. Location of hangers and supports.
 - c. Location and type of anchors.
 - d. Location of couplings and expansion joints.
 - e. 1/2-inch = 1 foot-0 inch scale details of all wall penetrations and special fittings.

- f. Schedules of pipe, fittings, special castings, couplings, expansion joints and other appurtenances.
 - 3. Certificates: Sworn certificates in duplicate showing compliance with material used and shop tests performed.
 - 4. Catalog cuts and technical data for expansion joints, couplings, gaskets, pipe supports and other accessories.
 - 5. Brochures and technical data on coatings and linings and proposed method of application.
 - 6. Manufacturer's descriptive literature and technical data on insulation and proposed method of installation.
- B. Material Certification:
- 1. Provide certification from the pipe and fittings manufacturer that the materials of construction specified are recommended and designed for the service conditions specified and indicated. If materials other than those specified are proposed based on incompatibility with the service conditions, provide technical data and certification that the proposed materials are recommended and designed for the service conditions specified and indicated including an installation list of a minimum of five (5) installations in operation for a minimum of five (5) years. Provide proposed materials at no additional cost to the Owner.
 - 2. Where materials are not specified, provide technical data and certification that the proposed materials are recommended and designed for the service conditions specified and indicated.
- 1.04 QUALITY ASSURANCE:
- A. Provide in accordance with Section 01 43 00 and as specified.
 - B. Provide manufacturer's certification in writing, that materials meet or exceed minimum requirements as specified.
 - C. Inspect and test at foundry according to applicable standard specifications.
 - D. Owner reserves right to inspect and test by independent service at manufacturer's plant or elsewhere at his own expense.
 - E. Visually inspect before installation.
 - F. Job Conditions:
 - 1. Coordinate dimensions and drillings of flanges with flanges for valves, pumps and equipment to be installed in the piping systems.

1.05 DELIVERY, STORAGE AND HANDLING:

- A. Comply with the requirements specified in Section 01 66 10.
- B. During loading, transportation and unloading, prevent damage to pipes and fittings. Load and unload each pipe under control at all times. Under no circumstances will a dropped pipe be used unless inspected and accepted by Engineer Place skids or blocks under each pipe in the shop and securely wedge pipe during transportation.

PART 2 - PRODUCTS

2.01 PIPE:

- A. Ductile Iron:
 - 1. Design conforming to AWWA A21.50.
 - 2. Manufacture conforming to AWWA A21.15 or AWWA A21.51.
 - 3. Pressure Class, unless otherwise indicated or specified:
 - a. Minimum Pressure Class, 4-inches through 12-inches: 350
 - b. Minimum thickness for use with grooved couplings conforming to AWWA C606.

2.02 PIPE FOR USE WITH COUPLINGS:

- A. As specified above except ends shall be plain.
- B. With bolted split sleeve couplings, ends cast or machined at right angles to axis.
- C. With grooved type coupling:
 - 1. Ductile-Iron of thickness class specified above.
 - 2. Grooved End dimensions conforming to AWWA C606 for flexible or rigid joints to suit joint requirements.

2.03 FITTINGS:

- A. Provide fittings conforming to AWWA A21.10 or AWWA A21.53, at least Class 150 and match piping class.
- B. Face and drill flanged fittings conforming to AWWA A21.10 except special drilling or tapping for correct alignment and bolting.

- C. If flanged fittings are not available under AWWA A21.10 provide fittings conforming to ASME B16.1 in 125 lb. pressure class.
 - D. Provide standard base fittings where indicated.
 - E. Provide grooved-end fittings ductile-iron conforming to AWWA A21.10 for center-to-face dimensions.
 - 1. End preparation for grooved-ends conforming to AWWA C606 for flexible or rigid joints as required by type of joint.
- 2.04 NONSTANDARD FITTINGS:
- A. Acceptable design.
 - B. Same diameter and thickness as standard fittings.
 - C. Manufactured to meet requirements of same specifications as standard fittings except for laying length and types of ends.
- 2.05 ADAPTERS:
- A. Furnish and install for joining pipe of different types, unless solid sleeves indicated.
 - 1. Provide ends conforming to above specifications for the correct type of joint, to receive adjoining pipe.
 - 2. Joining two classes of pipe may be of lighter class provided annular space in bell-and-spigot type joints sufficient for jointing.
- 2.06 JOINTS:
- A. Provide pipe flanges and accessories conforming to AWWA A21.15.
 - 1. Provide flat faced flanges.
 - 2. Provide 1/8-inch thick, full faced gaskets designed for exposure to liquid within pipe.
- 2.07 PIPE COATING:
- A. Outside of pipe and fittings within structures: Clean and apply one shop coat with a 3 to 5 mil (75 to 125 μm) DFT of moisture cured urethane.
 - B. Outside surfaces of castings to be encased in concrete: No coating.
 - C. Machined surfaces cleaned and coated with rust-preventative compound at shop.

