

**Worcester County Administration
1 West Market Street, Room 1103
Snow Hill, Maryland 21863**



INVITATION FOR BID

PROJECT: Lewis Road Gravity Sewer System and Pump Station

DEPARTMENT: Public Works

VENDOR:

NAME:

ADDRESS:

BID OPENING:

DATE:

January 29, 2025

TIME:

2:30 PM

TABLE OF CONTENTS

SECTION I: INTRODUCTION.....	3
A. PURPOSE	3
B. CLARIFICATION OF TERMS	3
C. QUESTIONS AND INQUIRES	3
D. FILLING OUT BID DOCUMENTS	4
E. SUBMISSION OF BID DOCUMENTS	4
F. OPENING OF BIDS	5
G. ACCEPTANCE OR REJECTION OF BIDS	5
H. DESCRIPTIVE LITERATURE	6
I. NOTICE TO VENDORS	6
J. GENERAL REQUIREMENTS	6
K. PAYMENT.....	6
L. QUESTIONS.....	6
M. AWARD	6
SECTION II: GENERAL INFORMATION.....	7
A. ECONOMY OF BID	7
B. PUBLIC INFORMATION ACT (PIA)	7
C. CONTRACT AWARD.....	7
D. AUDIT	7
E. NONPERFORMANCE.....	7
F. MODIFICATION OR WITHDRAWAL OF BID.....	8
G. DEFAULT.....	8
H. COLLUSION/FINANCIAL BENEFIT	8
I. TAX EXEMPTION	8
J. CONTRACT CHANGES	8
K. ADDENDUM	9
L. EXCEPTIONS/ SUBSTITUTIONS	9
M. APPROVED EQUALS	9
N. DELIVERY	10
O. INSURANCE	10
P. BID EVALUATION.....	10
SECTION III: GENERAL CONDITIONS.....	11
A. DRAWINGS AND SPECIFICATIONS	11
B. MATERIALS, SERVICES AND FACILITIES	11
C. INSPECTION AND TESTING.....	11
D. APPROVAL OF SUBSTITUTION OF MATERIALS	12

E.	PROTECTION OF WORK, PROPERTY AND PERSONS	12
F.	BARRICADES, DANGER, WARNING AND DETOUR SIGNS	12
G.	LICENSES AND PERMITS	12
H.	SUPERVISION	13
I.	CLEAN UP	13
J.	CHANGES IN WORK	13
K.	TIME FOR COMPLETION	13
L.	CORRECTION OF WORK	13
M.	CONSTRUCTION SAFETY AND HEALTH STANDARDS	14
N.	BID BOND	14
O.	PERFORMANCE AND PAYMENT BONDS	14
P.	GUARANTEE	15
	REFERENCES	16
	EXCEPTIONS	17
	INDIVIDUAL PRINCIPAL	18
	VENDOR’S AFFIDAVIT OF QUALIFICATION TO BID	19
	NON-COLLUSIVE AFFIDAVIT	20
	EXHIBIT A	21

SECTION I: INTRODUCTION

A. PURPOSE

1. The purpose of this Invitation for Bid Document is for Worcester County (“County”) to contract for the construction of the Lewis Road Gravity Sewer and Pump Station in conformity with the requirements contained herein (“Bid Document(s”).
2. The County specification requirements are in addition to the EJCDC Contract Documents. The information was coordinated between the County and EJCDC Documents, but where discrepancies are found, the EJCDC Contract Documents shall govern. Where County requirements are in excess of EJCDC requirements, the County requirements must be met in addition to the EJCDC requirements.

B. CLARIFICATION OF TERMS

1. Firms or individuals that submit a bid for award of a contract (“Contract”) are referred to as vendors (“Vendors”) in this document. The Vendor that is awarded the Contract is herein referred to as the (“Successful Vendor”). Reference to ‘Vendor’ shall equate to ‘Bidder’ as stated within the EJCDC standard specification sections.

C. QUESTIONS AND INQUIRES

1. Questions must be addressed in writing to the Worcester County Procurement Officer at nrice@co.worcester.md.us.
2. The last date to submit questions for clarification will be noon on January 22, 2025.

3. Addenda are posted on the County website at <https://www.co.worcester.md.us/> under County Info: Bid Board: at <https://www.co.worcester.md.us/commissioners/bids> at least five calendar days before bid opening.
4. It is the Vendors responsibility to make sure all addenda are acknowledged in their bid. Failure to do so could result in the bid being disqualified.

D. FILLING OUT BID DOCUMENTS

1. Only forms supplied by the County and EJCDC Forms prepared by EA Engineering, Science, and Technology, Inc. PBC included here within shall be used.
2. One unbound original and two bound copies of the bid form and any required attachments must be submitted in the solicitation and can be submitted in the same envelope unless otherwise instructed.
3. Bid Documents should be complied as follows: (1) Cover letter, (2) Form of Bid, (3) References, (4) Exceptions Document and Signed addenda, if necessary (5) Individual Principal Document, (6) Vendor's Affidavit of Qualification to Bid, (7) Non-Collusive Affidavit, and (8) Per EJCDC Bid Form C-410.
4. Where so indicated by the make-up of the Bid Documents, sums will be expressed in both words and figures, and in the case of a discrepancy between the two, the amount written in words will govern. In the event there is a discrepancy between the unit price and the extended totals, the unit prices will govern.
5. Any interlineation, alteration, or erasure will be initialed by the signer of the Bid Documents.
6. Each copy of the Bid Documents will be signed by the person(s) legally authorized to bind the Vendor to a contract, using the legal name of the signer.
7. Vendor will supply all information and submittals required by the Bid Documents to constitute a proper and responsible completed Bid Document package.
8. Any ambiguity in the Bid Documents as a result of omission, error, lack of clarity or non-compliance by the Vendor with specifications, instructions, and/or all conditions of bidding will be construed in the light most favorable to the County.

E. SUBMISSION OF BID DOCUMENTS

1. All copies of the Bid Documents and any other documents required to be submitted with the Bid Documents will be enclosed in a sealed envelope. The envelope will be addressed to the Worcester County Commissioners and will be identified with the project name: **LEWIS ROAD GRAVITY SEWER SYSTEM AND PUMP STATION** and the Vendor's name and address. If the Bid Documents are sent by mail, the sealed envelope will be enclosed in a separate mailing envelope with the notation "SEALED BID DOCUMENTS ENCLOSED" on the face thereof.
2. Bids must be mailed or hand carried to the **Worcester County Administration Office, 1 West Market Street, Room 1103, Snow Hill, MD 21863**, in order to be received **prior** to the announced bid deadline. *Bids received after said time or delivered to the wrong location will be returned to the Vendor unopened.*
3. **Bids are due and will be opened at the time listed on the front of this Bid Document.**
4. If you are delivering a bid in person please keep in mind to allow time to get through security and into the Administration Office. It is fully the responsibility of the Vendor to ensure that the bid is received on time.
5. The County will not speculate as to reasonableness of the postmark, nor comment on the apparent failure of a public carrier to have made prompt delivery of the bid.

6. Vendors, or their authorized agents, are expected to fully inform themselves as to the conditions, requirements, and specifications before submitting Bid Documents; failure to do so will be at the Vendor's own risk.
7. A fully executed Affidavit of Qualification to Bid will be attached to each Bid Document.
8. Minority vendors are encouraged to participate.
9. All Vendor submitted Bid Documents will be valid for a minimum of sixty days from the date of Bid Document opening.
10. Electronically mailed bids are **not** considered sealed bids and will **not** be accepted.

F. OPENING OF BIDS

1. Bid Documents received on time will be opened publicly and Vendor's names and total costs will be read aloud for the record.

G. ACCEPTANCE OR REJECTION OF BIDS

1. Unless otherwise specified, the Contract will be awarded to the most responsible and responsive Vendor complying with the provisions of the Bid Documents, provided the bid does not exceed the funds available, and it is in the best interest of the County to accept it. The County reserves the right to reject the Bid Documents of any Vendor who has previously failed to perform properly in any way or complete on time contracts of a similar nature; or a Bid Document from a Vendor who, investigation shows, is not in a position to perform the Contract; or Bid Documents from any person, firm, or corporation which is in arrears or in default to the County for any debt or contract.
2. Completed Bid Documents from Vendors debarred from doing business with the State of Maryland or the Federal Government will not be accepted.
3. In determining a Vendor's responsibility, the County may consider the following qualifications, in addition to price:
 - a. Ability, capacity, and skill to provide the commodities or services required within the specified time, including future maintenance and service, and including current financial statement or other evidence of pecuniary resources and necessary facilities.
 - b. Character, integrity, reputation, experience and efficiency.
 - c. Quality of past performance on previous or existing contracts, including a list of current and past contracts and other evidence of performance ability.
 - d. Previous and existing compliance with laws and ordinances relating to contracts with the County and to the Vendor's employment practices.
 - e. Evidence of adequate insurance to comply with Contract terms and conditions.
 - f. Statement of current work load and capacity to perform/provide the Goods and/or Services.
 - g. Explanation of methods to be used in fulfilling the Contract.
 - h. The Vendor, if requested, will be prepared to supply evidence of its qualifications, listed above, and its capacity to provide/perform the Goods and/or Services; such evidence to be supplied within a specified time and to the satisfaction of the County.
4. In determining a Vendor's responsiveness, the County will consider whether the Bid Document conforms in all material respects to the Bid Documents. The County reserves the right to waive any irregularities that may be in its best interest to do so.
5. The County will have the right to reject any and all Bid Documents, where applicable to accept in whole or in part, to add or delete quantities, to waive any informalities or irregularities in the Bid

Document received, to reject a Bid Document not accompanied by required Bid security or other data required by the Bid Documents, and to accept or reject any Bid Document which deviates from specifications when in the best interest of the County. Irrespective of any of the foregoing, the County will have the right to award the Contract in its own best interests.

H. DESCRIPTIVE LITERATURE

1. The proposed descriptive literature fully describing the product bid is what is intended to be included as the price. Failure to do so may be cause for rejection of the bid.
2. Any items, systems or devices supplied in this bid that are proprietary in nature relative to maintenance, repair, servicing or updating must be disclosed on the bid form.

I. NOTICE TO VENDORS

1. Before a Vendor submits the Bid Documents it will need to become fully informed as to the extent and character of the Goods and/or Services required and are expected to completely familiarize themselves with the requirements of this Bid Document's specifications. Failure to do so will not relieve the Vendor of the responsibility to fully perform in accordance therewith. No consideration will be granted for any alleged misunderstanding of the material to be furnished or the Services to be performed, it being understood that the submission of a Bid Document is an agreement with all of the items and conditions referred to herein.

J. GENERAL REQUIREMENTS

1. The successful vendor must be licensed to perform work in the state of Maryland.

K. PAYMENT

1. The county will make payment(s) to the Successful Vendor within thirty (30) calendar days from the receipt of a proper invoice for approved and accepted work performed.

L. QUESTIONS

1. The last day for questions is listed under Section I, Subsection C.2.

M. AWARD

1. The county intends to award to the lowest responsive and responsible vendor meeting the specifications.

END OF SECTION

SECTION II: GENERAL INFORMATION

A. ECONOMY OF BID

1. Bid Documents will be prepared simply and economically, providing straightforward and concise description of the Vendor's capabilities to satisfy the requirements of the Bid Documents. Emphasis should be on completeness and clarity of content. Elaborate brochures and other representations beyond that sufficient to present a complete and effective Bid Document are neither required nor desired.

B. PUBLIC INFORMATION ACT (PIA)

1. Worcester County is subject to the Maryland Public Information Act and may be required to release bid submissions in accordance with the Act.
2. Any materials the Vendor deems to be proprietary or copyrighted must be marked as such; however, the material may still be subject to analysis under the Maryland Public Information Act.
 - a. The Vendor may invoke proprietary information or trade secret protection for submission of any data/material by (1) identifying the data/material in a written description, (2) clearly marking the data/material as proprietary, and (3) providing a written statement detailing the reasons why protection is necessary. The County reserves the right to ask for additional clarification prior to establishing protection.

C. CONTRACT AWARD

1. A written award by the County to the Successful Vendor in the form of a Purchase Order or other contract document will result in a binding Contract without further action by either party. If the Successful Vendor fails or refuses to sign and deliver the Contract and the required insurance documentation, the County will have the right to award to the next responsible and responsive Vendor. Contract will be executed by the Successful Vendor within fifteen calendar days of receipt of the Contract.
2. Bid Documents and Contracts issued by the County will bind the Vendor to applicable conditions and requirements herein set forth, unless otherwise specified in the Bid Documents, and are subject to all federal, state, and municipal laws, rules, regulations, and limitations.
3. County personal property taxes ("Taxes") must be on a current basis; if any such Taxes are delinquent, they must be paid before award of Contract. Failure to pay will result in the award of Contract to another Vendor.
4. The County reserves the right to engage in individual discussions and interviews with those Vendors deemed fully qualified, responsible, suitable and professionally competent to provide the required Goods and/or Services should the project size warrant it. Vendors will be encouraged to elaborate on their qualifications, performance data, and staff expertise.

D. AUDIT

1. The Successful Vendor agrees to retain all books, records, and other documents relative to the awarded Contract for five years after final payment, or until audited. The County, its authorized agents, and/or State auditors will have full access to and the right to examine any of said materials during said period.

E. NONPERFORMANCE

1. The County reserves the right to inspect all operations and to withhold payment for any goods not performed or not performed in accordance with the specifications in this Bid Document. Errors, omissions or mistakes in performance will be corrected at no cost to the County. Failure to do so

will be cause for withholding of payment for that Goods and/or Services. In addition, if deficiencies are not corrected in a timely manner, the County may characterize the Successful Vendor as uncooperative, which may jeopardize future project order solicitations.

F. MODIFICATION OR WITHDRAWAL OF BID

1. A Bid Document may not be modified, withdrawn, or cancelled by the Vendor during the stipulated time period following the time and date designated for the receipt of Bid Documents, and each Vendor so agrees in submitting Bid Documents.

G. DEFAULT

1. The Contract may be cancelled or annulled by the County in whole or in part by written notice of default to the Successful Vendor upon non-performance, violation of Contract terms, delivery failure, bankruptcy or insolvency, any violation of state or local laws, or the making of an assignment for the benefit of creditors. An award may then be made to the next most highly rated Vendor, or when time is of the essence, similar commodities and/or service may be purchased on the open market. In either event, the defaulting Vendor (or his surety) will be liable to the County for cost to the County in excess of the defaulted Contract price.
2. If a representative or warranty of either Party to the Contract is false or misleading in any material respect, or if either Party breaches a material provision of the Contract ("Cause"), the non-breaching Party will give the other Party written notice of such cause. If such Cause is not remedied within fifteen calendar days ("Cure Period") after receipt of such notice, (unless, with respect to those Causes which cannot be reasonably corrected or remedied within the Cure Period, the breaching Party will have commenced to correct or remedy the same within such Cure Period and thereafter will proceed with all due diligence to correct or remedy the same), the Party giving notice will have the right to terminate this Contract upon the expiration of the Cure Period.

H. COLLUSION/FINANCIAL BENEFIT

1. The Vendor certifies that his/her Bid is made without any previous understanding, agreement, or connection with any person, firm, or corporation making a Bid Document for the same project; without prior knowledge of competitive prices; and is in all respects fair, without outside control, collusion, fraud, or otherwise illegal action.
2. Upon signing the Bid Document, Vendor certifies that no member of the governing body of the County, or members of his/her immediate family, including spouse, parents or children, or any other officer or employee of the County, or any member or employee of a Commission, Board, or Corporation controlled or appointed by the County Commissioners has received or has been promised, directly or indirectly, any financial benefit, related to this Bid Document and subsequent Contract.

I. TAX EXEMPTION

1. Tax exemptions shall be as detailed within the EJCDC documents.

J. CONTRACT CHANGES

1. No claims may be made by anyone that the scope of the project or that the Vendor's Goods and/or Services have been changed (requiring changes to the amount of compensation to the Vendor or other adjustments to the Contract) unless such changes or adjustments have been made by an approved written amendment (Change Order) to the Contract signed by the Chief Administrative Officer (and the County Commissioners, if required), prior to additional Goods and/or Services being initiated. Extra Goods and/or Services performed without prior, approved,

written authority will be considered as unauthorized and at the expense of the Vendor. Payment will not be made by the County.

2. No oral conversations, agreements, discussions, or suggestions, which involve changes to the scope of the Contract, made by anyone including any County employee, will be honored or valid. No written agreements or changes to the scope of the Contract made by anyone other than the Procurement Officer (with the Chief Administrative Officer and/or County Commissioners approval, if required) will be honored or valid.

K. ADDENDUM

1. No oral statements of any person will modify or otherwise affect or interpret the meaning of the Contract specifications, or the terms, conditions, or other portions of the Contract. All modifications and every request for any interpretation must be addressed to Worcester County's Procurement Officer and to be given consideration, must be received no later than the last day for questions listed in Section I, Subsection C.2.
2. Any and all interpretations, corrections, revisions, and amendments will be issued by the Procurement Officer to all holders of Bid Documents in the form of written addenda. Vendors are cautioned that any oral statements made by any County employee that materially change any portion of the Bid Documents cannot be relied upon unless subsequently ratified by a formal written amendment to the Bid Document.
3. All addenda will be issued so as to be received at least five days prior to the time set for receipt of Bid Documents, and will become part of the Contract and will be acknowledged in the Bid Document form. Failure of any Vendor to receive any such addenda will not relieve said Vendor from any obligation under the Bid Document as submitted.
4. Vendors are cautioned to refrain from including in their Bid Document any substitutions which are not confirmed by written addenda. To find out whether the County intends to issue an amendment reflecting an oral statement made by any employee, contact Worcester County's Procurement Officer during normal business hours.
5. The Worcester County Procurement Officer reserves the right to postpone the Bid Document opening for any major changes occurring in the five-day interim which would otherwise necessitate an Addendum.

L. EXCEPTIONS/ SUBSTITUTIONS

1. Any exceptions or substitutions to the specifications requested should be marked on the bid form and listed on a separate sheet of paper attached to the bid.
2. An exception to the specifications may disqualify the bid. The County will determine if the exception is an essential deviation or a minor item.
3. In the case of a minor deviation, the County maintains the option to award to that Vendor if it determines the performance is not adversely affected by the exception.

M. APPROVED EQUALS

1. In all specifications where a material or article is defined by describing a proprietary product or by using the name of a Vendor or manufacturer, it can be assumed that an approved equal can be substituted.
2. The use of a named product is an attempt to set a particular standard of quality and type that is familiar to the County. Such references are not intended to be restrictive.

3. However, the County shall decide if a product does in fact meet or exceed the quality of the specifications listed in the solicitation. It shall be the responsibility of the Vendor that claims his product is an equal to provide documentation to support such a claim.

N. DELIVERY

1. All items shall be delivered F.O.B. destination and delivery costs and charges included in the bid unless otherwise stated in the specifications or bid form.

O. INSURANCE

1. If required by the General Conditions or Terms and Conditions, the Successful Vendor shall provide the County with Certificates of Insurance within fifteen calendar days of bid award notification evidencing the required coverage.
2. Successful Vendor must provide Certificates of Insurance before commencing work in connection with the Contract.

P. BID EVALUATION

1. Bid tabulations will be posted on the County website at <https://www.co.worcester.md.us/commissioners/bids>. Click on the Expired Bids & Results tab and find the bid tabulation for the bid you are interested in. Bid tabulations will be posted as soon as reasonably possible after the Bid opening.

END OF SECTION

SECTION III: GENERAL CONDITIONS

A. DRAWINGS AND SPECIFICATIONS

1. Should any detail be omitted from the drawings or specifications, or should any errors appear in either, it shall be the duty of the Successful Vendor to notify the County's designated construction inspector.
2. In no case shall the Successful Vendor proceed with the work without notifying and receiving definite instructions from the County. Work wrongly constructed without such notification shall be corrected by the Successful Vendor at his own cost.

B. MATERIALS, SERVICES AND FACILITIES

1. It is understood that, except as otherwise specifically stated in the Bid Documents, the Successful Vendor will provide and pay for all materials, labor, tools, equipment, water, light, power and transportation, supervision, temporary construction of any nature, and all other services and facilities of any nature whatsoever necessary to execute, complete, and deliver the Work within the specified time.
2. Materials and equipment will be so stored as to insure the preservation of their quality and fitness for the Work. Stored materials and equipment to be incorporated in the Work will be located so as to facilitate prompt inspection.
3. Manufactured articles, materials, and equipment will be applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturer.
4. Materials, supplies and equipment will be in accordance with samples submitted by the Successful Vendor and approved by the County.

C. INSPECTION AND TESTING

1. All materials and equipment used in the construction of the Work will be subject to adequate inspection and testing in accordance with generally accepted standards, as required and defined in the Bid Documents.
2. The County or its representatives may, at any time, enter upon the work and the premises used by the Successful Vendor, and the Successful Vendor shall provide proper and safe facilities to secure convenient access to all parts of the work, and all other facilities necessary for inspection, as may be required.
3. The County will appoint such persons as deemed necessary to properly inspect the materials furnished or to be furnished, and the work done under the contract and to see that the same strictly corresponds with the drawings and specifications. All such materials and workmanship shall be subject to approval of the County. Approval or acceptance of payment shall not be misconstrued as approval of items or work not in conformance with specifications and drawings nor shall it prevent the rejection of said work or materials at any time thereafter during the existence of the contract, should said work or materials be found to be defective, or not in accordance with the requirements of the contract.
4. Work and material will be inspected promptly, but if for any reason should a delay occur, the Successful Vendor shall have no claim for damages or extra compensation.
5. The Successful Vendor shall pay for all inspection costs necessary to complete the work which may be incurred to comply with the requirements of any agency other than the County, such as a railroad, public service utility company, or any other governmental agency or any other agency whose jurisdiction affects the work in any manner unless otherwise specified herein.

D. APPROVAL OF SUBSTITUTION OF MATERIALS

1. Samples of materials shall be submitted by the Successful Vendor for approval before such materials are ordered from the manufacturers or distributors and shall be approved by the County before actual work is begun.
2. It is the intention of these specifications to permit all vendors bidding on this work to secure the fullest amount of competition on the various materials and specialties names herein. Wherever a material or article is defined by describing a proprietary product or by using the name of a vendor or manufacturer, the term or approved equal shall be presumed to be implied unless otherwise stated.

E. PROTECTION OF WORK, PROPERTY AND PERSONS

1. Successful Vendor will be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Successful Vendor will take all necessary precautions and programs in connection with the Work. Successful Vendor will take all necessary precautions for the safety of, and will provide the necessary protection to prevent damage, injury or loss to, all employees on the Work and other persons who may be affected thereby, all the Work and all materials or equipment to be incorporated therein, whether in storage on off the site, and 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.
2. Successful Vendor will comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction. Successful Vendor will erect and maintain, as required by the conditions and progress of the Work, all necessary safeguards for safety and protection. Successful Vendor will notify owners of adjacent utilities when progress of the Work may affect them. The Successful Vendor will remedy all damage, injury or loss to any property caused, directly or indirectly, in whole or in part, by Successful Vendor, any Subcontractor or anyone directly or indirectly employed by any of them or anyone for whose acts any of them be liable.
3. In emergencies affecting the safety of persons or the Work or property at the site or adjacent thereto, the Successful Vendor, without special instruction or authorization from the County, will act to prevent threatened damage, injury or loss. Successful Vendor will give the County prompt Written Notice of any significant changes in the Work or deviations from the Bid Documents caused thereby, and a Change Order will thereupon be issued covering the changes and deviations involved.

F. BARRICADES, DANGER, WARNING AND DETOUR SIGNS

1. The Successful Vendor shall provide, erect and maintain all necessary barricades, sufficient red lights, flares, danger signals and signs, provide a sufficient number of watchmen and take all necessary precautions for the protection of the work and safety of the public.

G. LICENSES AND PERMITS

1. The Successful Vendor shall have all necessary licenses required to do the work and give all notices and obtain and pay all necessary permits required by local laws and regulations for building.
2. State and Federal permits (if applicable) to undertake work have been obtained by the County and accompany these specifications.

H. SUPERVISION

1. The Successful Vendor shall maintain, at all times during the progress of work, a competent and experienced supervisor who shall represent the Successful Vendor, and all directions given to him shall be binding. Important decisions regarding directions, if requested by the supervisor, shall be confirmed in writing.
2. Supervision by the County or its representative does not relieve the Successful Vendor of responsibility for defective work executed under the direct control of the Successful Vendor. Responsibility for defective work rests upon the Successful Vendor, whether discovered by the County prior to final payment or subsequent thereto.

I. CLEAN UP

1. Upon completion of the items within a given location as specified and before monthly estimates will be paid, the construction area and all other areas occupied by the Successful Vendor during the construction of said Contract shall be cleaned of all surplus and discarded materials, bracing, forms, rubbish and temporary structures that were placed there by the Successful Vendor.
2. Disposal of the aforementioned shall be the responsibility of the Successful Vendor.

J. CHANGES IN WORK

1. The County, without invalidating the contract, may order extra work or make changes by altering, adding or deducting from the work with the contract sum being adjusted accordingly.
2. All such work shall be executed under the conditions of the original contract, except that any claim for the extension of time caused thereby shall be adjusted at the time of ordering such change.
3. The value of any such extra work or change shall be determined in one or more of the following ways:
 - a. By estimate and acceptance of lump sum.
 - b. By unit prices named in the contract or subsequently agreed upon.

K. TIME FOR COMPLETION

1. The Work contemplated under this Contract shall be considered as continuous and be completed within the timeframe(s) state in the EJCDC documents included here within.
2. The Successful Vendor will be allowed to work during the hours stated in EJCDC C-800 Section 7.03
3. The Successful Vendor will not be permitted to work on holidays observed by Worcester County or the State of Maryland or on Sundays unless otherwise authorized in writing.
4. In case of an emergency which may require that work be done on Saturdays, Sundays, and Holidays, the Successful Vendor shall request permission of the County to do so. If, in the opinion of the County, the emergency is bonafide, permission may be granted to the Successful Vendor to work such hours as may be determined are necessary by the County. Also, if in the opinion of the County a bonafide emergency exists, the Successful Vendor may be directed to work such hours as may be necessary whether or not the Successful Vendor requests permission to do so.
5. The Successful Vendor shall pay the County for all costs incurred for inspection services required for work permitted during holidays, weekends or in excess of eight hours per day.

L. CORRECTION OF WORK

1. The Successful Vendor will promptly remove from the premises all Work rejected by the County for failure to comply with the Bid Documents, whether incorporated in the construction or not,

and the Successful Vendor will promptly replace and re-execute the Work in accordance with the Bid Documents and without expense to the County and will bear the expense of making good all Work of other Vendors destroyed or damaged by such removal or replacement.

2. All removal and replacement Work will be done at the Successful Vendor's expense. If the Successful Vendor does not act to remove such rejected Work within ten days after receipt of Written Notice, the County may remove such Work and store the materials at the expense of the Successful Vendor.

M. CONSTRUCTION SAFETY AND HEALTH STANDARDS

1. It is a condition of this contract, and shall be made a condition of each sub-contract entered into pursuant to this contract, that the Successful Vendor and any sub-contractor shall not require any laborer or mechanic employed in performance of the contract to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health or safety, as determined under construction safety and health standards (Title 29, Code of Federal Regulations, Part 1926, formerly Part 1518, as revised from time to time, promulgated by the United States Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standard Act.) (83 Stat. 96).
2. Failure of Worcester County to inform the Successful Vendor of safety violations will not release the Successful Vendor of his responsibilities.

N. BID BOND

1. Bid Documents must be accompanied by a Bid Bond if the Vendor's total Bid amount exceeds \$100,000, payable to the County for five percent of the total amount of the bid. After the analysis of the Bid Documents the County will return Bid Bonds to all Vendors except the three lowest Responsive and Responsible Vendors. After execution of the Contract, and receipt, execution, and approval of the Successful Vendor's Payment and Performance bond, the Bid Bonds will be returned. A certified check may be used in lieu of a Bid Bond.
2. The County, at its discretion, may consider a Vendor in default if the Vendor fails to execute the Contract, in which the County will retain said Bid Bond.

O. PERFORMANCE AND PAYMENT BONDS

1. The Successful Vendor will be required to provide the County with a Performance Bond and Payment Bond if the total Contract amount exceeds \$100,000, each in the amount of one hundred percent of the Contract Price, with a corporate surety approved by the County for the faithful performance of the Contract.
2. The Successful Vendor will within fourteen calendar days after the receipt of the Contract furnish the County with a Performance Bond and Payment Bond in penal sums equal to the amount of the Contract Price, conditioned upon the performance by the Successful Vendor of all undertakings, covenants, terms, conditions and agreements of the Bid Documents, and upon the prompt payment by the Successful Vendor to all persons supplying labor and materials in the prosecution of the Work provided by the Bid Document. Such Bonds will be executed by the Successful Vendor and corporate bonding company licensed to transact such business in the state in which the Work is to be performed and named on the current list of "Surety Companies Acceptable on Federal Bonds" as published in the Circular Number 570. The expense of these Bonds will be borne by the Successful Vendor. If at any time a surety on any such Bond is declared bankrupt or loses its right to do business in the State of Maryland or is removed from the list of surety companies accepted on federal bonds, Successful Vendor will within ten calendar days after

notice from the County to do so, substitute an acceptable Bond(s) in such form and sum and signed by such other surety or sureties as may be satisfactory to the County.

P. GUARANTEE

1. The Successful Vendor shall furnish the County with a one-year guarantee of workmanship and materials, beginning upon substantial completion and shall make good any defects which may occur during that period.
2. If any special guarantees in excess of the one-year period are specified by the manufacturer, these guarantees shall take precedence over the one-year period guarantee.
3. Upon completion of work, and before final payment or release of retainage, the Successful Vendor shall submit, and obtain from each subcontractor, material supplier and equipment manufacture general warranties and a notarized asbestos free guarantee.

END OF SECTION

REFERENCES

List three references for which the Vendor has provided Goods/Services similar to those requested in the Bid Document within the last 12-36 months. Include contact name, address, telephone number, email address and services provided.

Company Name:		Company Name:	
Type of Project:		Type of Project:	
Address:		Address:	
Town, State, Zip Code:		Town, State, Zip Code:	
Contact Person:		Contact Person:	
Telephone Number:		Telephone Number:	
Email:		Email:	
Date of Service:		Date of Service:	
Company Name:			
Type of Project:			
Address:			
Town, State, Zip Code:			
Contact Person:			
Telephone Number:			
Email:			
Date of Service:			

Sign for Identification

Printed Name

EXCEPTIONS

The undersigned hereby certifies that, except as listed below, or on separate sheets attached hereto, the enclosed Completed Bid Document covers all items as specified.

EXCEPTIONS:

(If none, write none) _____

How did you hear about this solicitation?

- ☐ Worcester County's Website
- ☐ eMaryland Marketplace Advantage (eMMA)
- ☐ Newspaper Advertisement
- ☐ Direct email
- ☐ Other _____

The vendor hereby acknowledges receipt of the following addenda.

<u>Number</u>	<u>Date</u>	<u>Initials</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____

Sign for Identification

Printed Name

INDIVIDUAL PRINCIPAL

Vendor Name: _____

Signed By: _____ In the presence of: _____

Address of Vendor: _____ Town, State, Zip _____

Telephone No.: _____ Fax: _____ Email: _____

CO-PARTNERSHIP PRINCIPAL

Name of Co-Partnership: _____

Address: _____ Town, State, Zip _____

Telephone No.: _____ Fax: _____

Signed By: _____ In the presence of: _____
Partner Witness

Signed By: _____ In the presence of: _____
Partner Witness

Signed By: _____ In the presence of: _____
Partner Witness

CORPORATE PRINCIPAL

Name of Corporation: _____

Address: _____ Town, State, Zip _____

Telephone No.: _____ Fax: _____

Signed By: _____ In the presence of: _____
President Witness

Attest: _____
Corporate Secretary

Affix Corporate Seal

VENDOR'S AFFIDAVIT OF QUALIFICATION TO BID

I HEREBY AFFIRM THAT:

I, _____ am the _____
(Printed Name) (title)
and the duly authorized representative of the Vendor of
_____ whose address is
(name of corporation)

and that I possess the legal authority to make this affidavit on behalf of myself and the Vendor for which I am acting.

Except as described in paragraph 3 below, neither I nor the above Vendor, nor to the best of my knowledge and of its officers, directors or partners, or any of its employees directly involved in obtaining contracts with the State or any county, bi-county or multi-county agency, or subdivision of the State have been convicted of, or have pleaded nolo-contendere to a charge of, or have during the course of an official investigation or other proceeding admitted in writing or under oath acts or omissions which constitute, bribery, attempted bribery, or conspiracy to bribe under the provisions of Article 27 of the Annotated Code of Maryland or under the laws of any state or federal government (conduct prior to July 1, 1977 is not required to be reported).

(State "none" or, as appropriate, list any conviction, plea or admission described in paragraph 2 above, with the date, court, official or administrative body, the individuals involved and their position with the Vendor, and the sentence or disposition, if any.)

I acknowledge that this affidavit is to be furnished to the County, I acknowledge that, if the representations set forth in this affidavit are not true and correct, the County may terminate any Contract awarded and take any other appropriate action. I further acknowledge that I am executing this affidavit in compliance with section 16D of Article 78A of the Annotated Code of Maryland, which provides that certain persons who have been convicted of or have admitted to bribery, attempted bribery or conspiracy to bribe may be disqualified, either by operation of law or after a hearing, from entering into contracts with the State or any of its agencies or subdivisions.

I do solemnly declare and affirm under the penalties of perjury that the contents of this affidavit are true and correct.

Sign for Identification

Printed Name

NON-COLLUSIVE AFFIDAVIT

_____ being first duly sworn,
deposes and says that:

1. He/she is the _____, (Owner, Partner, Officer, Representative or Agent) of _____, the Vendor that has submitted the attached Bid Documents;
2. He/she is fully informed respecting the preparation and contents of the attached Bid Document and of all pertinent circumstances respecting such Bid Documents;
3. Such Bid Document is genuine and is not a collusive or sham Bid Document;
4. Neither the said Vendor nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affiant, have in any way colluded, conspired, connived or agreed, directly or indirectly, with any other Vendor, firm, or person to submit a collusive or sham Bid Document in connection with the Work for which the attached Bid Document has been submitted; or to refrain from bidding in connection with such Work; or have in any manner, directly or indirectly, sought by agreement or collusion, or communication, or conference with any Vendor, firm, or person to fix the price or prices in the attached Bid Document or of any other Vendor, or to fix any overhead, profit, or cost elements on the Bid Document price or the Bid Document price of any other Vendor, or to secure through any collusion, conspiracy, connivance, or unlawful agreement any disadvantage against (Recipient), or any person interested in the Work;
5. The price or prices quoted in the attached Bid Document are fair and proper and are not tainted by any collusion, conspiracy, connivance, or unlawful agreement on the part of the Vendor or any other of its agents, representatives, owners, employees or parties in interest, including this affiant.

Signed, sealed and delivered in the presence of:

Witness

Witness

By: _____
Signature

Printed Name

Title

EXHIBIT A

WORCESTER COUNTY MARYLAND STANDARD TERMS AND CONDITIONS

The provisions below are applicable to all Worcester County ("County") contracts. These provisions are not a complete agreement. These provisions must be attached to an executed document that identifies the work to be performed, compensation, term, incorporated attachments, and any special conditions ("Contract"). If the Standard Terms and any other part of the Contract conflict, then the Standard Terms will prevail.

1. **Amendment.** Amendments to the Contract must be in writing and signed by the parties.
2. **Bankruptcy.** If a bankruptcy proceeding by or against the Contractor is filed, then:
 - a. The Contractor must notify the County immediately; and
 - b. The County may cancel the Contract or affirm the Contract and hold the Contractor responsible for damages.
3. **Compliance with Law.** Contractor must comply with all applicable federal, state, and local law. Contractor is qualified to do business in the State of Maryland. Contractor must obtain, at its expense, all licenses, permits, insurance, and governmental approvals needed to perform its obligations under the Contract.
4. **Contingent Fee Prohibition.** The Contractor has not directed anyone, other than its employee or agent, to solicit the Contract and it has not promised to pay anyone a commission, percentage, brokerage fee, contingent fee, or other consideration contingent on the making of the Contract.
5. **Counterparts and Signature.** The Contract may be executed in several counterparts, each of which may be an original and all of which will be the same instrument. The Contract may be signed in writing or by electronic signature, including by email. An electronic signature, a facsimile copy, or computer image of the Contract will have the same effect as an original signed copy.
6. **Exclusive Jurisdiction.** All legal proceedings related to this Contract must be exclusively filed, tried, and maintained in either the District Court of Maryland for Worcester County, Maryland or the Circuit Court of Worcester County, Maryland. The parties expressly waive any right to remove the matter to any other state or federal venue and waive any right to a jury trial.
7. **Force Majeure.** The parties are not responsible for delay or default caused by fire, riot, acts of God, County-declaration-of-emergency, or war beyond their reasonable control. The parties must make all reasonable efforts to eliminate a cause of delay or default and must, upon cessation, diligently pursue their obligations under the Contract.
8. **Governing Law.** The Contract is governed by the laws of Maryland and the County.
9. **Indemnification.** The Contractor must indemnify the County and its agents from all liability, penalties, costs, damages, or claims (including attorney's fees) resulting from personal injury, death, or damage to property that arises from or is connected to the performance of the work or failure to perform its obligations under the Contract. All indemnification provisions will survive the expiration or termination of the Contract.