2.08 CEMENT LINING:

- A. Inside of pipe and fittings: Provide double thickness cement lining and bituminous seal coat conforming to AWWA A21.4.

2.09 GASKETS, BOLTS, AND NUTS:

- A. Provide ring or full face synthetic rubber gaskets for flanged joints and neoprene faced phenolic for insulating gaskets in accordance with AWWA A21.11 and ASME B16.21.
 - 1. 1/8 inch thick.
- B. Make flanged joints with:
 - 1. Bolts.
 - 2. Bolt studs with nut on each end.
 - 3. Studs with nuts where flange is tapped.
 - 4. Plastic bolt sleeves and washers for insulating joints.
- C. Number and size of bolts conform to same as flanges.

PART 3 - EXECUTION

3.01 HANDLING AND CUTTING:

- A. Mark pipe and fittings "Rejected" and remove from site when cracked or has received a severe blow.
- B. If permitted, cut on sound barrel at a point at least 12 inch from visible limit of crack, at Contractor's expense.
- C. Machine cut with milling type cutters, knives, or saws. Snap cutters, torch, or hammer and chisel NOT ALLOWED. Examine for possible cracks.

3.02 INSTALLATION:

- A. Visually inspect before installation.
- B. Ensure pipelines parallel to building walls wherever possible. Install piping to accurate lines and grades. Where temporary supports are used, ensure rigidity to prevent shifting or distortion of pipe. Provide for expansion where necessary.
- C. Before assembly, remove dirt and chips from inside pipe and fittings.
- D. Pipe and Fittings:

1. Remove and replace defective pieces.
2. Clear of all debris and dirt before installing and keep clean until accepted.
3. Lay accurately to lines and grades indicated or required. Provide accurate alignment, both horizontally and vertically.

E. Appurtenances: Set valves, fittings and appurtenances as indicated.

3.03 JOINTS AND COUPLINGS:

A. Bolted Joints:

1. Remove rust-preventive coatings from machined surfaces.
2. Clean pipe ends, sockets, sleeves, housings, and gaskets and smooth all burrs and other defects.
3. Use torque wrench to tighten to correct range of torque not to exceed values specified below:

TORQUE RANGE VALUES		
Nominal pipe size, in	Bolt diameter, in	Range of torque, ft-lb
3	5/8	40-60
4-24, incl.	3/4	75-90
30, 36	1	100-120
42, 48	1-1/4	120-150

B. Flanged Joint:

1. Make up tight.
2. Do not put strain on nozzles, valves, and other equipment.
3. Bolt threads must fully engage the nuts. At a minimum the bolt must be flush with the nut and no more than 1/2-inch excess thread protruding from the nut.

3.04 FIELD TESTING:

A. Clean of all dirt, dust, oil, grease and other foreign material, before conducting pressure and leakage tests.

B. Pressure and Leakage Tests:

1. Conduct combined pressure and leakage test in pipelines.

2. Furnish and install temporary testing plugs or caps; pressure pumps, pipe connections, meters, gages, equipment, and labor.
3. Test when desired and comply with specifications.
4. Test pipelines in excavation or embedded in concrete before backfill or placing of concrete and test exposed piping before field painting.
5. Fill section of pipe with water and expel air. If hydrants or blowoffs are not available at high points for releasing air, make necessary taps and plug after test completion.
6. Maintain section full of water for 24 hours before conducting combined pressure and leakage test.
7. Maintain pressure and make leakage test by metering water flow into pipe. Acceptable results:
 - a. Average leakage during test: less than 10 gallons (1 liter) per inch of diameter per 24 hours per mile.
 - b. No visible leakage in joints.
8. If unable to achieve and maintain specified pressure for one hour with no additional pumping, section fails test.
9. If section fails pressure and leakage test, locate, uncover, and repair or replace defective pipe, fitting, or joint, at no additional expense and without time extension. Conduct additional tests and repairs until section passes test.
10. Modify test procedure only if permitted by Engineer.