10. Independent Contractor.

- a. Contractor is an “Independent Contractor”, not an employee. Although the County may determine the delivery schedule for the work and evaluate the quality of the work, the County will not control the means or manner of the Contractor’s performance.
- b. Contractor is responsible for all applicable taxes on any compensation paid under the Contract. Contractor is not eligible for any federal Social Security, unemployment insurance, or workers’ compensation benefits under the Contract.
- c. Contractor must immediately provide the County notice of any claim made against Contractor by any third party.

11. Insurance Requirements.

- a. Contractor must have Commercial General Liability Insurance in the amounts listed below. The insurance must include coverage for personal injury, discrimination, and civil rights violation claims. All insurance must name County, its employees, and agents as “ADDITIONAL INSURED”. A copy of the certificate of insurance must be filed with the County before the Contract is executed, providing coverage in the amount of \$1,000,000 per occurrence, \$2,000,000 general aggregate, and \$500,000 for property damage.
- b. Contractor must have automobile insurance on all vehicles used in the Contract to protect Contractor against claims for damages resulting from bodily injury, including wrongful death, and property damage that may arise from the operations in connection with the Contract. All insurance must name County, its employees, and agents as “ADDITIONAL INSURED”.
- c. Contractor must provide the County with a certification of Workers’ Compensation Insurance, with employer’s liability in the minimum amount required by Maryland law in effect for each year of the Contract.
- d. All insurance policies must have a minimum 30 days’ notice of cancellation. The County must be notified immediately upon cancellation.
- e. When insurance coverage is renewed, Contractor must provide new certificates of insurance prior to expiration of current policies.

12. Nondiscrimination. Contractor must not discriminate against any worker, employee, or applicant because of religion, race, sex, age, sexual orientation, physical or mental disability, or perceived disability. This provision must be incorporated in all subcontracts related to the Contract.

13. Ownership of Documents; Intellectual Property.

- a. All documents prepared under the Contract must be available to the County upon request and will become the exclusive property of the County upon termination or completion of the services. The County may use the documents without restriction or without additional compensation to the Contractor. The County will be the owner of the documents for the purposes of copyright, patent, or trademark registration.
- b. If the Contractor obtains, uses, or subcontracts for any intellectual property, then it must provide an assignment to the County of ownership or use of the property.
- c. The Contractor must indemnify the County from all claims of infringement related to

the use of any patented design, device, materials, or process, or any trademark or copyright, and must indemnify the County, its officers, agents, and employees with respect to any claim, action, costs, or infringement, for royalties or user fees, arising out of purchase or use of materials, construction, supplies, equipment, or services covered by the Contract.

14. **Payments.** Payments to the Contractor under the Contract will be within 30 days of the County's receipt of a proper invoice from the Contractor. If an invoice remains unpaid 45 days after the invoice was received, interest will accrue at 5% per year.
15. **Records.** Contractor must maintain fiscal records relating to the Contract in accordance with generally accepted accounting principles. All other relevant records must be retained by Contractor and kept accessible for at least three years after final payment, termination of the Contract, or until the conclusion of any audit, controversy, or litigation related to the Contract. All subcontracts must comply with these provisions. County may access all records of the Contractor related to the Contract.
16. **Remedies.**
 - a. **Corrections of errors and omissions.** Contractor must perform work necessary to correct errors and omissions in the services required under the Contract, without undue delays and cost to the County. The County's acceptance will not relieve the Contractor of the responsibility of subsequent corrections of errors.
 - b. **Set-off.** The County may deduct from any amounts payable to the Contractor any back-charges, penalties, or damages sustained by the County, its agents, or employees caused by Contractor's breach. Contractor will not be relieved of liability for any costs caused by a failure to satisfactorily perform the services.
 - c. **Cumulative.** These remedies are cumulative and without waiver of any others.
17. **Responsibility of Contractor.**
 - a. The Contractor must perform the services with the standard of care, skill, and diligence normally provided by a Contractor in the performance of services similar the services.
 - b. Notwithstanding any review, approval, acceptance, or payment for the services by the County, the Contractor will be responsible for the accuracy of any work, design, drawings, specifications, and materials furnished by the Contractor under the Contract.
 - c. If the Contractor fails to conform with subparagraph (a) above, then it must, if required by the County, perform at its own expense any service necessary for the correction of any deficiencies or damages resulting from the Contractor's failure. This obligation is in addition to any other remedy available to the County.
18. **Severability/Waiver.** If a court finds any term of the Contract to be invalid, the validity of the remaining terms will not be affected. The failure of either party to enforce any term of the Contract is not a waiver by that party.
19. **Subcontracting or Assignment.** The Contractor may not subcontract or assign any part of the Contract without the prior written consent of the County. The County may withhold consent for any reason the County deems appropriate.

20. **Termination.** If the Contractor violates any provision of the Contract, the County may terminate the Contract by written notice. All finished or unfinished work provided by the Contractor will, at the County's option, become the County's property. The County will pay the Contractor fair compensation for satisfactory performance that occurred before termination less the amount of damages caused by the Contractor's breach. If the damages are more than the compensation payable to the Contractor, the Contractor will remain liable after termination and the County can affirmatively collect damages.
21. **Termination of Contract for Convenience.** Upon written notice, the County may terminate the Contract when the County determines termination is in the County's best interest. Termination for convenience is effective on the date specified in the County's written notice. The County will pay for reasonable costs allocable to the Contract for costs incurred by the Contractor up to the date of termination. But the Contractor will not be reimbursed for any anticipatory profits that have not been earned before termination.
22. **Termination of Multi-year Contract.** If funds are not available for any fiscal period of the Contract after the first fiscal period, then the Contract will be terminated automatically as of the beginning of unfunded fiscal period. Termination will discharge the Contractor and the County from future performance of the Contract, but not from their rights and obligations existing at the time of termination.
23. **Third Party Beneficiaries.** The County and Contractor are the only parties to the Contract and are the only parties entitled to enforce its terms. Nothing in the Contract gives any benefit or right to third persons unless individually identified by name and expressly described as intended beneficiaries of the Contract.
24. **Use of County Facilities.** Contractor may only utilize County facilities that are needed to perform the Contract. County has no responsibility for the loss or damage to Contractor's personal property which may be stored within a County facility or on County property.
25. **Whole Contract.** The Contract, the Standard Terms, and attachments are the complete agreement between the parties and supersede all earlier agreements, proposals, or other communications between the parties relating to the subject matter of the Contract.

END OF SECTION

***The preceding sections contain Worcester County's standard bid specifications. Should there be any discrepancies between this information and the specifications outlined by the Engineers Joint Contract Documents Committee (EJCDC) below, the EJCDC specifications will take precedence.**

ADVERTISEMENT FOR BIDS
COUNTY COMMISSIONERS OF WORCESTER COUNTY
WORCESTER COUNTY, MARYLAND
LEWIS ROAD GRAVITY SEWER AND PUMP STATION

General Notice: The County Commissioners of Worcester County (Owner) is requesting Bids for the construction of the following Project:

LEWIS ROAD GRAVITY SEWER AND PUMP STATION

Bids for the construction of the Project will be received at the office of the County Commissioners of Worcester County, One West Market Street, Room 1103, Snow Hill, Maryland 21863, until January 29, 2025 at 2:30pm local time. At that time the Bids received will be publicly opened and read.

Work of the Project includes the construction of approximately 5,200 linear feet of gravity sewer main, precast manhole structures, approximately 1,700 linear feet of sewer force main, regional sewer pumping station, installation of sewer laterals and connection to homes, abandonment of existing septic systems, trench and pavement restoration, and all other associated ancillary items necessary for the completion of the project as stipulated in the contract documents.

Bids are requested for the following Contract: Lewis Road Gravity Sewer and Pump Station

The Project has an expected substantial completion duration of 240 days.

Obtaining the Bidding Documents: Information and Bidding Documents for the Project can be found at the following designated website:

<https://www.co.worcester.md.us/commissioners/bids>

Bidding Documents may be downloaded from the designated website. Prospective Bidders are urged to monitor the designated website as a plan holder, even if Bidding Documents are obtained from a plan room or source other than the designated website in either electronic or paper format. The designated website will be updated periodically with addenda, reports, and other information relevant to submitting a Bid for the Project. All official notifications, addenda, and other Bidding Documents will be offered only through the designated website. Neither Owner nor Engineer will be responsible for Bidding Documents, including addenda, if any, obtained from sources other than the designated website.

Pre-bid Conference: A pre-bid conference for the Project will be held on January 9, 2025 at 10:00am local time at Worcester County Department of Public Works located at 1000 Shore Lane, Berlin Maryland 21811. Attendance at the pre-bid conference is encouraged but not required.

Instructions to Bidders: For all further requirements regarding bid submittal, qualifications, procedures, and contract award, refer to the Instructions to Bidders that are included in the Bidding Documents.

Domestic Preference

This project is subject to the Build America, Buy America Act (BABAA) requirements under Title IX of the Infrastructure Investment and Jobs Act (IIJA), Pub. L. 117-58, §§ 70901-70953. Absent an approved waiver, all iron, steel, manufactured products, and construction materials used in this project must be produced in the United States.

The following waivers apply to this Contract:

BABAA De Minimis, Small Grants, and Minor Components

This Advertisement is issued by:

Owner: County Commissioners of Worcester County

By: Mr. Dallas Baker, P.E.

Title: Director of Public Work

Date: December 13, 2024



**Contract Documents and
Construction Specifications
Lewis Road Gravity Sewer System
and
Pump Station
Worcester County, Maryland**

Prepared for

Worcester County Department of Public Works
1000 Shore Lane
Berlin, Maryland 21811

Prepared by

EA Engineering, Science, and Technology, Inc., PBC
11200 Racetrack Road, Unit A101
Ocean Pines, Maryland 21811
(410) 641-5341



October 2024
EA Project No. 6250909

**Contract Documents and
Construction Specifications
Lewis Road Gravity Sewer
And Pump Station
Worcester County, Maryland**

Prepared for

Worcester County Department of Public Works
6113 Timmons Road
Snow Hill, Maryland 21863

Prepared by

EA Engineering, Science, and Technology, Inc., PBC
11200 Racetrack Road, Unit A101
Ocean Pines, Maryland 21811
(410) 641-5341

October 2024

**WORCESTER COUNTY MARYLAND
BIDDING DOCUMENTS**

**CONSTRUCTION SPECIFICATIONS
FOR
LEWIS ROAD GRAVITY SEWER AND PUMP STATION**

TABLE OF CONTENTS

SECTION A:	INSTRUCTIONS TO BIDDERS
SECTION B:	GENERAL CONDITIONS OF THE CONTRACT
SECTION C:	SUPPLEMENTARY CONDITIONS
SECTION D:	BONDS AND BID FORMS
SECTION E:	SPECIFICATIONS
SECTION F:	PERMITS

SECTION A

INSTRUCTIONS TO BIDDERS

INSTRUCTIONS TO BIDDERS FOR CONSTRUCTION CONTRACT

TABLE OF CONTENTS

	Page
Article 1— Defined Terms	1
Article 2— Bidding Documents	1
Article 3— Qualifications of Bidders	2
Article 4— Pre-Bid Conference	3
Article 5— Site and Other Areas; Existing Site Conditions; Examination of Site; Owner’s Safety Program; Other Work at the Site	3
Article 6— Bidder’s Representations and Certifications	5
Article 7— Interpretations and Addenda	5
Article 8— Bid Security	6
Article 9— Contract Times	6
Article 10— Substitute and “Or Equal” Items.....	7
Article 11— Subcontractors, Suppliers, and Others	7
Article 12— Preparation of Bid	8
Article 13— Basis of Bid	9
Article 14— Submittal of Bid.....	11
Article 15— Modification and Withdrawal of Bid.....	11
Article 16— Opening of Bids	12
Article 17— Bids to Remain Subject to Acceptance	12
Article 18— Evaluation of Bids and Award of Contract	12
Article 19— Bonds and Insurance.....	13
Article 20— Signing of Agreement.....	13
Article 21— Sales and Use Taxes	14
Article 22— Federal requirements	14

ARTICLE 1—DEFINED TERMS

- 1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:
- A. *Issuing Office*—The office from which the Bidding Documents are to be issued, and which registers plan holders.
 - B. ***Domestic Preference – The Build America, Buy America Act (BABAA) requirements under Title IX of the Infrastructure Investment and Jobs Act (IIJA), Pub. L. 117-58, §§ 70901-70953.***

ARTICLE 2—BIDDING DOCUMENTS

- 2.01 Bidder shall obtain a complete set of Bidding Requirements and proposed Contract Documents (together, the Bidding Documents). See the Agreement for a list of the Contract Documents. It is Bidder's responsibility to determine that it is using a complete set of documents in the preparation of a Bid. Bidder assumes sole responsibility for errors or misinterpretations resulting from the use of incomplete documents, by Bidder itself or by its prospective Subcontractors and Suppliers.
- 2.02 Bidding Documents are made available for the sole purpose of obtaining Bids for completion of the Project and permission to download or distribution of the Bidding Documents does not confer a license or grant permission or authorization for any other use. Authorization to download documents, or other distribution, includes the right for plan holders to print documents solely for their use, and the use of their prospective Subcontractors and Suppliers, provided the plan holder pays all costs associated with printing or reproduction. Printed documents may not be re-sold under any circumstances.
- 2.03 Owner has established a Bidding Documents Website as indicated in the Advertisement or invitation to bid. Owner recommends that Bidder register as a plan holder with the Issuing Office at such website, and obtain a complete set of the Bidding Documents from such website. Bidders may rely that sets of Bidding Documents obtained from the Bidding Documents Website are complete, unless an omission is blatant. Registered plan holders will receive Addenda issued by Owner.
- 2.04 *Electronic Documents*
- A. When the Bidding Requirements indicate that electronic (digital) copies of the Bidding Documents are available, such documents will be made available to the Bidders as Electronic Documents in the manner specified.
 - 1. Bidding Documents will be provided in Adobe PDF (Portable Document Format) (.pdf) that is readable by Adobe Acrobat Reader Version. It is the intent of the Engineer and Owner that such Electronic Documents are to be exactly representative of the paper copies of the documents. However, because the Owner and Engineer cannot totally control the transmission and receipt of Electronic Documents nor the Contractor's means of reproduction of such documents, the Owner and Engineer cannot and do not guarantee that Electronic Documents and reproductions prepared from those versions are identical in every manner to the paper copies.
 - B. Unless otherwise stated in the Bidding Documents, the Bidder may use and rely upon complete sets of Electronic Documents of the Bidding Documents, described in

Paragraph 2.06.A above. However, Bidder assumes all risks associated with differences arising from transmission/receipt of Electronic Documents versions of Bidding Documents and reproductions prepared from those versions and, further, assumes all risks, costs, and responsibility associated with use of the Electronic Documents versions to derive information that is not explicitly contained in printed paper versions of the documents, and for Bidder's reliance upon such derived information.

- C. After the Contract is awarded, the Owner will provide or direct the Engineer to provide for the use of the Contractor documents that were developed by Engineer as part of the Project design process, as Electronic Documents in native file formats.
 - 1. Electronic Documents that are available in native file format include:
 - a. AutoCAD Drawings at the discretion of the County and Engineer.
 - 2. Release of such documents will be solely for the convenience of the Contractor. No such document is a Contract Document.
 - 3. Unless the Contract Documents explicitly identify that such information will be available to the Successful Bidder (Contractor), nothing herein will create an obligation on the part of the Owner or Engineer to provide or create such information, and the Contractor is not entitled to rely on the availability of such information in the preparation of its Bid or pricing of the Work. In all cases, the Contractor shall take appropriate measures to verify that any electronic/digital information provided in Electronic Documents is appropriate and adequate for the Contractor's specific purposes.
 - 4. In no case will the Contractor be entitled to additional compensation or time for completion due to any differences between the actual Contract Documents and any related document in native file format.

ARTICLE 3—QUALIFICATIONS OF BIDDERS

- 3.01 Bidder is to submit the following information with its Bid to demonstrate Bidder's qualifications to perform the Work:
 - A. Written evidence establishing its qualifications such as financial data, previous experience, and present commitments.
 - B. A written statement that Bidder is authorized to do business in the state where the Project is located, or a written certification that Bidder will obtain such authority prior to the Effective Date of the Contract.
 - C. Bidder's state or other contractor license number, if applicable.
 - D. Subcontractor and Supplier qualification information.
 - E. Other required information regarding qualifications.

- 3.02 ~~Deleted~~ A Bidder's failure to submit required qualification information within the times indicated may disqualify Bidder from receiving an award of the Contract.
- 3.03 No requirement in this Article 3 to submit information will prejudice the right of Owner to seek additional pertinent information regarding Bidder's qualifications.

ARTICLE 4—PRE-BID CONFERENCE

- 4.01 A non-mandatory pre-bid conference will be held at the time and location indicated in the Advertisement or invitation to bid. Representatives of Owner and Engineer will be present to discuss the Project. Bidders are encouraged to attend and participate in the conference; however, attendance at this conference is not required to submit a Bid.
- 4.02 Information presented at the pre-Bid conference does not alter the Contract Documents. Owner will issue Addenda to make any changes to the Contract Documents that result from discussions at the pre-Bid conference. Information presented, and statements made at the pre-bid conference will not be binding or legally effective unless incorporated in an Addendum.

ARTICLE 5—SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE; OWNER'S SAFETY PROGRAM; OTHER WORK AT THE SITE

5.01 Site and Other Areas

- A. The Site is identified in the Bidding Documents. By definition, the Site includes rights-of-way, easements, and other lands furnished by Owner for the use of the Contractor. Any additional lands required for temporary construction facilities, construction equipment, or storage of materials and equipment, and any access needed for such additional lands, are to be obtained and paid for by Contractor.

5.02 Existing Site Conditions

A. Subsurface and Physical Conditions; Hazardous Environmental Conditions

1. The Supplementary Conditions identify the following regarding existing conditions at or adjacent to the Site:
 - a. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data.
 - b. Those drawings known to Owner of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data.
 - c. Reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site.
 - d. Technical Data contained in such reports and drawings.
2. Owner will make copies of reports and drawings referenced above available to any Bidder on request. These reports and drawings are not part of the Contract Documents, but the Technical Data contained therein upon whose accuracy Bidder is entitled to rely, as provided in the General Conditions, has been identified and established in the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion

Bidder draws from any Technical Data or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

3. If the Supplementary Conditions do not identify Technical Data, the default definition of Technical Data set forth in Article 1 of the General Conditions will apply.

- B. *Underground Facilities:* Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05 of the General Conditions, and not in the drawings referred to in Paragraph 5.02.A of these Instructions to Bidders. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

5.03 *Other Site-related Documents*

- A. In addition to the documents regarding existing Site conditions referred to in Paragraph 5.02.A, the following other documents relating to conditions at or adjacent to the Site are known to Owner and made available to Bidders for reference:

1. **Preliminary Engineering Report for Lewis Road Sewer Extension, Worcester County, Maryland, prepared by Davis, Bowen & Friedel, November 2017, Updated January 2018.**
2. **Subsurface Investigation and Geotechnical Analysis, Lewis Road Sewer Pump Station, prepared by Hardin Kight and Associates, Inc. April 1, 2022.**
3. **The Landings West Worcester County, Maryland Drinking Water and Wastewater Treatment Plants, prepared by George, Miles, and Buhr, LLC, October 2004.**

Owner will make copies of these other Site-related documents available to any Bidder on request.

- B. Owner has not verified the contents of these other Site-related documents, and Bidder may not rely on the accuracy of any data or information in such documents. Bidder is responsible for any interpretation or conclusion Bidder draws from the other Site-related documents.
- C. The other Site-related documents are not part of the Contract Documents.
- D. Bidders are encouraged to review the other Site-related documents, but Bidders will not be held accountable for any data or information in such documents. The requirement to review and take responsibility for documentary Site information is limited to information in (1) the Contract Documents and (2) the Technical Data.
- E. No other Site-related documents are available.

5.04 *Site Visit and Testing by Bidders*

- A. A Site visit is scheduled following the pre-bid conference. Maps to the Site will be available at the pre-Bid conference.
- B. Bidders visiting the Site are required to arrange their own transportation to the Site.
- C. All access to the Site other than during a regularly scheduled Site visit must be coordinated through the County Director of Public Works for visiting the Site. Bidder must conduct the required Site visit during normal working hours.
- D. Bidder is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions.

- E. On request, and to the extent Owner has control over the Site, and schedule permitting, the Owner will provide Bidder general access to the Site to conduct such additional examinations, investigations, explorations, tests, and studies as Bidder deems necessary for preparing and submitting a successful Bid. Owner will not have any obligation to grant such access if doing so is not practical because of existing operations, security or safety concerns, or restraints on Owner's authority regarding the Site. Bidder is responsible for establishing access needed to reach specific selected test sites.
- F. Bidder must comply with all applicable Laws and Regulations regarding excavation and location of utilities, obtain all permits, and comply with all terms and conditions established by Owner or by property owners or other entities controlling the Site with respect to schedule, access, existing operations, security, liability insurance, and applicable safety programs.
- G. Bidder must fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

5.05 *Owner's Safety Program*

- A. Site visits and work at the Site may be governed by an Owner safety program. If an Owner safety program exists, it will be noted in the Supplementary Conditions.

5.06 *Other Work at the Site*

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

ARTICLE 6—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

6.01 *Express Representations and Certifications in Bid Form, Agreement*

- A. The Bid Form that each Bidder will submit contains express representations regarding the Bidder's examination of Project documentation, Site visit, and preparation of the Bid, and certifications regarding lack of collusion or fraud in connection with the Bid. Bidder should review these representations and certifications, and assure that Bidder can make the representations and certifications in good faith, before executing and submitting its Bid.
- B. If Bidder is awarded the Contract, Bidder (as Contractor) will make similar express representations and certifications when it executes the Agreement.

ARTICLE 7—INTERPRETATIONS AND ADDENDA

- 7.01 Owner on its own initiative may issue Addenda to clarify, correct, supplement, or change the Bidding Documents.
- 7.02 Bidder shall submit all questions about the meaning or intent of the Bidding Documents to Engineer in writing. Contact information and submittal procedures for such questions are as follows:

A. Mr. Nicholas Rice,
Procurement Officer
Worcester County Administration
One West Market Street, Room 1103
Snow Hill, Maryland 21863
nrice@co.worcester.md.us

- 7.03 Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda delivered to all registered plan holders. Questions received less than seven days prior to the date for opening of Bids may not be answered.
- 7.04 Only responses set forth in an Addendum will be binding. Oral and other interpretations or clarifications will be without legal effect. Responses to questions are not part of the Contract Documents unless set forth in an Addendum that expressly modifies or supplements the Contract Documents.

ARTICLE 8—BID SECURITY

- 8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of 5 percent of Bidder's maximum Bid price (determined by adding the base bid and all alternates) and in the form of a Bid bond issued by a surety meeting the requirements of Paragraph 6.01 of the General Conditions. Such Bid bond will be issued in the form included in the Bidding Documents. **Bid security must be at least 5% of the Bidder's maximum Bid price.**
- 8.02 The Bid security of the apparent Successful Bidder will be retained until Owner awards the contract to such Bidder, and such Bidder has executed the Contract, furnished the required Contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be released. If the Successful Bidder fails to execute and deliver the Contract and furnish the required Contract security within 15 days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited, in whole in the case of a penal sum bid bond, and to the extent of Owner's damages in the case of a damages-form bond. Such forfeiture will be Owner's exclusive remedy if Bidder defaults.
- 8.03 The Bid security of other Bidders that Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of 7 days after the Effective Date of the Contract or 61 days after the Bid opening, whereupon Bid security furnished by such Bidders will be released.
- 8.04 Bid security of other Bidders that Owner believes do not have a reasonable chance of receiving the award will be released within 7 days after the Bid opening.

ARTICLE 9—CONTRACT TIMES

- 9.01 The number of days within which, or the dates by which, the Work is to be (a) substantially completed and (b) ready for final payment, and (c) Milestones (if any) are to be achieved, are set forth in the Agreement.
- 9.02 ~~Deleted Provisions for liquidated damages, if any, for failure to timely attain a Milestone, Substantial Completion, or completion of the Work in readiness for final payment, are set forth in the Agreement.~~

ARTICLE 10—SUBSTITUTE AND “OR EQUAL” ITEMS

- 10.01 ~~Deleted~~ The Contract for the Work, as awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration during the bidding and Contract award process of possible substitute or “or-equal” items. In cases in which the Contract allows the Contractor to request that Engineer authorize the use of a substitute or “or-equal” item of material or equipment, application for such acceptance may not be made to and will not be considered by Engineer until after the Effective Date of the Contract.
- 10.02 The Contract for the Work, as awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, and those “or-equal” or substitute or materials and equipment subsequently approved by Engineer prior to the submittal of Bids and identified by Addendum. No item of material or equipment will be considered by Engineer as an “or-equal” or substitute unless written request for approval has been submitted by Bidder and has been received by Engineer within 10 days of the issuance of the Advertisement for Bids or invitation to Bidders. Each such request must comply with the requirements of Paragraphs 7.05 and 7.06 of the General Conditions, and the review of the request will be governed by the principles in those paragraphs. **Each such request shall include the Manufacturers’ Certification for Compliance with Domestic Preference requirements. Refer to the suggested Manufacturer’s Certification provided in these construction Contract Documents.** The burden of proof of the merit of the proposed item is upon Bidder. Engineer’s decision of approval or disapproval of a proposed item will be final. If Engineer approves any such proposed item, such approval will be set forth in an Addendum issued to all registered Bidders. Bidders cannot rely upon approvals made in any other manner. **Substitutes and “or-equal” materials and equipment may be proposed by Contractor in accordance with Paragraphs 7.05 and 7.06 of the General Conditions after the Effective Date of the Contract. Each such request shall include Manufacturer’s Certification letter to document compliance with Domestic Preference requirements. Refer to Manufacturer’s Certification Letter provided in these Contract Documents.**
- 10.03 All prices that Bidder sets forth in its Bid will be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, as supplemented by Addenda. Any assumptions regarding the possibility of post-Bid approvals of “or-equal” or substitution requests are made at Bidder’s sole risk.

ARTICLE 11—SUBCONTRACTORS, SUPPLIERS, AND OTHERS

- 11.01 ~~Deleted~~ A Bidder must be prepared to retain specific Subcontractors and Suppliers for the performance of the Work if required to do so by the Bidding Documents or in the Specifications. If a prospective Bidder objects to retaining any such Subcontractor or Supplier and the concern is not relieved by an Addendum, then the prospective Bidder should refrain from submitting a Bid.
- 11.02 The apparent Successful Bidder, and any other Bidder so requested, must submit to Owner a list of the Subcontractors or Suppliers proposed for the following, but not limited to, portions of the Work within five days after Bid opening:
- A. Mechanical
 - B. Pumps, Valves, Blower, Flow Meter, and Controls
 - C. Electrical
 - D. Concrete

E. Asphalt

- 11.03 If requested by Owner, such list must be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor or Supplier. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor or Supplier, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute, in which case apparent Successful Bidder will submit a substitute, Bidder's Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and Owner may consider such price adjustment in evaluating Bids and making the Contract award.
- 11.04 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors and Suppliers. Declining to make requested substitutions will constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor or Supplier, so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to subsequent revocation of such acceptance as provided in Paragraph 7.07 of the General Conditions.
- 11.05 **The Contractor shall not award work to Subcontractor(s) in excess of the limits stated in SC 7.07A.**

ARTICLE 12—PREPARATION OF BID

- 12.01 The Bid Form is included with the Bidding Documents.
- A. All blanks on the Bid Form must be completed in ink and the Bid Form signed in ink. Erasures or alterations must be initialed in ink by the person signing the Bid Form. A Bid price must be indicated for each section, Bid item, alternate, adjustment unit price item, and unit price item listed therein.
 - B. If the Bid Form expressly indicates that submitting pricing on a specific alternate item is optional, and Bidder elects to not furnish pricing for such optional alternate item, then Bidder may enter the words "No Bid" or "Not Applicable."
- 12.02 If Bidder has obtained the Bidding Documents as Electronic Documents, then Bidder shall prepare its Bid on a paper copy of the Bid Form printed from the Electronic Documents version of the Bidding Documents. The printed copy of the Bid Form must be clearly legible, printed on 8½ inch by 11-inch paper and as closely identical in appearance to the Electronic Document version of the Bid Form as may be practical. The Owner reserves the right to accept Bid Forms which nominally vary in appearance from the original paper version of the Bid Form, providing that all required information and submittals are included with the Bid.
- 12.03 A Bid by a corporation must be executed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate address and state of incorporation must be shown.
- 12.04 A Bid by a partnership must be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership must be shown.

- 12.05 A Bid by a limited liability company must be executed in the name of the firm by a member or other authorized person and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm must be shown.
- 12.06 A Bid by an individual must show the Bidder's name and official address.
- 12.07 A Bid by a joint venture must be executed by an authorized representative of each joint venturer in the manner indicated on the Bid Form. The joint venture must have been formally established prior to submittal of a Bid, and the official address of the joint venture must be shown.
- 12.08 All names must be printed in ink below the signatures.
- 12.09 The Bid must contain an acknowledgment of receipt of all Addenda, the numbers of which must be filled in on the Bid Form.
- 12.10 Postal and e-mail addresses and telephone number for communications regarding the Bid must be shown.
- 12.11 The Bid must contain evidence of Bidder's authority to do business in the state where the Project is located, or Bidder must certify in writing that it will obtain such authority within the time for acceptance of Bids and attach such certification to the Bid.
- 12.12 If Bidder is required to be licensed to submit a Bid or perform the Work in the state where the Project is located, the Bid must contain evidence of Bidder's licensure. Bidder's state contractor license number, if any, must also be shown on the Bid Form.

ARTICLE 13—BASIS OF BID

13.01 *Lump Sum*

- A. Bidders must submit a Bid on a lump sum basis as set forth in the Bid Form.

13.02 *Base Bid with Alternates*

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

13.03 *Sectional Bids*

- A. Bidders may submit a Bid on any individual section or any combination of sections, as set forth in the Bid Form.
- B. Submission of a Bid on any section signifies Bidder's willingness to enter into a Contract for that section alone at the price offered.
- C. If Bidder submits Bids on individual sections and a Bid based on a combination of those sections, such combined Bid need not be the sum of the Bids on the individual sections.
- D. Bidders offering a Bid on one or more sections must be capable of completing the Work covered by those sections within the time period stated in the Agreement.

13.04 ~~Deleted Cost-Plus-Fee Bids~~

- ~~A. Bidders must submit a Bid on the Contractor's fee, which must be in addition to compensation for Cost of the Work. Such fee must be either (1) a fixed fee, (2) percentages of specified categories of costs, or (3) a percentage applicable to the Cost of the Work as a whole, as set forth in the Bid Form.~~
- ~~B. If the Contractor's fee, as set forth in the Bid Form, is to be based on percentages of categories of cost, or on a percentage applicable to the Cost of the Work as a whole, then Bidders must enter a maximum amount limiting the total fee if required by the Bid Form to do so.~~
- ~~C. Bidders must submit a Bid on the Guaranteed Maximum Price, setting a maximum amount on the compensable Cost of the Work plus Contractor's fee, if required by the Bid Form to do so.~~

13.05 *Unit Price*

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

13.06 *Allowances*

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

13.07 ~~Deleted Price-Plus-Time Bids~~

- ~~A. The Owner will consider the time of Substantial Completion commitment made by the Bidder in the comparison of Bids.~~
- ~~B. Bidder must designate the number of days required to achieve Substantial Completion of the Work and enter that number in the Bid Form as the total number of calendar days to substantially complete the Work.~~
- ~~C. The total number of calendar days for Substantial Completion designated by Bidder must be less than or equal to a maximum of [number], but not less than the minimum of [number]. If Bidder purports to designate a time for Substantial Completion that is less than the allowed minimum, or greater than the allowed maximum, Owner will reject the Bid as nonresponsive.~~

- ~~D. The Agreement as executed will contain the Substantial Completion time designated in Successful Bidder's Bid, and the Contractor will be assessed liquidated damages at the rate stated in the Agreement for failure to attain Substantial Completion within that time.~~
- ~~E. Bidder must also designate the time in which it will achieve Milestones, and achieve readiness for final payment. Such time commitments must be consistent with the "Time of Substantial Completion" to which Bidder commits. The Agreement as executed will contain, as binding Contract Times, Successful Bidder's time commitments regarding Milestones, as applicable, and readiness for final payment.~~

ARTICLE 14—SUBMITTAL OF BID

- 14.01 The Bidding Documents include one separate unbound copy of the Bid Form, and, if required, the Bid Bond Form. The unbound copy of the Bid Form is to be completed and submitted with the Bid security and the other documents required to be submitted under the terms of Article 2 of the Bid Form.
- 14.02 A Bid must be received no later than the date and time prescribed and at the place indicated in the Advertisement or invitation to bid and must be enclosed in a plainly marked package with the Project title, and, if applicable, the designated portion of the Project for which the Bid is submitted, the name and address of Bidder, and must be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid must be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid must be addressed to the location designated in the Advertisement.
- 14.03 Bids received after the date and time prescribed for the opening of bids, or not submitted at the correct location or in the designated manner, will not be accepted and will be returned to the Bidder unopened.

ARTICLE 15—MODIFICATION AND WITHDRAWAL OF BID

- 15.01 An unopened Bid may be withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids. Upon receipt of such notice, the unopened Bid will be returned to the Bidder.
- 15.02 If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in the manner specified in Paragraph 15.01 and submit a new Bid prior to the date and time for the opening of Bids.
- 15.03 If within 24 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, the Bidder may withdraw its Bid,

and the Bid security will be returned. Thereafter, if the Work is rebid, the Bidder will be disqualified from further bidding on the Work.

ARTICLE 16—OPENING OF BIDS

- 16.01 Bids will be opened at the time and place indicated in the advertisement or invitation to bid and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

ARTICLE 17—BIDS TO REMAIN SUBJECT TO ACCEPTANCE

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

ARTICLE 18—EVALUATION OF BIDS AND AWARD OF CONTRACT

- 18.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner also reserves the right to waive all minor Bid informalities not involving price, time, or changes in the Work.
- 18.02 Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible.
- 18.03 If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of the Bid, whether in the Bid itself or in a separate communication to Owner or Engineer, then Owner will reject the Bid as nonresponsive.
- 18.04 If Owner awards the contract for the Work, such award will be to the responsible Bidder submitting the lowest responsive Bid.
- 18.05 *Evaluation of Bids*
- A. In evaluating Bids, Owner will consider whether the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Bid Form or prior to the Notice of Award.
 - B. In the comparison of Bids, alternates will be applied in the same order of priority as listed in the Bid Form. To determine the Bid prices for purposes of comparison, Owner will announce to all bidders a “Base Bid plus alternates” budget after receiving all Bids, but prior to opening them. For comparison purposes alternates will be accepted, following the order of priority established in the Bid Form, until doing so would cause the budget to be exceeded. After determination of the Successful Bidder based on this comparative process and on the responsiveness, responsibility, and other factors set forth in these Instructions, the award may be made to said Successful Bidder on its base Bid and any combination of its additive alternate Bids for which Owner determines funds will be available at the time of award.
 - C. For determination of the apparent low Bidder(s) when sectional bids are submitted, Bids will be compared on the basis of the aggregate of the Bids for separate sections and the Bids for combined sections that result in the lowest total amount for all of the Work.

- D. For the determination of the apparent low Bidder when unit price bids are submitted, Bids will be compared on the basis of the total of the products of the estimated quantity of each item and unit price Bid for that item, together with any lump sum items.
 - E. ~~**Deleted** For the determination of the apparent low Bidder when cost-plus-fee bids are submitted, Bids will be compared on the basis of the Guaranteed Maximum Price set forth by Bidder on the Bid Form.~~
 - F. ~~**Deleted** Bid prices will be compared after adjusting for differences in time of Substantial Completion (total number of calendar days to substantially complete the Work) designated by Bidders. The adjusting amount will be determined at the rate set forth in the Agreement for liquidated damages for failing to achieve Substantial Completion, or such other amount that Owner has designated in the Bid Form.~~
 - 1. ~~The method for calculating the lowest bid for comparison will be the summation of the Bid price shown in the Bid Form plus the product of the Bidder specified time of Substantial Completion in calendar days times the rate for liquidated damages [or other Owner designated daily rate] in dollars per day.~~
 - 2. ~~This procedure is only used to determine the lowest bid for comparison and contractor selection purposes. The Contract Price for compensation and payment purposes remains the Bid price shown in the Bid Form.~~
- 18.06 In evaluating whether a Bidder is responsible, Owner will consider the qualifications of the Bidder and may consider the qualifications and experience of Subcontractors and Suppliers proposed for those portions of the Work for which the identity of Subcontractors and Suppliers must be submitted as provided in the Bidding Documents.
- 18.07 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders and any proposed Subcontractors or Suppliers.

ARTICLE 19—BONDS AND INSURANCE

- 19.01 Article 6 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds, other required bonds, and insurance. When the Successful Bidder delivers the executed Agreement to Owner, it must be accompanied by required bonds and insurance documentation.
- 19.02 Article 8, Bid Security, of these Instructions, addresses any requirements for providing bid bonds as part of the bidding process.