3.05 FIELD PAINTING:

- A. Provide in accordance with Section 09 91 13.

3.06 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01 77 00.

END OF SECTION

SECTION 43 21 00.11

SUBMERSIBLE GRINDER PUMPS AND APPURTENANCES

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide and test submersible grinder pumps, motors and appurtenances as indicated and in compliance with Contract Documents.

1.02 REFERENCES:

- A. American Bearing Manufacturers Association (ABMA):
 - 1. 9: Load Ratings and Fatigue Life for Ball Bearings.
 - 2. 11: Load Ratings and Fatigue Life for Roller Bearings.
- B. ASTM International (ASTM):
 - 1. A48: Gray Iron Castings
- C. American National Standards Institute (ANSI):
 - 1. B16.1: Standard for Cast Iron Pipe Flanges and Flanged Fittings, 125 lb.
- D. Hydraulic Institute (HI):
 - 1. Current Standards.
 - 2. 11.6: Rotodynamic Pumps for Hydraulic Performance Acceptance Tests
- E. National Electrical Manufacturers Association (NEMA):
 - 1. MG1: Motors and Generators.

1.03 SUBMITTALS:

- A. Submit the following shop drawings in accordance with Section 01 33 00
 - 1. Certified shop and erection drawings. Contractor must submit electronic files of the proposed equipment of the capacity, size, and arrangement as indicated and specified.
 - a. Electronic files shall conform to the following minimum requirements:
 - (1) Electronic Files: AutoCAD latest version or Revit, drawn to scale.

- (2) Submit electronic files as part of the Shop Drawing submittal.
2. Data regarding pump and motor characteristics and performance:
 - a. Provide catalog performance curves at maximum pump speed indicated and specified for each service showing maximum and minimum impeller diameters available, acceptable operating range (AOR) and preferred operating range (POR).
3. Pump control system product data.
4. Factory drawing data for accessory items.
5. Certified setting plans, with tolerances, for anchor bolts.
6. Manufacturer's literature as needed to supplement certified data.
7. Operating and maintenance instructions and parts lists.
8. Listing of reference installations as specified with contact names and telephone numbers.
9. Certified results of hydrostatic testing.
10. Certified results of dynamic balancing.
11. List of recommended spare parts other than those specified.
12. Factory and field inspection reports.
13. Bearing Life: Certified by the pump manufacturer. Include design data.
14. Qualifications of field service engineer.
15. Recommendations for short and long-term storage.
16. Field testing procedures.
17. Special tools.
18. Number of service person-days provided and per diem field service rate.
19. Manufacturer's product data, specifications and color charts for shop painting.
20. Provide a listing of the materials recommended for each service specified and indicated. Provide documentation showing compatibility with process fluid and service specified and indicated.
21. The latest ISO 9001 series certification or Quality Assurance Manual.

22. Provide a scaled drawing for each pump service showing the pumps, motors, hoists and bridge cranes including equipment weights, lifting attachments, slings and clearances for equipment removal and maintenance.
 23. Material Certification:
 - a. Provide certification from the equipment manufacturer that the materials of construction specified are recommended and suitable for the service conditions specified and indicated. If materials other than those specified are proposed based on incompatibility with the service conditions, provide technical data and certification that the proposed materials are recommended and suitable for the service conditions specified and indicated including an installation list of a minimum of five (5) installations in operation for a minimum of five (5) years. Provide proposed materials at no additional cost to the Owner.
 - b. Where materials are not specified, provide technical data and certification that the proposed materials are recommended and suitable for the service conditions specified and indicated.
- B. A copy of this specification section with addenda and all referenced specification sections with addenda, with each paragraph check-marked to indicate specification compliance or marked and indexed to indicate requested deviations and clarifications from the specified requirements.
1. If deviations and clarifications from the specifications are indicated, therefore requested by the Contractor, provide a detailed written justification for each deviation and clarification.
 2. Failure to include a copy of the marked-up specification sections and or the detailed justifications for any requested deviation or clarification will result in submittal return without review until marked up specifications and justifications are submitted in a complete package.