ARTICLE 20—SIGNING OF AGREEMENT

- 20.01 When Owner issues a Notice of Award to the Successful Bidder, it will be accompanied by the unexecuted counterparts of the Agreement along with the other Contract Documents as identified in the Agreement. Within 15 days thereafter, Successful Bidder must execute and deliver the required number of counterparts of the Agreement and any bonds and insurance documentation required to be delivered by the Contract Documents to Owner. Within 10 days thereafter, Owner will deliver one fully executed counterpart of the Agreement to Successful

Bidder, together with printed and electronic copies of the Contract Documents as stated in Paragraph 2.02 of the General Conditions.

ARTICLE 21—SALES AND USE TAXES

- 21.01 Owner is exempt from **Maryland** state sales and use taxes on materials and equipment to be incorporated in the Work. The County will provide a tax exemption certificate number. It is the responsibility of the Contractor to determine what costs are tax exempt. Said taxes must not be included in the Bid. Refer to Paragraph SC-7.10 of the Supplementary Conditions for additional information.

ARTICLE 22—FEDERAL REQUIREMENTS

- 22.01 **If the contract price is in excess of \$100,000, provisions of the Contract Work Hours and Safety Standards Act at 29 CFR 5.5(b) apply.**
- 22.02 **Federal requirements at Article 19 of the Supplementary Conditions apply to this Contract.**

SECTION B

GENERAL CONDITIONS OF THE CONTRACT

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

TABLE OF CONTENTS

	Page
Article 1—Definitions and Terminology.....	1
1.01 Defined Terms.....	1
1.02 Terminology	6
Article 2—Preliminary Matters	7
2.01 Delivery of Performance and Payment Bonds; Evidence of Insurance.....	7
2.02 Copies of Documents	7
2.03 Before Starting Construction	7
2.04 Preconstruction Conference; Designation of Authorized Representatives	8
2.05 Acceptance of Schedules	8
2.06 Electronic Transmittals	8
Article 3—Contract Documents: Intent, Requirements, Reuse.....	9
3.01 Intent.....	9
3.02 Reference Standards.....	9
3.03 Reporting and Resolving Discrepancies	10
3.04 Requirements of the Contract Documents.....	10
3.05 Reuse of Documents	11
Article 4—Commencement and Progress of the Work	11
4.01 Commencement of Contract Times; Notice to Proceed.....	11
4.02 Starting the Work.....	11
4.03 Reference Points	11
4.04 Progress Schedule	12
4.05 Delays in Contractor’s Progress	12
Article 5—Site; Subsurface and Physical Conditions; Hazardous Environmental Conditions	13
5.01 Availability of Lands	13
5.02 Use of Site and Other Areas.....	14
5.03 Subsurface and Physical Conditions.....	15
5.04 Differing Subsurface or Physical Conditions	16

5.05	Underground Facilities	17
5.06	Hazardous Environmental Conditions at Site	19
Article 6—Bonds and Insurance.....		21
6.01	Performance, Payment, and Other Bonds	21
6.02	Insurance—General Provisions	22
6.03	Contractor’s Insurance.....	24
6.04	Builder’s Risk and Other Property Insurance	25
6.05	Property Losses; Subrogation	25
6.06	Receipt and Application of Property Insurance Proceeds	27
Article 7—Contractor’s Responsibilities		27
7.01	Contractor’s Means and Methods of Construction	27
7.02	Supervision and Superintendence	27
7.03	Labor; Working Hours	27
7.04	Services, Materials, and Equipment	28
7.05	“Or Equals”	28
7.06	Substitutes	29
7.07	Concerning Subcontractors and Suppliers.....	31
7.08	Patent Fees and Royalties.....	32
7.09	Permits	33
7.10	Taxes	33
7.11	Laws and Regulations.....	33
7.12	Record Documents.....	33
7.13	Safety and Protection	34
7.14	Hazard Communication Programs	35
7.15	Emergencies	35
7.16	Submittals	35
7.17	Contractor’s General Warranty and Guarantee	38
7.18	Indemnification	39
7.19	Delegation of Professional Design Services	39
Article 8—Other Work at the Site.....		40
8.01	Other Work	40
8.02	Coordination	41
8.03	Legal Relationships.....	41

Article 9—Owner’s Responsibilities	42
9.01 Communications to Contractor	42
9.02 Replacement of Engineer	42
9.03 Furnish Data	42
9.04 Pay When Due.....	42
9.05 Lands and Easements; Reports, Tests, and Drawings	43
9.06 Insurance.....	43
9.07 Change Orders	43
9.08 Inspections, Tests, and Approvals.....	43
9.09 Limitations on Owner’s Responsibilities	43
9.10 Undisclosed Hazardous Environmental Condition.....	43
9.11 Evidence of Financial Arrangements.....	43
9.12 Safety Programs	43
Article 10—Engineer’s Status During Construction	44
10.01 Owner’s Representative.....	44
10.02 Visits to Site.....	44
10.03 Resident Project Representative.....	44
10.04 Engineer’s Authority	44
10.05 Determinations for Unit Price Work	45
10.06 Decisions on Requirements of Contract Documents and Acceptability of Work	45
10.07 Limitations on Engineer’s Authority and Responsibilities	45
10.08 Compliance with Safety Program.....	45
Article 11—Changes to the Contract	46
11.01 Amending and Supplementing the Contract	46
11.02 Change Orders	46
11.03 Work Change Directives.....	46
11.04 Field Orders.....	47
11.05 Owner-Authorized Changes in the Work	47
11.06 Unauthorized Changes in the Work.....	47
11.07 Change of Contract Price	47
11.08 Change of Contract Times.....	49
11.09 Change Proposals.....	49
11.10 Notification to Surety.....	50

Article 12—Claims.....	50
12.01 Claims.....	50
Article 13—Cost of the Work; Allowances; Unit Price Work	51
13.01 Cost of the Work	51
13.02 Allowances	55
13.03 Unit Price Work.....	55
Article 14—Tests and Inspections; Correction, Removal, or Acceptance of Defective Work	56
14.01 Access to Work.....	56
14.02 Tests, Inspections, and Approvals.....	56
14.03 Defective Work	57
14.04 Acceptance of Defective Work.....	58
14.05 Uncovering Work	58
14.06 Owner May Stop the Work	58
14.07 Owner May Correct Defective Work.....	59
Article 15—Payments to Contractor; Set-Offs; Completion; Correction Period	59
15.01 Progress Payments.....	59
15.02 Contractor’s Warranty of Title	62
15.03 Substantial Completion.....	62
15.04 Partial Use or Occupancy	63
15.05 Final Inspection	64
15.06 Final Payment.....	64
15.07 Waiver of Claims	65
15.08 Correction Period	66
Article 16—Suspension of Work and Termination	67
16.01 Owner May Suspend Work	67
16.02 Owner May Terminate for Cause.....	67
16.03 Owner May Terminate for Convenience.....	68
16.04 Contractor May Stop Work or Terminate	68
Article 17—Final Resolution of Disputes	69
17.01 Methods and Procedures.....	69
Article 18—Miscellaneous	69
18.01 Giving Notice	69
18.02 Computation of Times.....	69

18.03	Cumulative Remedies	70
18.04	Limitation of Damages	70
18.05	No Waiver	70
18.06	Survival of Obligations	70
18.07	Controlling Law	70
18.08	Assignment of Contract.....	70
18.09	Successors and Assigns	70
18.10	Headings.....	70

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

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

requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract.

- b. A demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal, or seeking resolution of a contractual issue that Engineer has declined to address.
 - c. A demand or assertion by Owner or Contractor, duly submitted in compliance with the procedural requirements set forth herein, made pursuant to Paragraph 12.01.A.4, concerning disputes arising after Engineer has issued a recommendation of final payment.
 - d. A demand for money or services by a third party is not a Claim.
- 11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
 - 12. *Contract*—The entire and integrated written contract between Owner and Contractor concerning the Work.
 - 13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
 - 14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.
 - 15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
 - 16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
 - 17. *Cost of the Work*—See Paragraph 13.01 for definition.
 - 18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
 - 19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
 - 20. *Electronic Document*—Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.
 - 21. *Electronic Means*—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or communication of Electronic Documents; (b) the documentation of transmissions, including sending and receipt; (c) printing of the transmitted Electronic Document by the

recipient; (d) the storage and archiving of the Electronic Document by sender and recipient; and (e) the use by recipient of the Electronic Document for purposes permitted by this Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.

22. *Engineer*—The individual or entity named as such in the Agreement.
23. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
24. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto.
 - a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.
 - b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.
 - c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.
25. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and binding decrees, resolutions, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
26. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
27. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date, or by a time prior to Substantial Completion of all the Work.
28. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.
29. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
30. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
31. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising Contractor's plan to accomplish the Work within the Contract Times.
32. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

33. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative (RPR) includes any assistants or field staff of Resident Project Representative.
34. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
35. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer’s review of the submittals.
36. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor’s Applications for Payment.
37. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.
38. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands or areas furnished by Owner which are designated for the use of Contractor.
39. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
40. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.
41. *Submittal*—A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals may include Shop Drawings and Samples; schedules; product data; Owner-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections, and field or Site quality-control testing and inspections; warranties and certifications; Suppliers’ instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other such documents required by the Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.
42. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion of such Work.

43. *Successful Bidder*—The Bidder to which the Owner makes an award of contract.
44. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
45. *Supplier*—A manufacturer, fabricator, supplier, distributor, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.
46. *Technical Data*
- a. Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (1) existing subsurface conditions at or adjacent to the Site, or existing physical conditions at or adjacent to the Site including existing surface or subsurface structures (except Underground Facilities) or (2) Hazardous Environmental Conditions at the Site.
 - b. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then Technical Data is defined, with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06, as the data contained in boring logs, recorded measurements of subsurface water levels, assessments of the condition of subsurface facilities, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical, environmental, or other Site or facilities conditions report prepared for the Project and made available to Contractor.
 - c. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data, and instead Underground Facilities are shown or indicated on the Drawings.
47. *Underground Facilities*—All active or not-in-service underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including but not limited to those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid petroleum products, water, steam, waste, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. An abandoned facility or system is not an Underground Facility.
48. *Unit Price Work*—Work to be paid for on the basis of unit prices.
49. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.
50. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 Terminology

- A. The words and terms discussed in Paragraphs 1.02.B, C, D, and E are not defined terms that require initial capital letters, but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives:* The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.
- C. *Day:* The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.
- D. *Defective:* The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - 1. does not conform to the Contract Documents;
 - 2. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - 3. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or Paragraph 15.04).
- E. *Furnish, Install, Perform, Provide*
 - 1. The word “furnish,” when used in connection with services, materials, or equipment, means to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 - 2. The word “install,” when used in connection with services, materials, or equipment, means to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
 - 3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, means to furnish and install said services, materials, or equipment complete and ready for intended use.
 - 4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

- F. *Contract Price or Contract Times*: References to a change in “Contract Price or Contract Times” or “Contract Times or Contract Price” or similar, indicate that such change applies to (1) Contract Price, (2) Contract Times, or (3) both Contract Price and Contract Times, as warranted, even if the term “or both” is not expressed.
- G. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2—PRELIMINARY MATTERS

2.01 *Delivery of Performance and Payment Bonds; Evidence of Insurance*

- A. *Performance and Payment Bonds*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner the performance bond and payment bond (if the Contract requires Contractor to furnish such bonds).
- B. *Evidence of Contractor’s Insurance*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each additional insured (as identified in the Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Contractor in accordance with Article 6, except to the extent the Supplementary Conditions expressly establish other dates for delivery of specific insurance policies.
- C. *Evidence of Owner’s Insurance*: After receipt of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each additional insured (as identified in the Contract), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

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

2.03 *Before Starting Construction*

- A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise required by the Contract Documents), Contractor shall submit to Engineer for timely review:
 - 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;
 - 2. a preliminary Schedule of Submittals; and
 - 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work

into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

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

2.05 *Acceptance of Schedules*

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

2.06 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may send, and shall accept, Electronic Documents transmitted by Electronic Means.
- B. If the Contract does not establish protocols for Electronic Means, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. Subject to any governing protocols for Electronic Means, when transmitting Electronic Documents by Electronic Means, the transmitting party makes no representations as to long-term compatibility, usability, or readability of the Electronic Documents resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the Electronic Documents.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one Contract Document is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents.
- C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the printed record version will govern.
- D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
- E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.
- F. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Owner and Contractor, which agree that the Contract Documents will be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.
- G. Nothing in the Contract Documents creates:
 - 1. any contractual relationship between Owner or Engineer and any Subcontractor, Supplier, or other individual or entity performing or furnishing any of the Work, for the benefit of such Subcontractor, Supplier, or other individual or entity; or
 - 2. any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity, except as may otherwise be required by Laws and Regulations.

3.02 *Reference Standards*

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

inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*

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

B. *Resolving Discrepancies*

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

3.04 *Requirements of the Contract Documents*

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer in writing all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work.

- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.
- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly notify Owner and Contractor in writing that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

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

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the 30th day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the 60th day after the day of Bid opening or the 30th day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

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

4.03 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the

established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.
 - 2. Proposed adjustments in the Progress Schedule that will change the Contract Times must be submitted in accordance with the requirements of Article 11.
- B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work will be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.
- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Such an adjustment will be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
 - 1. Severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
 - 2. Abnormal weather conditions;
 - 3. Acts or failures to act of third-party utility owners or other third-party entities (other than those third-party utility owners or other third-party entities performing other work at or adjacent to the Site as arranged by or under contract with Owner, as contemplated in Article 8); and
 - 4. Acts of war or terrorism.

- D. Contractor's entitlement to an adjustment of Contract Times or Contract Price is limited as follows:
1. Contractor's entitlement to an adjustment of the Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.
 2. Contractor shall not be entitled to an adjustment in Contract Price for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor. Such a concurrent delay by Contractor shall not preclude an adjustment of Contract Times to which Contractor is otherwise entitled.
 3. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 11.
- E. Each Contractor request or Change Proposal seeking an increase in Contract Times or Contract Price must be supplemented by supporting data that sets forth in detail the following:
1. The circumstances that form the basis for the requested adjustment;
 2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;
 3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;
 4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and
 5. The impact on Contract Price, in accordance with the provisions of Paragraph 11.07.
- Contractor shall also furnish such additional supporting documentation as Owner or Engineer may require including, where appropriate, a revised progress schedule indicating all the activities affected by the delay, disruption, or interference, and an explanation of the effect of the delay, disruption, or interference on the critical path to completion of the Work.
- F. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5, together with the provisions of Paragraphs 4.05.D and 4.05.E.
- G. Paragraph 8.03 addresses delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

ARTICLE 5—SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor in writing of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.

- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas*

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas, or to improvements, structures, utilities, or similar facilities located at such adjacent lands or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
 2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.13, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or in a court of competent jurisdiction; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.
- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris will conform to applicable Laws and Regulations.
 - C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment

and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

- D. *Loading of Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

- A. *Reports and Drawings:* The Supplementary Conditions identify:

1. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data;
2. Those drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data; and
3. Technical Data contained in such reports and drawings.

- B. *Underground Facilities:* Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05, and not in the drawings referred to in Paragraph 5.03.A. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

- C. *Reliance by Contractor on Technical Data:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b.

- D. *Limitations of Other Data and Documents:* Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;
 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings;
 3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or
 4. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

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

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

- B. *Engineer's Review:* After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine whether it is necessary for Owner to obtain additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- C. *Owner's Statement to Contractor Regarding Site Condition:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.
- D. *Early Resumption of Work:* If at any time Engineer determines that Work in connection with the subsurface or physical condition in question may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the condition in question has been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- E. *Possible Price and Times Adjustments*
1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in

Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

- a. Such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
 - b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,
 - c. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
 - a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise;
 - b. The existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
 - c. Contractor failed to give the written notice required by Paragraph 5.04.A.
 3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.
 4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.
- F. *Underground Facilities; Hazardous Environmental Conditions:* Paragraph 5.05 governs rights and responsibilities regarding the presence or location of Underground Facilities. Paragraph 5.06 governs rights and responsibilities regarding Hazardous Environmental Conditions. The provisions of Paragraphs 5.03 and 5.04 are not applicable to the presence or location of Underground Facilities, or to Hazardous Environmental Conditions.

5.05 *Underground Facilities*

- A. *Contractor's Responsibilities:* Unless it is otherwise expressly provided in the Supplementary Conditions, the cost of all of the following are included in the Contract Price, and Contractor shall have full responsibility for:
1. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
 2. complying with applicable state and local utility damage prevention Laws and Regulations;

3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;
 4. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 5. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated on the Drawings, or was not shown or indicated on the Drawings with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing regarding such Underground Facility.
- C. *Engineer's Review:* Engineer will:
1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy;
 2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question;
 3. obtain any pertinent cost or schedule information from Contractor; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and
 4. advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
- D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. *Early Resumption of Work:* If at any time Engineer determines that Work in connection with the Underground Facility may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the Underground Facility in question and conditions affected by its presence have been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- F. *Possible Price and Times Adjustments*
1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown

or indicated on the Drawings, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

- a. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;
 - b. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and
 - c. Contractor gave the notice required in Paragraph 5.05.B.
2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.
 3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.
 4. The information and data shown or indicated on the Drawings with respect to existing Underground Facilities at the Site is based on information and data (a) furnished by the owners of such Underground Facilities, or by others, (b) obtained from available records, or (c) gathered in an investigation conducted in accordance with the current edition of ASCE 38, Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, by the American Society of Civil Engineers. If such information or data is incorrect or incomplete, Contractor's remedies are limited to those set forth in this Paragraph 5.05.F.

5.06 *Hazardous Environmental Conditions at Site*

A. *Reports and Drawings:* The Supplementary Conditions identify:

1. those reports known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site;
2. drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
3. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures

- of construction to be employed by Contractor, and safety precautions and programs incident thereto;
2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.
- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, as a result of such Work stoppage, such special conditions under which Work is agreed to be resumed by Contractor, or any costs or expenses incurred in response to the Hazardous Environmental Condition, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off. Entitlement to any such adjustment is subject to the provisions of Paragraphs 4.05.D, 4.05.E, 11.07, and 11.08.
- H. If, after receipt of such written notice, Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special

conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court, arbitration, or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I obligates Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J obligates Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6—BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of Contractor's obligations under the Contract. These bonds must remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the terms of a prescribed bond form, the Supplementary Conditions, or other provisions of the Contract.
- B. Contractor shall also furnish such other bonds (if any) as are required by the Supplementary Conditions or other provisions of the Contract.
- C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Owner prior to execution of the Contract, except as provided otherwise by Laws or

Regulations, and must be issued and signed by a surety named in “Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies” as published in Department Circular 570 (as amended and supplemented) by the Bureau of the Fiscal Service, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual’s authority to bind the surety. The evidence of authority must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

- D. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue bonds in the required amounts.
- E. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer in writing and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which must comply with the bond and surety requirements above.
- F. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner’s termination rights under Article 16.
- G. Upon request to Owner from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Owner shall provide a copy of the payment bond to such person or entity.
- H. Upon request to Contractor from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Contractor shall provide a copy of the payment bond to such person or entity.