1.04 SPARE PARTS:

- A. Comply with the requirements specified in Section 01 61 00.
- B. Provide spare parts that are identical to and interchangeable with similar parts installed.
 1. For each pump:
 - a. One set of cutter blades.
 2. For each set of pumps of the same size and performance.
 - a. One impeller

- b. One set of all special tools required.

1.05 QUALITY ASSURANCE:

- A. Comply with the requirements specified in Section 01 43 00.
- B. Pumps must be the product of one manufacturer.
- C. Pumps shall be manufacturer's standard cataloged product and modified to provide compliance with the drawings, specifications and the service conditions specified and indicated.
- D. Welding: In accordance with latest applicable American Welding Society Code or equivalent.
- E. Factory tests as specified.
- F. The Contractor to obtain the pumps, motors and appurtenances from the pump manufacturer, as a complete and integrated package to insure proper coordination and compatibility and operation of the system.
 - 1. The pumping system must be a complete and integrated package to insure proper coordination and compatibility and operation of the system.
 - 2. Guide rails can be supplied by the Contractor or the pump manufacturer at the Contractor's option. The pumping system must be a complete and integrated package to insure proper coordination and compatibility and operation of the system.
 - a. Coordinate the rail size and number of rails with the pump manufacturer and submit as part of the shop drawings a written statement signed by the contractor and pump manufacturer that the Contractor has received the required information from the pump manufacturer and that all parties have reviewed the cable or rail size and number of rails and coordinated the size, location and equipment removal.
- G. Services of Manufacturer's Representative as stated in Section 01 43 00 and as specified herein.
- H. Provide services of factory-trained Service Technician, specifically trained on type of equipment specified:
 - 1. Service Technician must be present on site for all items listed below. Person-day requirements listed are exclusive of travel time, and do not relieve Contractor of the obligation to place equipment in operation as specified.
 - 2. Installation: Inspect grouting, location of anchor bolts; setting, leveling, alignment, field erection; coordination of piping and electrical:

- a. [] person-days.
 - 3. Functional Testing: Calibrate, check alignment and perform a functional test with water. Tests to include all items specified.
 - a. [] person-days.
 - 4. Performance Testing: Field performance test equipment specified.
 - a. [] person-days.
 - 5. Vendor Training: Provide classroom and field operation and maintenance instruction including all materials, slides, videos, handouts and preparation to lead and teach classroom sessions.
 - a. [] person-days.
 - 6. Credit to the Owner, all unused service person-days specified above, at the manufacturer's published field service rate.
 - 7. Any additional time required of the factory trained service technician to assist in placing the equipment in operation, or testing or to correct deficiencies in installation, equipment or material shall be provided at no additional cost to the Owner.
- I. Manufacturer of pumps shall have a minimum of five (5) operating installations with pumps of the size specified and in the same service as specified operating for not less than five (5) years.
 - J. If equipment proposed is heavier or taller, different rotation, or discharge arrangement than specified and indicated; provide all structural, architectural, mechanical, electrical and plumbing revisions at no additional cost to the Owner.
 - 1. If equipment is heavier than specified, the Contractor to provide all hoisting equipment sized to maintain the minimum safety factor between the specified maximum equipment weight and the lifting capacity of the hoisting equipment indicated and specified.
- 1.06 DELIVERY, STORAGE AND HANDLING:
- A. Comply with the requirements specified in Section 01 66 10.

PART 2 - PRODUCTS

2.01 SYSTEM DESCRIPTION:

- A. Pump capacities and operating data are indicated in the Pump Schedule.

B. Raw Wastewater Pumps: Pump raw wastewater from wet wells.

2.02 MANUFACTURERS:

A. Submersible Grinder Pumps

1. Pentair Hydromatic – HPCH-750
2. Or Equal

2.03 PUMP CONSTRUCTION:

A. Type: Single stage, rotodynamic grinder type.

1. Provide pumps specifically designed to pump waste solids at heavy concentrations and consistencies without plugging or dewatering of solids.
2. Design pumps to chop, macerate and condition solids as an integral part of the pumping action.
3. Pumps must be capable of chopping through and pumping high concentrations of solids such as plastics, heavy rags, grease, hairballs, wood, paper products and stringy materials without plugging.

B. Casing:

1. Casing and Back Pull-Out Adaptor Plate: Cast Iron ASTM A48, resistant to abrasive action of solids or foreign matter contained in liquid.
2. Centerline discharge.
3. Fabricated steel casings are not acceptable.

C. Discharge Connection:

1. Flanges faced and drilled in accordance with 125 lb. ANSI B16.1 and for connection to discharge elbows.

D. Impeller:

1. Semi open, non clog grinder, single suction, dynamically balanced.
2. Provide waterways with smooth contours and well rounded entrances.
3. Provide pump out vanes to reduce seal area pressure, and to draw lubricant down from the reservoir should seal leakage occur.

4. Provide chopping/maceration of materials accomplished by the action of the cupped and sharpened leading edges at the bottom of the impeller blades as they move across the cutter wheel at all points across the suction opening.
5. 316 SST and dynamically balanced.
6. Hold impeller in place with a key for pumps 6-inch (150 mm) and smaller.
7. Secure impeller to the shaft with a hardened cutter nut designed to cut stringy materials and prevent binding.
 - a. 316 SST.
8. Fabricated steel impellers are not acceptable.

E. Cutters:

1. Material: 440C stainless steel hardened to 55-60 Rockwell C.

2.04 MOTORS:

- A. Provide in accordance with Section 26 20 20 and as specified and indicated.
- B. Horsepower rating of motors: Not less than maximum brake horsepower requirements of pumps under any condition of operation specified and indicated without operating in the motor service factor.
- C. Motor speed: As indicated in the Process Pump Schedule.
- D. Enclosure: Explosion proof, Class I, Division 1, Group D; UL or FM Listed.
- E. In addition to the requirements for bearings specified under Electric Motors in Section 26 20 20, provide pump motors with ball or roller bearings. Provide vertical motors with at least one bearing designed for thrust with bearings. Provide bearing with a minimum B-10 life of 100,000 hours.
- F. Operate without overheating at the speeds specified and indicated.
- G. Service Factor: 1.15.
- H. Rating: 208V, 3-phase, 60 Hertz.
- I. Insulation: Class H non-hygroscopic insulation with Class B temperature rise, 40 degree C ambient.
- J. Site Altitude: Less than 3,300 feet (1,000 metre) above sea level.
- K. Motors:

1. Provide complete sealed electric submersible squirrel cage induction motors in accordance with the above and as specified herein.
2. Provide the motor cooled via media cooling.
3. Provide a minimum of three mechanical shaft seals to prevent the pumped media from penetrating into the oil chamber and the motor housing.
4. Provide an inner mechanical seal in the oil chamber.
5. Provide a double mechanical seal within the oil chamber with silicon carbide faces and with the oil as a lubricant.
6. Provide the oil chamber designed to act as a barrier to trap moisture.
7. Provide a single or dual electrode leakage detector located in the oil chamber to sense water intrusion into the oil chamber to indicate the possible failure of both the outer process side mechanical seal and the outer oil chamber mechanical seal.
8. Insulate stator-winding and lead with moisture resistant Class H insulation for continuous duty in 40 degrees C rise liquids.
9. Provide motor capable of ten (10) starts per hour at maximum speed.
10. Motor shaft: Type 416 or Type 420 stainless steel or ASTM A576 Cr 1040 with Type 420 stainless steel sleeve.
 - a. One piece internal pump/motor shaft.
 - b. Provide shaft of sufficient diameter that the ratio of the shaft overhand, distance from lowest bearing to the impeller hub, to the shaft diameter through the seal area not to exceed 2.5.
11. Dynamically balance rotor to within NEMA vibration limits.
12. All hardware: Type 316 stainless steel.
13. Provide all cables of multi-conductor SOOW of sufficient length to extend from pump motor to a junction box as indicated. Provide cable size in accordance with NEC specifications.
14. Cable Entry:
 - a. Provide all power and control lead wires double sealed entering the motor in a method that prevents cable wicking.
 - b. Provide the sealing system consisting of a rubber grommet to seal the cable exterior followed by interior epoxy seal.