6.02 *Insurance—General Provisions*

- A. Owner and Contractor shall obtain and maintain insurance as required in this article and in the Supplementary Conditions.
- B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized in the state or jurisdiction in which the Project is located to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- C. Alternative forms of insurance coverage, including but not limited to self-insurance and “Occupational Accident and Excess Employer’s Indemnity Policies,” are not sufficient to meet the insurance requirements of this Contract, unless expressly allowed in the Supplementary Conditions.
- D. Contractor shall deliver to Owner, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Contractor has obtained and is maintaining the policies and coverages required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, full disclosure of all relevant exclusions, and evidence of insurance required to be purchased and maintained by

Subcontractors or Suppliers. In any documentation furnished under this provision, Contractor, Subcontractors, and Suppliers may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those applicable to this Contract.

- E. Owner shall deliver to Contractor, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Owner has obtained and is maintaining the policies and coverages required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, and full disclosure of all relevant exclusions. In any documentation furnished under this provision, Owner may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those relevant to this Contract.
- F. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, will not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.
- G. In addition to the liability insurance required to be provided by Contractor, the Owner, at Owner's option, may purchase and maintain Owner's own liability insurance. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.
- H. Contractor shall require:
 - 1. Subcontractors to purchase and maintain worker's compensation, commercial general liability, and other insurance that is appropriate for their participation in the Project, and to name as additional insureds Owner and Engineer (and any other individuals or entities identified in the Supplementary Conditions as additional insureds on Contractor's liability policies) on each Subcontractor's commercial general liability insurance policy; and
 - 2. Suppliers to purchase and maintain insurance that is appropriate for their participation in the Project.
- I. If either party does not purchase or maintain the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.
- J. If Contractor has failed to obtain and maintain required insurance, Contractor's entitlement to enter or remain at the Site will end immediately, and Owner may impose an appropriate set-off against payment for any associated costs (including but not limited to the cost of purchasing necessary insurance coverage), and exercise Owner's termination rights under Article 16.
- K. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect (but is in no way obligated) to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price will be adjusted accordingly.

- L. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary.
- M. The insurance and insurance limits required herein will not be deemed as a limitation on Contractor's liability, or that of its Subcontractors or Suppliers, under the indemnities granted to Owner and other individuals and entities in the Contract or otherwise.
- N. All the policies of insurance required to be purchased and maintained under this Contract will contain a provision or endorsement that the coverage afforded will not be canceled, or renewal refused, until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured and Engineer.

6.03 *Contractor's Insurance*

- A. *Required Insurance:* Contractor shall purchase and maintain Worker's Compensation, Commercial General Liability, and other insurance pursuant to the specific requirements of the Supplementary Conditions.
- B. *General Provisions:* The policies of insurance required by this Paragraph 6.03 as supplemented must:
 - 1. include at least the specific coverages required;
 - 2. be written for not less than the limits provided, or those required by Laws or Regulations, whichever is greater;
 - 3. remain in effect at least until the Work is complete (as set forth in Paragraph 15.06.D), and longer if expressly required elsewhere in this Contract, and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract;
 - 4. apply with respect to the performance of the Work, whether such performance is by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable; and
 - 5. include all necessary endorsements to support the stated requirements.
- C. *Additional Insureds:* The Contractor's commercial general liability, automobile liability, employer's liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies, if required by this Contract, must:
 - 1. include and list as additional insureds Owner and Engineer, and any individuals or entities identified as additional insureds in the Supplementary Conditions;
 - 2. include coverage for the respective officers, directors, members, partners, employees, and consultants of all such additional insureds;
 - 3. afford primary coverage to these additional insureds for all claims covered thereby (including as applicable those arising from both ongoing and completed operations);

4. not seek contribution from insurance maintained by the additional insured; and
5. as to commercial general liability insurance, apply to additional insureds with respect to liability caused in whole or in part by Contractor's acts or omissions, or the acts and omissions of those working on Contractor's behalf, in the performance of Contractor's operations.

6.04 *Builder's Risk and Other Property Insurance*

- A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the Work's full insurable replacement cost (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). The specific requirements applicable to the builder's risk insurance are set forth in the Supplementary Conditions.
- B. *Property Insurance for Facilities of Owner Where Work Will Occur*: Owner is responsible for obtaining and maintaining property insurance covering each existing structure, building, or facility in which any part of the Work will occur, or to which any part of the Work will attach or be adjoined. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, providing coverage consistent with that required for the builder's risk insurance, and will be maintained until the Work is complete, as set forth in Paragraph 15.06.D.
- C. *Property Insurance for Substantially Complete Facilities*: Promptly after Substantial Completion, and before actual occupancy or use of the substantially completed Work, Owner will obtain property insurance for such substantially completed Work, and maintain such property insurance at least until the Work is complete, as set forth in Paragraph 15.06.D. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, and provide coverage consistent with that required for the builder's risk insurance. The builder's risk insurance may terminate upon written confirmation of Owner's procurement of such property insurance.
- D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide advance notice of such occupancy or use to the builder's risk insurer, and obtain an endorsement consenting to the continuation of coverage prior to commencing such partial occupancy or use.
- E. *Insurance of Other Property; Additional Insurance*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, then the entity or individual owning such property item will be responsible for insuring it. If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.04, it may do so at Contractor's expense.

6.05 *Property Losses; Subrogation*

- A. The builder's risk insurance policy purchased and maintained in accordance with Paragraph 6.04 (or an installation floater policy if authorized by the Supplementary Conditions), will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against

Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors.

1. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils, risks, or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all individuals or entities identified in the Supplementary Conditions as builder's risk or installation floater insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused.
 2. None of the above waivers extends to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.
- B. Any property insurance policy maintained by Owner covering any loss, damage, or consequential loss to Owner's existing structures, buildings, or facilities in which any part of the Work will occur, or to which any part of the Work will attach or adjoin; to adjacent structures, buildings, or facilities of Owner; or to part or all of the completed or substantially completed Work, during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06, will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them, and that the insured is allowed to waive the insurer's rights of subrogation in a written contract executed prior to the loss, damage, or consequential loss.
1. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from fire or any of the perils, risks, or causes of loss covered by such policies.
- C. The waivers in this Paragraph 6.05 include the waiver of rights due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other insured peril, risk, or cause of loss.
- D. Contractor shall be responsible for assuring that each Subcontract contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from fire or other peril, risk, or cause of loss covered by builder's risk insurance, installation floater, and any other property insurance applicable to the Work.

6.06 *Receipt and Application of Property Insurance Proceeds*

- A. Any insured loss under the builder's risk and other policies of property insurance required by Paragraph 6.04 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.
- B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.04 shall maintain such proceeds in a segregated account, and distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.
- C. If no other special agreement is reached, Contractor shall repair or replace the damaged Work, using allocated insurance proceeds.

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.01 *Contractor's Means and Methods of Construction*

- A. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.
- B. If the Contract Documents note, or Contractor determines, that professional engineering or other design services are needed to carry out Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures, or for Site safety, then Contractor shall cause such services to be provided by a properly licensed design professional, at Contractor's expense. Such services are not Owner-delegated professional design services under this Contract, and neither Owner nor Engineer has any responsibility with respect to (1) Contractor's determination of the need for such services, (2) the qualifications or licensing of the design professionals retained or employed by Contractor, (3) the performance of such services, or (4) any errors, omissions, or defects in such services.

7.02 *Supervision and Superintendence*

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

7.03 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall maintain good discipline and order at the Site.

- B. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of Contractor's employees; of Suppliers and Subcontractors, and their employees; and of any other individuals or entities performing or furnishing any of the Work, just as Contractor is responsible for Contractor's own acts and omissions.
- C. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site will be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.04 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.
- B. All materials and equipment incorporated into the Work must be new and of good quality, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications will expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment must be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.05 *"Or Equals"*

- A. *Contractor's Request; Governing Criteria:* Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material, or items from other proposed Suppliers, under the circumstances described below.
 - 1. If Engineer in its sole discretion determines that an item of equipment or material proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer will deem it an "or equal" item. For the purposes of this paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that the proposed item:
 - 1) is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

- 2) will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
 - 3) has a proven record of performance and availability of responsive service; and
 - 4) is not objectionable to Owner.
- b. Contractor certifies that, if the proposed item is approved and incorporated into the Work:
- 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) the item will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.
- C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal," which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.
- D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request will result in any change in Contract Price. The Engineer's denial of an "or-equal" request will be final and binding, and may not be reversed through an appeal under any provision of the Contract.
- E. *Treatment as a Substitution Request*: If Engineer determines that an item of equipment or material proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the item a proposed substitute pursuant to Paragraph 7.06.

7.06 Substitutes

- A. *Contractor's Request; Governing Criteria*: Unless the specification or description of an item of equipment or material required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material under the circumstances described below. To the extent possible such requests must be made before commencement of related construction at the Site.
1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of equipment or material from anyone other than Contractor.
 2. The requirements for review by Engineer will be as set forth in Paragraph 7.06.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.

3. Contractor shall make written application to Engineer for review of a proposed substitute item of equipment or material that Contractor seeks to furnish or use. The application:
 - a. will certify that the proposed substitute item will:
 - 1) perform adequately the functions and achieve the results called for by the general design;
 - 2) be similar in substance to the item specified; and
 - 3) be suited to the same use as the item specified.
 - b. will state:
 - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times;
 - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and
 - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
 - c. will identify:
 - 1) all variations of the proposed substitute item from the item specified; and
 - 2) available engineering, sales, maintenance, repair, and replacement services.
 - d. will contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.
- C. *Special Guarantee*: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- D. *Reimbursement of Engineer's Cost*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

- E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
- F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request will be final and binding, and may not be reversed through an appeal under any provision of the Contract. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.06.D, by timely submittal of a Change Proposal.

7.07 *Concerning Subcontractors and Suppliers*

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner. The Contractor's retention of a Subcontractor or Supplier for the performance of parts of the Work will not relieve Contractor's obligation to Owner to perform and complete the Work in accordance with the Contract Documents.
- B. Contractor shall retain specific Subcontractors and Suppliers for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor or Supplier to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within 5 days.
- E. Owner may require the replacement of any Subcontractor or Supplier. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors or Suppliers for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor or Supplier so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor or Supplier.
- F. If Owner requires the replacement of any Subcontractor or Supplier retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
- G. No acceptance by Owner of any such Subcontractor or Supplier, whether initially or as a replacement, will constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

- H. On a monthly basis, Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors and Suppliers.
- J. The divisions and sections of the Specifications and the identifications of any Drawings do not control Contractor in dividing the Work among Subcontractors or Suppliers, or in delineating the Work to be performed by any specific trade.
- K. All Work performed for Contractor by a Subcontractor or Supplier must be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract for the benefit of Owner and Engineer.
- L. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor for Work performed for Contractor by the Subcontractor or Supplier.
- M. Contractor shall restrict all Subcontractors and Suppliers from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed in this Contract.

7.08 *Patent Fees and Royalties*

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

7.09 *Permits*

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

7.10 *Taxes*

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

7.11 *Laws and Regulations*

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

7.12 *Record Documents*

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

7.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations.
- B. Contractor shall designate a qualified and experienced safety representative whose duties and responsibilities are the prevention of Work-related accidents and the maintenance and supervision of safety precautions and programs.
- C. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
 - 1. all persons on the Site or who may be affected by the Work;
 - 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 - 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- D. All damage, injury, or loss to any property referred to in Paragraph 7.13.C.2 or 7.13.C.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
- E. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection.
- F. Contractor shall notify Owner; the owners of adjacent property; the owners of Underground Facilities and other utilities (if the identity of such owners is known to Contractor); and other contractors and utility owners performing work at or adjacent to the Site, in writing, when Contractor knows that prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
- G. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. Any Owner's safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.
- H. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

- I. Contractor's duties and responsibilities for safety and protection will continue until all the Work is completed, Engineer has issued a written notice to Owner and Contractor in accordance with Paragraph 15.06.C that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).
- J. Contractor's duties and responsibilities for safety and protection will resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.14 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of safety data sheets (formerly known as material safety data sheets) or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

7.15 *Emergencies*

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

7.16 *Submittals*

A. *Shop Drawing and Sample Requirements*

- 1. Before submitting a Shop Drawing or Sample, Contractor shall:
 - a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determine and verify:
 - 1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal;
 - 2) the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - 3) all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto;
 - c. confirm that the Submittal is complete with respect to all related data included in the Submittal.
- 2. Each Shop Drawing or Sample must bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that Submittal, and that Contractor approves the Submittal.

3. With each Shop Drawing or Sample, Contractor shall give Engineer specific written notice of any variations that the Submittal may have from the requirements of the Contract Documents. This notice must be set forth in a written communication separate from the Submittal; and, in addition, in the case of a Shop Drawing by a specific notation made on the Shop Drawing itself.
- B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall label and submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals.
1. *Shop Drawings*
 - a. Contractor shall submit the number of copies required in the Specifications.
 - b. Data shown on the Shop Drawings must be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide, and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.C.
 2. *Samples*
 - a. Contractor shall submit the number of Samples required in the Specifications.
 - b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the Submittal for the limited purposes required by Paragraph 7.16.C.
 3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
- C. *Engineer's Review of Shop Drawings and Samples*
1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the accepted Schedule of Submittals. Engineer's review and approval will be only to determine if the items covered by the Submittals will, after installation or incorporation in the Work, comply with the requirements of the Contract Documents, and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
 2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction, or to safety precautions or programs incident thereto.
 3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
 4. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will

document any such approved variation from the requirements of the Contract Documents in a Field Order or other appropriate Contract modification.

5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for complying with the requirements of Paragraphs 7.16.A and B.
6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, will not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
7. Neither Engineer's receipt, review, acceptance, or approval of a Shop Drawing or Sample will result in such item becoming a Contract Document.
8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.C.4.

D. Resubmittal Procedures for Shop Drawings and Samples

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

E. Submittals Other than Shop Drawings, Samples, and Owner-Delegated Designs

1. The following provisions apply to all Submittals other than Shop Drawings, Samples, and Owner-delegated designs:
 - a. Contractor shall submit all such Submittals to the Engineer in accordance with the Schedule of Submittals and pursuant to the applicable terms of the Contract Documents.
 - b. Engineer will provide timely review of all such Submittals in accordance with the Schedule of Submittals and return such Submittals with a notation of either Accepted or Not Accepted. Any such Submittal that is not returned within the time established in the Schedule of Submittals will be deemed accepted.
 - c. Engineer's review will be only to determine if the Submittal is acceptable under the requirements of the Contract Documents as to general form and content of the Submittal.

- d. If any such Submittal is not accepted, Contractor shall confer with Engineer regarding the reason for the non-acceptance, and resubmit an acceptable document.
- 2. Procedures for the submittal and acceptance of the Progress Schedule, the Schedule of Submittals, and the Schedule of Values are set forth in Paragraphs 2.03, 2.04, and 2.05.
- F. Owner-delegated Designs: Submittals pursuant to Owner-delegated designs are governed by the provisions of Paragraph 7.19.

7.17 Contractor's General Warranty and Guarantee

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer is entitled to rely on Contractor's warranty and guarantee.
- B. Owner's rights under this warranty and guarantee are in addition to, and are not limited by, Owner's rights under the correction period provisions of Paragraph 15.08. The time in which Owner may enforce its warranty and guarantee rights under this Paragraph 7.17 is limited only by applicable Laws and Regulations restricting actions to enforce such rights; provided, however, that after the end of the correction period under Paragraph 15.08:
 - 1. Owner shall give Contractor written notice of any defective Work within 60 days of the discovery that such Work is defective; and
 - 2. Such notice will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the notice.
- C. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 - 1. abuse, or improper modification, maintenance, or operation, by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 - 2. normal wear and tear under normal usage.
- D. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents, a release of Contractor's obligation to perform the Work in accordance with the Contract Documents, or a release of Owner's warranty and guarantee rights under this Paragraph 7.17:
 - 1. Observations by Engineer;
 - 2. Recommendation by Engineer or payment by Owner of any progress or final payment;
 - 3. The issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 - 4. Use or occupancy of the Work or any part thereof by Owner;
 - 5. Any review and approval of a Shop Drawing or Sample submittal;
 - 6. The issuance of a notice of acceptability by Engineer;
 - 7. The end of the correction period established in Paragraph 15.08;
 - 8. Any inspection, test, or approval by others; or

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

7.18 Indemnification

- A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from losses, damages, costs, and judgments (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising from third-party claims or actions relating to or resulting from the performance or furnishing of the Work, provided that any such claim, action, loss, cost, judgment or damage is attributable to bodily injury, sickness, disease, or death, or to damage to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable.
- B. In any and all claims against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A will not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

7.19 Delegation of Professional Design Services

- A. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that Contractor must furnish to Engineer with respect to the Owner-delegated design.
- B. Contractor shall cause such Owner-delegated professional design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal must appear on all drawings, calculations, specifications, certifications, and Submittals prepared by such design professional. Such design professional must issue all certifications of design required by Laws and Regulations.
- C. If a Shop Drawing or other Submittal related to the Owner-delegated design is prepared by Contractor, a Subcontractor, or others for submittal to Engineer, then such Shop Drawing or other Submittal must bear the written approval of Contractor's design professional when submitted by Contractor to Engineer.

- D. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by Contractor under an Owner-delegated design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.
- E. Pursuant to this Paragraph 7.19, Engineer's review, approval, and other determinations regarding design drawings, calculations, specifications, certifications, and other Submittals furnished by Contractor pursuant to an Owner-delegated design will be only for the following limited purposes:
 - 1. Checking for conformance with the requirements of this Paragraph 7.19;
 - 2. Confirming that Contractor (through its design professionals) has used the performance and design criteria specified in the Contract Documents; and
 - 3. Establishing that the design furnished by Contractor is consistent with the design concept expressed in the Contract Documents.
- F. Contractor shall not be responsible for the adequacy of performance or design criteria specified by Owner or Engineer.
- G. Contractor is not required to provide professional services in violation of applicable Laws and Regulations.

ARTICLE 8—OTHER WORK AT THE SITE

8.01 *Other Work*

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
- B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any third-party utility work that Owner has arranged to take place at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford proper and safe access to the Site to each contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work.
- D. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.

- E. If the proper execution or results of any part of Contractor's Work depends upon work performed by others, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.
- F. The provisions of this article are not applicable to work that is performed by third-party utilities or other third-party entities without a contract with Owner, or that is performed without having been arranged by Owner. If such work occurs, then any related delay, disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.05.C.3.