- c. Provide each cable wire with a section of insulation removed to establish a window area of bare wire and each wire surrounded by epoxy potting material.
 - d. Provide a cable strain relief mechanism as an integral part of this sealing system.
 - e. Provide the cable sealing system capable of withstanding an external pressure test of 1200 psi (83 bar) as well as a cable assembly pull test as required by UL or FM.
 - f. Provide the cable entry rated by UL or FM for submerged operating depths to 85 feet (26 meters).
 - g. Singular grommet or other similar sealing systems are not acceptable.
15. Moisture and Temperature Probes:
- a. Provide two moisture detection probes to detect moisture in the seal and stator cavity measuring conductivity.
 - b. Provide one piece cable from pump to control panel, see electrical drawings for panel location. Contractor to provide conduit and cable as indicated from pump to control panel.
 - c. Provide sufficient length of cable to extend from the pump assembly to a junction box above top of wet well as indicated.
 - d. Provide O-ring sealed plugged fill and drain inspection ports.
 - e. Provide winding over temperature protection.
 - f. Moisture detection to alarm, over temperature to shut down pumps, indicates condition and alarm.
16. Bearings:
- a. Provide a minimum of two bearings.
 - b. Minimum B-10 bearing life of 100,000 hours.
17. Provide all mating surfaces machined and fitted with O-rings. All fittings shall be metal to metal contact between each machine surface.
18. Provide a Type 316 lifting attachment capable of lifting the entire pump and motor assembly.
19. Motors: Conform to UL or FM quality assurance specifications and be manufactured by an ISO-9001 company.

2.05 PUMP CONTROL SYSTEM

A. General:

1. Provide an automatic type pump operating control including all necessary components to function reliably. Mount controls in a NEMA 4X rated stainless steel control panel. Ensure equipment subject to contact with sewage or sewage gases is corrosion-resistant metal. Provide an electronic controller that automatically activates and alternates the pump operation. If the liquid level continues to rise to the plans-specified level, the controller engages both pumps to operate simultaneously until both shut off at the specified low level. Provide hand-off-auto switches to choose the mode of operation for each pump. Provide controls with a 12 VDC powered float switch connected to the alarm contact of the battery charger to activate high-level alarms.
2. Protect pumping stations from lightning and transient voltage surges and equip with phase protection.
3. Design the control system to operate pumps at the power characteristics as shown on the plans. Ensure all controls and wiring meet or exceed the requirements of NFPA 70.
4. Require the control function to provide for the operation of the pumps under normal conditions and alternates the pumps on each pump down cycle.
5. In the event the incoming flow exceeds the pumping capacity of the lead pump, the offline pumps automatically start to handle the increased flow. As the flow decreases, the pumps cut off at the elevations set on the controller.

B. Enclosure

1. Provide a NEMA 4X rated enclosure manufactured from stainless steel with a minimum depth sized to adequately house all the components. Provide a rubber composition door gasket and assures a positive weatherproof seal. Provide a door that opens a minimum of 180 degrees and is equipped with a 3-point latch and padlockable handle.
2. Provide a dead front mounted in the panel to provide protection of personnel from live internal wiring. Install cutouts for breaker handles to allow operation of breakers without entering the compartment.
3. Mount all control switches, indicator pilot lights, elapsed time meters, duplex receptacle and other operational devices on the external surface of the dead front.
4. Ensure the dead front opens a minimum of 150 degrees to allow access to equipment for maintenance.

5. Mount all hardware to the subpanel with machine thread tapped holes. Sheet metal screws are not acceptable. Permanently identify all devices to match the schematic diagram.
6. Provide an enclosure ventilator located near the top of the enclosure. Provide a rain and vermin proof ventilator and made of fire retardant thermoplastic material.

C. Level Control System

1. Provide a sealed, mercury-free float switch control system to sense variations of sewage level in the wet well.
2. Provide stainless steel float brackets in accordance with manufacturer's recommendations. Mount floats at fixed elevations as shown on the drawings.
3. Use floats designed to tilt and operate their switches causing sequential turn-on turn-off of the pump, when the liquid level being sensed rises or falls past the float.
4. Float switches must be intrinsically safe relays. Provide an intrinsically safe barrier relay between the wet well and the control panel.

D. Alternator

1. Provide an alternator control switch to operate in connection with each float. Use an alternator control switch to alternate the operation of the pumps and operate both pumps if the water level rises above the second high water level. Incorporate time delay function and devices in the alternator controls such that both sewage pumps cannot be started simultaneously for an adjustable period of 10 to 120 seconds after shutdown. Use the delay function designed to operate in any condition of start-up in either normal or emergency operational mode.