8.02 *Coordination*

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

8.03 *Legal Relationships*

- A. If, in the course of performing other work for Owner at or adjacent to the Site, the Owner's employees, any other contractor working for Owner, or any utility owner that Owner has arranged to perform work, causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment will take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract, and any remedies available to Contractor under Laws or Regulations concerning utility action or inaction. When applicable, any such equitable adjustment in Contract Price will be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times or Contract Price is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site.
 - 1. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this Paragraph 8.03.B.
 - 2. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due Contractor.
- C. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9—OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

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

9.02 *Replacement of Engineer*

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

9.03 *Furnish Data*

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

9.04 *Pay When Due*

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

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

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

9.06 *Insurance*

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

9.07 *Change Orders*

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

9.08 *Inspections, Tests, and Approvals*

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

9.09 *Limitations on Owner's Responsibilities*

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

9.10 *Undisclosed Hazardous Environmental Condition*

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

9.11 *Evidence of Financial Arrangements*

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

9.12 *Safety Programs*

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

ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

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

10.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe, as an experienced and qualified design professional, the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.07. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Resident Project Representative*

- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in the Supplementary Conditions and in Paragraph 10.07.
- B. If Owner designates an individual or entity who is not Engineer's consultant, agent, or employee to represent Owner at the Site, then the responsibilities and authority of such individual or entity will be as provided in the Supplementary Conditions.

10.04 *Engineer's Authority*

- A. Engineer has the authority to reject Work in accordance with Article 14.
- B. Engineer's authority as to Submittals is set forth in Paragraph 7.16.
- C. Engineer's authority as to design drawings, calculations, specifications, certifications and other Submittals from Contractor in response to Owner's delegation (if any) to Contractor of professional design services, is set forth in Paragraph 7.19.
- D. Engineer's authority as to changes in the Work is set forth in Article 11.

E. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.05 *Determinations for Unit Price Work*

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

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

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

10.07 *Limitations on Engineer's Authority and Responsibilities*

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

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation, and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Contractor under Paragraph 15.06.A, will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 10.07 also apply to the Resident Project Representative, if any.

10.08 *Compliance with Safety Program*

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

ARTICLE 11—CHANGES TO THE CONTRACT

11.01 *Amending and Supplementing the Contract*

- A. The Contract may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
- B. If an amendment or supplement to the Contract includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order.
- C. All changes to the Contract that involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, must be supported by Engineer's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of the Engineer.

11.02 *Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders covering:
 - 1. Changes in Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;
 - 2. Changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
 - 3. Changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.05, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters; and
 - 4. Changes that embody the substance of any final and binding results under: Paragraph 11.03.B, resolving the impact of a Work Change Directive; Paragraph 11.09, concerning Change Proposals; Article 12, Claims; Paragraph 13.02.D, final adjustments resulting from allowances; Paragraph 13.03.D, final adjustments relating to determination of quantities for Unit Price Work; and similar provisions.
- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of Paragraph 11.02.A, it will be deemed to be of full force and effect, as if fully executed.

11.03 *Work Change Directives*

- A. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.07 regarding change of Contract Price.

- B. If Owner has issued a Work Change Directive and:
 - 1. Contractor believes that an adjustment in Contract Times or Contract Price is necessary, then Contractor shall submit any Change Proposal seeking such an adjustment no later than 30 days after the completion of the Work set out in the Work Change Directive.
 - 2. Owner believes that an adjustment in Contract Times or Contract Price is necessary, then Owner shall submit any Claim seeking such an adjustment no later than 60 days after issuance of the Work Change Directive.

11.04 *Field Orders*

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

11.05 *Owner-Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Changes involving the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters will be supported by Engineer's recommendation.
- B. Such changes in the Work may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work must be performed under the applicable conditions of the Contract Documents.
- C. Nothing in this Paragraph 11.05 obligates Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.06 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.C.2.

11.07 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment of Contract Price must comply with the provisions of Article 12.
- B. An adjustment in the Contract Price will be determined as follows:

1. Where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03);
 2. Where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.07.C.2); or
 3. Where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.07.C).
- C. *Contractor's Fee:* When applicable, the Contractor's fee for overhead and profit will be determined as follows:
1. A mutually acceptable fixed fee; or
 2. If a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. For costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee will be 15 percent;
 - b. For costs incurred under Paragraph 13.01.B.3, the Contractor's fee will be 5 percent;
 - c. Where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.07.C.2.a and 11.07.C.2.b is that the Contractor's fee will be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of 5 percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted Work the maximum total fee to be paid by Owner will be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the Work;
 - d. No fee will be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
 - e. The amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in Cost of the Work will be the amount of the actual net decrease in Cost of the Work and a deduction of an additional amount equal to 5 percent of such actual net decrease in Cost of the Work; and
 - f. When both additions and credits are involved in any one change or Change Proposal, the adjustment in Contractor's fee will be computed by determining the sum of the costs in each of the cost categories in Paragraph 13.01.B (specifically, payroll costs, Paragraph 13.01.B.1; incorporated materials and equipment costs, Paragraph 13.01.B.2; Subcontract costs, Paragraph 13.01.B.3; special consultants costs, Paragraph 13.01.B.4; and other costs, Paragraph 13.01.B.5) and applying to each such cost category sum the appropriate fee from Paragraphs 11.07.C.2.a through 11.07.C.2.e, inclusive.

11.08 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment in the Contract Times must comply with the provisions of Article 12.
- B. Delay, disruption, and interference in the Work, and any related changes in Contract Times, are addressed in and governed by Paragraph 4.05.

11.09 *Change Proposals*

- A. *Purpose and Content:* Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; contest an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; challenge a set-off against payment due; or seek other relief under the Contract. The Change Proposal will specify any proposed change in Contract Times or Contract Price, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents. Each Change Proposal will address only one issue, or a set of closely related issues.

- B. *Change Proposal Procedures*

- 1. *Submittal:* Contractor shall submit each Change Proposal to Engineer within 30 days after the start of the event giving rise thereto, or after such initial decision.
- 2. *Supporting Data:* The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal.
 - a. Change Proposals based on or related to delay, interruption, or interference must comply with the provisions of Paragraphs 4.05.D and 4.05.E.
 - b. Change proposals related to a change of Contract Price must include full and detailed accounts of materials incorporated into the Work and labor and equipment used for the subject Work.

The supporting data must be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event.

- 3. *Engineer's Initial Review:* Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal. If in its discretion Engineer concludes that additional supporting data is needed before conducting a full review and making a decision regarding the Change Proposal, then Engineer may request that Contractor submit such additional supporting data by a date specified by Engineer, prior to Engineer beginning its full review of the Change Proposal.
- 4. *Engineer's Full Review and Action on the Change Proposal:* Upon receipt of Contractor's supporting data (including any additional data requested by Engineer), Engineer will conduct a full review of each Change Proposal and, within 30 days after such receipt of the Contractor's supporting data, either approve the Change Proposal in whole, deny it in whole, or approve it in part and deny it in part. Such actions must be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change

Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

5. *Binding Decision*: Engineer's decision is final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- C. *Resolution of Certain Change Proposals*: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties in writing that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice will be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.
- D. *Post-Completion*: Contractor shall not submit any Change Proposals after Engineer issues a written recommendation of final payment pursuant to Paragraph 15.06.B.

11.10 *Notification to Surety*

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

ARTICLE 12—CLAIMS

12.01 *Claims*

- A. *Claims Process*: The following disputes between Owner and Contractor are subject to the Claims process set forth in this article:
 1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
 2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents;
 3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters; and
 4. Subject to the waiver provisions of Paragraph 15.07, any dispute arising after Engineer has issued a written recommendation of final payment pursuant to Paragraph 15.06.B.
- B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim rests with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge

and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

- C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim will be stated in writing and submitted to the other party, with a copy to Engineer.
- D. *Mediation*
 - 1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate will stay the Claim submittal and response process.
 - 2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process will resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process will resume as of the date of the conclusion of the mediation, as determined by the mediator.
 - 3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.
- E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action will be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim will be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim will be incorporated in a Change Order or other written document to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

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

13.01 *Cost of the Work*

- A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
 - 1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

2. When needed to determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. *Costs Included:* Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work will be in amounts no higher than those commonly incurred in the locality of the Project, will not include any of the costs itemized in Paragraph 13.01.C, and will include only the following items:
1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor in advance of the subject Work. Such employees include, without limitation, superintendents, foremen, safety managers, safety representatives, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work will be apportioned on the basis of their time spent on the Work. Payroll costs include, but are not limited to, salaries and wages plus the cost of fringe benefits, which include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, will be included in the above to the extent authorized by Owner.
 2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts will accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment will accrue to Owner, and Contractor shall make provisions so that they may be obtained.
 3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, which will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee will be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.
 4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed or retained for services specifically related to the Work.
 5. Other costs consisting of the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, which are

consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

- 1) In establishing included costs for materials such as scaffolding, plating, or sheeting, consideration will be given to the actual or the estimated life of the material for use on other projects; or rental rates may be established on the basis of purchase or salvage value of such items, whichever is less. Contractor will not be eligible for compensation for such items in an amount that exceeds the purchase cost of such item.

c. *Construction Equipment Rental*

- 1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner as to price (including any surcharge or special rates applicable to overtime use of the construction equipment or machinery), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts must cease when the use thereof is no longer necessary for the Work.
 - 2) Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.
 - 3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price ("changed Work"), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed Work.
- d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
- e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
- f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of builder's risk or other property insurance established in accordance with Paragraph 6.04), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will be included in the Cost of the Work for the purpose of determining Contractor's fee.

- g. The cost of utilities, fuel, and sanitary facilities at the Site.
 - h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
 - i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.
- C. *Costs Excluded:* The term Cost of the Work does not include any of the following items:
 - 1. Payroll costs and other compensation of Contractor's officers, executives, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
 - 2. The cost of purchasing, renting, or furnishing small tools and hand tools.
 - 3. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
 - 4. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
 - 5. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
 - 6. Expenses incurred in preparing and advancing Claims.
 - 7. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.
- D. *Contractor's Fee*
 - 1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:
 - a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.
 - b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:
 - 1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.
 - 2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.
 - 2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change

Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work will be determined in accordance with Paragraph 11.07.C.2.

- E. *Documentation and Audit*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor and pertinent Subcontractors will establish and maintain records of the costs in accordance with generally accepted accounting practices. Subject to prior written notice, Owner will be afforded reasonable access, during normal business hours, to all Contractor's accounts, records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to the Cost of the Work and Contractor's fee. Contractor shall preserve all such documents for a period of three years after the final payment by Owner. Pertinent Subcontractors will afford such access to Owner, and preserve such documents, to the same extent required of Contractor.

13.02 Allowances

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

13.03 Unit Price Work

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision

thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, and the final adjustment of Contract Price will be set forth in a Change Order, subject to the provisions of the following paragraph.

E. *Adjustments in Unit Price*

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:
 - a. the quantity of the item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
 - b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.
2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.
3. Adjusted unit prices will apply to all units of that item.

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

14.01 *Access to Work*

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

14.02 *Tests, Inspections, and Approvals*

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work will be governed by the provisions of Paragraph 14.05.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

- D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
 2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
 3. by manufacturers of equipment furnished under the Contract Documents;
 4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
 5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

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

- E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering will be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

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

losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

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

14.05 *Uncovering Work*

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

14.06 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work,

or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work will not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 Owner May Correct Defective Work

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace defective Work as required by Engineer, then Owner may, after 7 days' written notice to Contractor, correct or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.
- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

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

15.01 Progress Payments

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments for Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. *Applications for Payments*
 - 1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents.
 - 2. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment must also be accompanied by: (a) a bill of sale, invoice, copies of subcontract or purchase order payments, or other documentation

establishing full payment by Contractor for the materials and equipment; (b) at Owner's request, documentation warranting that Owner has received the materials and equipment free and clear of all Liens; and (c) evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

3. Beginning with the second Application for Payment, each Application must include an affidavit of Contractor stating that all previous progress payments received by Contractor have been applied to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
4. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. Review of Applications

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work;
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto;
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work;
 - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid by Owner; or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or
 - e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due*

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

E. *Reductions in Payment by Owner*

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
 - a. Claims have been made against Owner based on Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages resulting from Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

- b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
 - c. Contractor has failed to provide and maintain required bonds or insurance;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
 - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
 - f. The Work is defective, requiring correction or replacement;
 - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - h. The Contract Price has been reduced by Change Orders;
 - i. An event has occurred that would constitute a default by Contractor and therefore justify a termination for cause;
 - j. Liquidated or other damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
 - k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens; or
 - l. Other items entitle Owner to a set-off against the amount recommended.
2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed will be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.
 3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld will be treated as an amount due as determined by Paragraph 15.01.D.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than 7 days after the time of payment by Owner.

15.03 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time

submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which will fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have 7 days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.
- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without

significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through 15.03.E for that part of the Work.
2. At any time, Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.04 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

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

15.06 *Final Payment*

A. *Application for Payment*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.12), and other documents, Contractor may make application for final payment.
2. The final Application for Payment must be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents;
 - b. consent of the surety, if any, to final payment;
 - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.

- d. a list of all duly pending Change Proposals and Claims; and
 - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
- 3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.
- B. *Engineer's Review of Final Application and Recommendation of Payment:* If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the final Application for Payment to Owner for payment. Such recommendation will account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.
- C. *Notice of Acceptability:* In support of its recommendation of payment of the final Application for Payment, Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 15.07.
- D. *Completion of Work:* The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment and issuance of notice of the acceptability of the Work.
- E. *Final Payment Becomes Due:* Upon receipt from Engineer of the final Application for Payment and accompanying documentation, Owner shall set off against the amount recommended by Engineer for final payment any further sum to which Owner is entitled, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions of this Contract with respect to progress payments. Owner shall pay the resulting balance due to Contractor within 30 days of Owner's receipt of the final Application for Payment from Engineer.

15.07 *Waiver of Claims*

- A. By making final payment, Owner waives its claim or right to liquidated damages or other damages for late completion by Contractor, except as set forth in an outstanding Claim,

appeal under the provisions of Article 17, set-off, or express reservation of rights by Owner. Owner reserves all other claims or rights after final payment.

- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted as a Claim, or appealed under the provisions of Article 17.

15.08 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the Supplementary Conditions or the terms of any applicable special guarantee required by the Contract Documents), Owner gives Contractor written notice that any Work has been found to be defective, or that Contractor's repair of any damages to the Site or adjacent areas has been found to be defective, then after receipt of such notice of defect Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 - 1. correct the defective repairs to the Site or such adjacent areas;
 - 2. correct such defective Work;
 - 3. remove the defective Work from the Project and replace it with Work that is not defective, if the defective Work has been rejected by Owner, and
 - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting from the corrective measures.
- B. Owner shall give any such notice of defect within 60 days of the discovery that such Work or repairs is defective. If such notice is given within such 60 days but after the end of the correction period, the notice will be deemed a notice of defective Work under Paragraph 7.17.B.
- C. If, after receipt of a notice of defect within 60 days and within the correction period, Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others). Contractor's failure to pay such costs, losses, and damages within 10 days of invoice from Owner will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the failure to pay.
- D. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- E. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

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

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

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

16.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
 - 1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment, or failure to adhere to the Progress Schedule);
 - 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
 - 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
 - 4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) 10 days' written notice that Owner is considering a declaration that Contractor is in default and termination of the Contract, Owner may proceed to:
 - 1. declare Contractor to be in default, and give Contractor (and any surety) written notice that the Contract is terminated; and
 - 2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.
- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within 7 days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
- E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects,

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

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

16.03 *Owner May Terminate for Convenience*

- A. Upon 7 days' written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and
 - 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid for any loss of anticipated profits or revenue, post-termination overhead costs, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon 7 days' written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, 7 days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The

provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17—FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this article:
 - 1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full, pursuant to Article 12; and
 - 2. Disputes between Owner and Contractor concerning the Work, or obligations under the Contract Documents, that arise after final payment has been made.
- B. *Final Resolution of Disputes:* For any dispute subject to resolution under this article, Owner or Contractor may:
 - 1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions;
 - 2. agree with the other party to submit the dispute to another dispute resolution process; or
 - 3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18—MISCELLANEOUS

18.01 *Giving Notice*

- A. Whenever any provision of the Contract requires the giving of written notice to Owner, Engineer, or Contractor, it will be deemed to have been validly given only if delivered:
 - 1. in person, by a commercial courier service or otherwise, to the recipient's place of business;
 - 2. by registered or certified mail, postage prepaid, to the recipient's place of business; or
 - 3. by e-mail to the recipient, with the words "Formal Notice" or similar in the e-mail's subject line.

18.02 *Computation of Times*

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

18.03 *Cumulative Remedies*

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

18.04 *Limitation of Damages*

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

18.05 *No Waiver*

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

18.06 *Survival of Obligations*

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

18.07 *Controlling Law*

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

18.08 *Assignment of Contract*

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

18.09 *Successors and Assigns*

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

18.10 *Headings*

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

SECTION C

SUPPLEMENTARY CONDITIONS

SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT

TABLE OF CONTENTS

	Page
Article 1— Definitions and Terminology	1
Article 2— Preliminary Matters	2
Article 3— Contract Documents: Intent, Requirements, Reuse	7
Article 4— Commencement and Progress of the Work.....	7
Article 5— Site, Subsurface and Physical Conditions, Hazardous Environmental Conditions.....	8
No suggested Supplementary Conditions in this Article.	8
Article 6— Bonds and Insurance	8
Article 7— Contractor’s Responsibilities	14
Article 10 - Engineer’s Status During Construction	16
Article 11 - Changes to the Contract.....	18
Article 12 - Claims.....	18
Article 13 - Cost of Work; Allowances, Unit Price Work	18
Article 14 - Tests and Inspections; Correction, Removal, or Acceptance of Defective Work	19
Article 15 - Payments to Contractor, Set Offs; Completions; Correction Period	19
Article 16 - Suspension of Work and Termination	20
Article 17 - Final Resolutions of Disputes.....	20
Article 18 – Miscellaneous	22
Article 19 - Federal Requirements	22
Exhibit B— Software Requirements for Electronic Document Exchange.....	1

SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT

These Supplementary Conditions amend or supplement EJCDC® C-700, Standard General Conditions of the Construction Contract (2018). The General Conditions remain in full force and effect except as amended.

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

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added—for example, “Paragraph SC-4.05.”

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

~~No suggested Supplementary Conditions in this Article.~~

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

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

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

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

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

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

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

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

SC-1.01.A.52 – Add the following new paragraph with the title “Domestic Preference Definitions” immediately after Paragraph 1.01.A.51:

52.a Build America, Buy America Act (BABAA) - Requirements mandated by Title IX of the Infrastructure Investment and Jobs Act (IIJA), Pub. L. 117-58, §§ 70901-70953-58 mandating domestic preference that all iron and steel, manufactured products, and construction materials are produced in the United States.

52.b Construction Materials - Those articles, materials, or supplies — other than an item of primarily iron or steel; a manufactured product; cement and cementitious materials;

aggregates such as stone, sand, or gravel; or aggregate binding agents or additives— that are or consist primarily of: non- ferrous metals, plastic and polymer- based products, glass, lumber or drywall.