E. Sewage Pump Alarm and Control Panel

1. Enclose alarm panel in the pump control panel enclosure and with a flashing red light that is visible from 50 feet away, with long life bulb in guarded enclosure and 6 inch diameter horn. Use horns capable of emitting 120 DB at 10 feet. Power alarm horn and light from 12V DC power supply with battery backup. Provide a rechargeable battery rated to power both the horn and light for a minimum of two hours upon loss of main power. Provide circuitry to automatically recharge the battery after main power is restored. Use batteries capable of being fully recharged in no more than 20 hours. Use panel with power on light, push to test button for horn and light and push to silence button for horn and light with automatic reset for next alarm.
2. Alarms

- a. Provide a test function ability for the alarm system. Provide alarms to activate under the following conditions:
 - (1) High liquid level as sensed by the level control system.
 - (2) Loss of main power.
 - (3) No flow light as sensed by limit switch on the check valve or as sensed by current sensors.
 - (4) Pump failure via temperature overload or motor heat sensor trip; provide motor high temperature light.
 - (5) Seal failure with indication light.
3. Circuit Breakers
 - a. Provide an individual circuit breaker for each pump.
 - b. Include a control circuit breaker and an alarm circuit breaker in the control panel.
 - c. Allow for two additional spare 115V single phase 20A circuit breakers for local pole lighting and future spare.
 - d. Provide circuit breakers in accordance with UL 489
 - e. Conform to UL 67 for circuit breaker mounting.
4. Motor Starter and Overload Protection
 - a. Provide an International Electrotechnical Commission (IEC) rated motor starter and thermal overload protection located in the control panel for each pump. Include undervoltage release, manual reset buttons and hand-automatic selector switches.
5. Power Lugs
 - a. Size the incoming power lugs for the proper voltage, amperage, and horsepower for each pump station.
 - b. Include grounding lugs for the incoming power. Provide a dedicated grounding lug in the control panel for each pump.
 - c. Size ground lug and rod according to local and base electrical codes and install by a licensed electrician.
 - d. Use UL listed power lugs.

- e. Conform to UL 67 for required power lug mounting.
6. Anti-Condensation Heater
- a. Provide an anti-condensation heater in the control panel that is sized based upon the size of the particular pump station's control panel size.
 - b. Power the heater from the control voltage transformer for three phase pump motor units and from the incoming power for single phase pump motor units.
 - c. Control the heater by a thermostat, coming on at C 50 degree F and going off at 65 degree F.
 - d. Clearly label panel directory for breakers.
7. Trouble Light
- a. Provide a fluorescent trouble shooting light in the panel that is hard-wired into an appropriately sized circuit breaker. It is acceptable for the light and one of the convenience outlets to share the same circuit breaker.
8. Convenience Outlets
- a. Place two duplex convenience outlets in the control panel; utilize one for the battery charger. The battery receives power from the control voltage transformer via the alarm fuse.
 - b. Upsize the alarm fuse to 1 to 1.5 amps for the battery charger.
 - c. Provide each outlet with its own 20 amp 115/1/60 circuit breaker.
9. Additional Requirements
- a. Provide elapsed time meter for each pump that measures run time in hours to 9999.9.
 - b. Do not place junction boxes between pumps, control systems and control panels; provide conduit seals at all wet well penetrations. If this is unavoidable, use NEMA 7 construction.
10. Electrical Requirements
- a. Install labels to identify switches and controls. Provide internal wiring for components of packaged equipment as an integral part of the equipment. Provide power wiring and conduit for field installed equipment.

2.06 DISCHARGE BASE:

- A. Provide an ASTM A48 Class 30 cast iron discharge base assembly including a 90 degree elbow and base to support the entire weight of the pump and motor and to secure the lower end of the guide rails.
- B. Provide base machined to receive sliding bracket of pump discharge.
- C. Provide seat constructed of bronze or non-metallic O-ring that is self-cleaning, non-clogging and non-sparking UL listed or FM certified explosionproof.
- D. Bolt to floor with Type 316 stainless steel anchors.

2.07 GUIDE ASSEMBLY:

- A. Provide Schedule 40 Type 316L stainless steel guide rails or Type 316 cables for each pump discharge assembly.
 - 1. Guide Rail: Pump manufacturer's standard size but not less than 2-inch (50 mm) diameter.
- B. Provide Type 316L stainless steel intermediate supports for guide rails with a maximum spacing of 10 feet (3 meters) between supports.
- C. Provide Type 316L stainless steel top guide rail retainer brackets to support the guide rails or cables. Bracket to be attached to top slab of wet well.
- D. Provide Type 316 stainless steel chain of sufficient length, to reach from pump to top of wet well plus 10 feet (3 meters) and of strength for lifting pump and motor. Provide chain designed for attachment to lifting bail provided on motor and to the guide rail retainer bracket.

2.08 PUMP LIFTING/DOCKING DEVICE:

- A. Provide a chain and latch mechanism to allow the pumps and motors to be removed in one pull without re-rigging the system. Provide a device that is lowered along the guide cables or rails and can be remotely latched to the pump lifting bail without the need to enter the wet well.
- B. Materials:
 - 1. Lifting Bail: ASTM A248 B
 - 2. Hook, Shackle, Counterweight and Chain: ASTM A322
 - 3. Guide Ropes: Stainless Steel
 - 4. Latch Operating Rope: Polyamid

- C. Mechanism Lifting Capacity to be suitable for equipment provided.
 - D. Provide one (1) device for each size pump
- 2.09 HARDWARE:
- A. Type 316 stainless steel.
- 2.10 FACTORY PAINTING:
- A. Primer and Finish Paint: Factory apply to all exterior ferrous surfaces, high solids epoxy in accordance with Section 09 91 10.
 - B. Ferrous surfaces which are not to be painted shall be given a factory applied coat of grease or rust resistant coating.
 - C. Provide additional factory paint coating for touch-up to all surfaces after installation and testing is completed and equipment accepted.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Install items in accordance with accepted factory drawings, manufacturer's printed instructions and as indicated.
- B. Install pumping units and align.
 - 1. Set base on metal shims placed directly under the part of the base carrying the greatest weight and spaced close enough to provide uniform support.
- C. After alignment is correct, grout using high grade non-shrink grout.
 - 1. Do not imbed leveling nuts in grout.

3.02 FIELD TESTING:

- A. Test piping connections to prove the pump nozzle are installed with the pipe in a free supported state and without need to apply vertical or horizontal pressure to align piping with pump nozzles. This must be performed and the piping acceptable prior to any field performance testing.
- B. Field testing will not be conducted without an accepted procedure, calibration certificates for all testing equipment, gauges and flow meters and a completed and signed pretesting check list. See Division 01 for checklist.
- C. After installation of pumping equipment, and after inspection, operation, testing and adjustment have been completed by the manufacturer's field service technician,

conduct running test for each pump in presence of the Engineer to determine its ability to operate within the vibration and temperature limits specified, and to deliver its rated capacity under specified conditions.

1. During tests, observe and record head, capacity, and motor inputs.
 - a. Test Duration: Determined by the Engineer, but not less than three hours of continuous operation at each condition specified and indicated.
 2. Immediately correct or replace all defects or defective equipment revealed by or noted during tests at no additional cost to the Owner.
 3. Repeat tests until specified results are obtained.
 4. Contractor to provide all water labor, piping, testing equipment, equipment, flow meters and test gauges for conducting tests.
 - a. Contractor shall provide calibrated test gauges for all permanently installed gauges and portable calibrated flow meters for all pumping systems even in those cases where permanent flow meters are installed.
 - b. All calibrations must be within 30 days of the field testing.
 - c. The testing will not be started and will not be accepted until the calibrated testing equipment stated above is operational and all certifications have been submitted.
- D. Make all adjustments necessary to place equipment in specified working order at time of above tests.
- E. Test pump on product only. If product is not available, test with water. Water for testing furnished by Contractor.
- F. Remove all replace equipment at no additional cost to the Owner with equipment that will meet all requirements specified and indicated if unable to demonstrate to the satisfaction of the Engineer that equipment will perform the service specified, indicated and as submitted.

3.03 FIELD TOUCH-UP PAINTING:

- A. After installation and accepted testing by the Engineer, apply touch-up paint to all scratched, abraded and damaged factory painted surfaces. Coating type and color shall match factory painting.

3.04 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01 77 00.

END OF SECTION