- 52.c **Contractor’s Certification - Documentation submitted by the Contractor upon Substantial Completion of the Contract that all iron and steel, manufactured products, and construction materials are produced in the United States.**
- 52.d **De Minimis - Materials and products that represent a small portion of an infrastructure project, specifically no more than 5% of the project costs up to a maximum of \$1,000,000.**
- 52.e **Domestic Preference - The Build America, Buy America Act (BABAA) requirements under Title IX of the Infrastructure Investment and Jobs Act (IIJA), Pub. L. 117-58, §§ 70901-70953.**
- 52.f **Engineer’s Certification - Documentation submitted by the Engineer that Drawings, Specifications, and Bidding Documents comply with Domestic Preference requirements.**
- 52.g **Manufactured Product – Items assembled out of components, or otherwise made or processed from raw materials into finished products. Manufactured products must be manufactured (assembled) in the United States, and the cost of components that were mined, produced, or manufactured in the United States must be greater than 55 percent of the total cost of all components of the product.**
- 52.h **Manufacturer’s Certification - Documentation provided by the Manufacturer stating that Domestic Preference requirements have been satisfied for all provided items. If items are purchased via a Supplier, distributor, vendor, etc. from the Manufacturer directly, then the Supplier, distributor, vendor, etc. will be responsible for obtaining and providing these certifications to the parties purchasing the products.**
- 52.i **Minor Components - Components within an iron and/or steel product otherwise compliant with the Domestic Preference requirements. This waiver, typically used by Manufacturers, allows use of non-domestically produced miscellaneous Minor Components comprising up to five percent of the total material cost of an otherwise domestically produced iron and steel product. However, unless a separate waiver for a product has been approved, all other iron and steel components in said product must still meet the Domestic Preference requirements. This waiver does not exempt the whole product from the Domestic Preference requirements only Minor Components within said product and the iron or steel components of the product must be produced domestically.**
- 52.j **Primarily Iron or Steel - A product is made of greater than 50 percent iron or Steel on a materials cost basis.**

ARTICLE 2—PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

SC-2.01 Delete Paragraphs 2.01.B. and C. in their entirety and insert the following in their place:

- B. *Evidence of Contractor's Insurance:* When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner copies of the policies (including all endorsements, and identification of applicable self-insured retentions and deductibles) of insurance required to be provided by Contractor in this Contract. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- C. *Evidence of Owner's Insurance:* After receipt from Contractor of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor copies of the policies of insurance to be provided by Owner in this Contract (if any). Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

2.02 *Copies of Documents*

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

Owner shall furnish to Contractor ~~three~~ **five** printed copies of the Contract Documents (including one fully signed counterpart of the Agreement), and **one** in electronic portable document format (PDF).

2.06 *Electronic Transmittals*

SC-2.06 Delete Paragraphs 2.06.B and 2.06.C in their entirety and insert the following in their place:

- B. *Electronic Documents Protocol:* The parties shall conform to the following provisions in Paragraphs 2.06.B and 2.06.C, together referred to as the Electronic Documents Protocol (“EDP” or “Protocol”) for exchange of electronic transmittals.

1. *Basic Requirements*

- a. To the fullest extent practical, the parties agree to and will transmit and accept Electronic Documents in an electronic or digital format using the procedures described in this Protocol. Use of the Electronic Documents and any information contained therein is subject to the requirements of this Protocol and other provisions of the Contract.
- b. The contents of the information in any Electronic Document will be the responsibility of the transmitting party.
- c. Electronic Documents as exchanged by this Protocol may be used in the same manner as the printed versions of the same documents that are exchanged using non-electronic format and methods, subject to the same governing requirements, limitations, and restrictions, set forth in the Contract Documents.
- d. Except as otherwise explicitly stated herein, the terms of this Protocol will be incorporated into any other agreement or subcontract between a party and any third party for any portion of the Work on the Project, or any Project-related services, where that third party is, either directly or indirectly, required to exchange Electronic Documents with a party or with Engineer. Nothing herein will modify the requirements of the Contract regarding communications between and among the parties and their subcontractors and consultants.

- e. When transmitting Electronic Documents, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the receiving party's use of software application packages, operating systems, or computer hardware differing from those established in this Protocol.
- f. Nothing herein negates any obligation 1) in the Contract to create, provide, or maintain an original printed record version of Drawings and Specifications, signed and sealed according to applicable Laws and Regulations; 2) to comply with any applicable Law or Regulation governing the signing and sealing of design documents or the signing and electronic transmission of any other documents; or 3) to comply with the notice requirements of Paragraph 18.01 of the General Conditions.

2. *System Infrastructure for Electronic Document Exchange*

- a. Each party will provide hardware, operating system(s) software, internet, e-mail, and large file transfer functions ("System Infrastructure") at its own cost and sufficient for complying with the EDP requirements. With the exception of minimum standards set forth in this EDP, and any explicit system requirements specified by attachment to this EDP, it is the obligation of each party to determine, for itself, its own System Infrastructure.
 - 1) The maximum size of an email attachment for exchange of Electronic Documents under this EDP is **10 MB**. Attachments larger than that may be exchanged using large file transfer functions or physical media.
 - 2) Each Party assumes full and complete responsibility for any and all of its own costs, delays, deficiencies, and errors associated with converting, translating, updating, verifying, licensing, or otherwise enabling its System Infrastructure, including operating systems and software, for use with respect to this EDP.
- b. Each party is responsible for its own system operations, security, back-up, archiving, audits, printing resources, and other Information Technology ("IT") for maintaining operations of its System Infrastructure during the Project, including coordination with the party's individual(s) or entity responsible for managing its System Infrastructure and capable of addressing routine communications and other IT issues affecting the exchange of Electronic Documents.
- c. Each party will operate and maintain industry-standard, industry-accepted, ISO-standard, commercial-grade security software and systems that are intended to protect the other party from: software viruses and other malicious software like worms, trojans, adware; data breaches; loss of confidentiality; and other threats in the transmission to or storage of information from the other parties, including transmission of Electronic Documents by physical media such as CD/DVD/flash drive/hard drive. To the extent that a party maintains and operates such security software and systems, it shall not be liable to the other party for any breach of system security.
- d. In the case of disputes, conflicts, or modifications to the EDP required to address issues affecting System Infrastructure, the parties shall cooperatively resolve the issues; but, failing resolution, the Owner is authorized to make and require

reasonable and necessary changes to the EDP to effectuate its original intent. If the changes cause additional cost or time to Contractor, not reasonably anticipated under the original EDP, Contractor may seek an adjustment in price or time under the appropriate process in the Contract.

- e. Each party is responsible for its own back-up and archive of documents sent and received during the term of the contract under this EDP, unless this EDP establishes a Project document archive, either as part of a mandatory Project website or other communications protocol, upon which the parties may rely for document archiving during the specified term of operation of such Project document archive. Further, each party remains solely responsible for its own post-Project back-up and archive of Project documents after the term of the Contract, or after termination of the Project document archive, if one is established, for as long as required by the Contract and as each party deems necessary for its own purposes.
- f. If a receiving party receives an obviously corrupted, damaged, or unreadable Electronic Document, the receiving party will advise the sending party of the incomplete transmission.
- g. The parties will bring any non-conforming Electronic Documents into compliance with the EDP. The parties will attempt to complete a successful transmission of the Electronic Document or use an alternative delivery method to complete the communication.
- h. The Owner will operate a Project information management system (also referred to in this EDP as “Project Website”) for use of Owner, Engineer and Contractor during the Project for exchange and storage of Project-related communications and information. Except as otherwise provided in this EDP or the General Conditions, use of the Project Website by the parties as described in this Paragraph will be mandatory for exchange of Project documents, communications, submittals, and other Project-related information. The following conditions and standards will govern use of the Project Website:
 - 1) Describe the period of time during which the Project Website will be operated and be available for reliance by the parties;
 - 2) Provide any minimum system infrastructure, software licensing and security standards for access to and use of the Project Website;
 - 3) Describe the types and extent of services to be provided at the Project Website (such as large file transfer, email, communication and document archives, etc.); and
 - 4) Include any other Project Website attributes that may be pertinent to Contractor’s use of the facility and pricing of such use.

C. Software Requirements for Electronic Document Exchange; Limitations

- 1. Each party will acquire the software and software licenses necessary to create and transmit Electronic Documents and to read and to use any Electronic Documents received from the other party (and if relevant from third parties), using the software formats required in this section of the EDP.

- a. Prior to using any updated version of the software required in this section for sending Electronic Documents to the other party, the originating party will first notify and receive concurrence from the other party for use of the updated version or adjust its transmission to comply with this EDP.
2. The parties agree not to intentionally edit, reverse engineer, decrypt, remove security or encryption features, or convert to another format for modification purposes any Electronic Document or information contained therein that was transmitted in a software data format, including Portable Document Format (PDF), intended by sender not to be modified, unless the receiving party obtains the permission of the sending party or is citing or quoting excerpts of the Electronic Document for Project purposes.
3. Software and data formats for exchange of Electronic Documents will conform to the requirements set forth in Exhibit A to this EDP, including software versions, if listed.

SC-2.06 Supplement Paragraph 2.06 of the General Conditions by adding the following paragraph:

D. Requests by Contractor for Electronic Documents in Other Formats

1. Release of any Electronic Document versions of the Project documents in formats other than those identified in the Electronic Documents Protocol (if any) or elsewhere in the Contract will be at the sole discretion of the Owner.
2. To extent determined by Owner, in its sole discretion, to be prudent and necessary, release of Electronic Documents versions of Project documents and other Project information requested by Contractor ("Request") in formats other than those identified in the Electronic Documents Protocol (if any) or elsewhere in the Contract will be subject to the provisions of the Owner's response to the Request, and to the following conditions to which Contractor agrees:
 - a. The content included in the Electronic Documents created by Engineer and covered by the Request was prepared by Engineer as an internal working document for Engineer's purposes solely, and is being provided to Contractor on an "AS IS" basis without any warranties of any kind, including, but not limited to any implied warranties of fitness for any purpose. As such, Contractor is advised and acknowledges that the content may not be suitable for Contractor's application, or may require substantial modification and independent verification by Contractor. The content may include limited resolution of models, not-to-scale schematic representations and symbols, use of notes to convey design concepts in lieu of accurate graphics, approximations, graphical simplifications, undocumented intermediate revisions, and other devices that may affect subsequent reuse.
 - b. Electronic Documents containing text, graphics, metadata, or other types of data that are provided by Engineer to Contractor under the request are only for convenience of Contractor. Any conclusion or information obtained or derived from such data will be at the Contractor's sole risk and the Contractor waives any claims against Engineer or Owner arising from use of data in Electronic Documents covered by the Request.
 - c. Contractor shall indemnify and hold harmless Owner and Engineer and their subconsultants from all claims, damages, losses, and expenses, including attorneys'

fees and defense costs arising out of or resulting from Contractor's use, adaptation, or distribution of any Electronic Documents provided under the Request.

- d. Contractor agrees not to sell, copy, transfer, forward, give away or otherwise distribute this information (in source or modified file format) to any third party without the direct written authorization of Engineer, unless such distribution is specifically identified in the Request and is limited to Contractor's subcontractors. Contractor warrants that subsequent use by Contractor's subcontractors complies with all terms of the Contract Documents and Owner's response to Request.
3. In the event that Owner elects to provide or directs the Engineer to provide to Contractor any Contractor-requested Electronic Document versions of Project information that is not explicitly identified in the Contract Documents as being available to Contractor, the Owner shall be reimbursed by Contractor on an hourly basis (at **\$150** per hour) for any engineering costs necessary to create or otherwise prepare the data in a manner deemed appropriate by Engineer.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

No suggested Supplementary Conditions in this Article.

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

SC-4.01.A – Delete the last sentence of paragraph.

4.05 *Delays in Contractor's Progress*

SC-4.05 Amend Paragraph 4.05.C by adding the following subparagraphs:

5. *Weather-Related Delays*

- a. If "abnormal weather conditions" as set forth in Paragraph 4.05.C.2 of the General Conditions are the basis for a request for an equitable adjustment in the Contract Times, such request must be documented by data substantiating each of the following: 1) that weather conditions were abnormal for the period of time in which the delay occurred, 2) that such weather conditions could not have been reasonably anticipated, and 3) that such weather conditions had an adverse effect on the Work as scheduled. **Extreme or unusual weather that is typical for a given region, elevation, or season should not be considered abnormal weather conditions. Requests for time extensions due to abnormal weather conditions will be submitted to the Engineer within five days of the end of the abnormal weather condition event. It is the responsibility of the Contractor to provide the information listed in SC 4.05.C.5.b.**
- b. The existence of abnormal weather conditions will be determined on a month-by-month basis in accordance with the following:
 - 1) Determination of actual bad weather days during performance of the Work will be based on the weather records measured and recorded by the nearest weather monitoring station.

ARTICLE 5—SITE, SUBSURFACE AND PHYSICAL CONDITIONS, HAZARDOUS ENVIRONMENTAL CONDITIONS

No suggested Supplementary Conditions in this Article.

ARTICLE 6—BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

SC-6.01 Add the following paragraphs immediately after Paragraph 6.01.A:

1. *Required Performance Bond Form:* The performance bond that Contractor furnishes will be in the form of EJCDC® C-610, Performance Bond (2010, 2013, or 2018 edition).
2. *Required Payment Bond Form:* The payment bond that Contractor furnishes will be in the form of EJCDC® C-615, Payment Bond (2010, 2013, or 2018 edition).

SC-6.01 Delete the last sentence and add the following paragraphs immediately after Paragraph 6.01.B:

1. All Property and Liability Insurance to be purchased by CONTRACTOR shall be placed with insurance companies, which carry a rating of A- or better from A.M. Best and Company Insurance Rating Service. The correction period specified as one year after the date of Substantial Completion in Paragraph 15.08.A of the General Conditions is hereby revised to be **2** years after Substantial Completion.

6.02 *Insurance—General Provisions*

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

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

6.03 *Contractor's Insurance*

SC-6.03 Supplement Paragraph 6.03 with the following provisions after Paragraph 6.03.C:

- D. *Workers' Compensation and Employer's Liability:* Contractor shall purchase and maintain workers' compensation and employer's liability insurance, including, as applicable, United States Longshoreman and Harbor Workers' Compensation Act, Jones Act, stop-gap employer's liability coverage for monopolistic states, and foreign voluntary workers' compensation (from available sources, notwithstanding the jurisdictional requirement of Paragraph 6.02.B of the General Conditions).

Workers' Compensation and Related Policies	Policy limits of not less than:
Workers' Compensation	
State	Statutory
Applicable Federal (e.g., Longshoreman's)	Statutory
Foreign voluntary workers' compensation (employer's responsibility coverage), if applicable	Statutory
Bodily injury by accident—each accident	\$ 500,000
Bodily injury by disease—aggregate	\$ 1,000,000
Employer's Liability	
Each accident	\$ 100,000
Each employee	\$ 100,000
Policy limit	\$ 500,000

- E. *Commercial General Liability—Claims Covered:* Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against claims for:
1. damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees,
 2. damages insured by reasonably available personal injury liability coverage, and
 3. damages because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.
- F. *Commercial General Liability—Form and Content:* Contractor's commercial liability policy must be written on a 1996 (or later) Insurance Services Organization, Inc. (ISO) commercial general liability form (occurrence form) and include the following coverages and endorsements:
1. Products and completed operations coverage.
 - a. Such insurance must be maintained for three years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
 2. Blanket contractual liability coverage, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
 3. Severability of interests and no insured-versus-insured or cross-liability exclusions.
 4. Underground, explosion, and collapse coverage.
 5. Personal injury coverage.
 6. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together). If Contractor demonstrates to Owner that the specified ISO endorsements are not commercially available, then Contractor may satisfy this requirement by providing equivalent endorsements.

7. For design professional additional insureds, ISO Endorsement CG 20 32 07 04 “Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured” or its equivalent.
- G. *Commercial General Liability—Excluded Content:* The commercial general liability insurance policy, including its coverages, endorsements, and incorporated provisions, must not include any of the following:
1. Any modification of the standard definition of “insured contract” (except to delete the railroad protective liability exclusion if Contractor is required to indemnify a railroad or others with respect to Work within 50 feet of railroad property).
 2. Any exclusion for water intrusion or water damage.
 3. Any provisions resulting in the erosion of insurance limits by defense costs other than those already incorporated in ISO form CG 00 01.
 4. Any exclusion of coverage relating to earth subsidence or movement.
 5. Any exclusion for the insured’s vicarious liability, strict liability, or statutory liability (other than worker’s compensation).
 6. Any limitation or exclusion based on the nature of Contractor’s work.
 7. Any professional liability exclusion broader in effect than the most recent edition of ISO form CG 22 79.
- H. *Commercial General Liability—Minimum Policy Limits*

Commercial General Liability	Policy limits of not less than:
General Aggregate	\$ 2,000,000
Property Damage	\$ 500,000
Bodily Injury and Property Damage—Each Occurrence	\$ 1,000,000

- I. *Automobile Liability:* Contractor shall purchase and maintain automobile liability insurance for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy must be written on an occurrence basis.

Automobile Liability	Policy limits of not less than:
Bodily Injury	
Each Person	\$ 1,000,000
Each Accident	\$ 1,000,000
Property Damage	
Each Accident	\$ 500,000
[or]	

Automobile Liability	Policy limits of not less than:
Combined Single Limit	
Combined Single Limit (Bodily Injury and Property Damage)	\$ 1,000,000

- J. *Umbrella or Excess Liability:* Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the Paragraphs above. The coverage afforded must be at least as broad as that of each and every one of the underlying policies.

Excess or Umbrella Liability	Policy limits of not less than:
Each Occurrence	\$ 1,000,000
General Aggregate	\$ 1,000,000

- K. *Using Umbrella or Excess Liability Insurance to Meet CGL and Other Policy Limit Requirements:* Contractor may meet the policy limits specified for employer's liability, commercial general liability, and automobile liability through the primary policies alone, or through combinations of the primary insurance policy's policy limits and partial attribution of the policy limits of an umbrella or excess liability policy that is at least as broad in coverage as that of the underlying policy, as specified herein. If such umbrella or excess liability policy was required under this Contract, at a specified minimum policy limit, such umbrella or excess policy must retain a minimum limit of **\$1,000,000** after accounting for partial attribution of its limits to underlying policies, as allowed above.
- L. *CONTRACTUAL ENDORSEMENT* - The contractual liability required of the Standard General Conditions shall provide coverage for not less than the following amounts:

Contractual Liability	Policy limits of not less than:
Bodily Injury	
Each Accident	\$ 500,000
Property Damage	
Each Accident	\$ 500,000
Annual Aggregate	\$ 500,000

CONTRACTOR shall provide Excess Umbrella Liability Coverage as specified in SC 6.03.I

- M. *OWNER'S LIABILITY INSURANCE* - Add the following language to the end of paragraph 6.02G of the Standard General Conditions:

Such coverage, if elected by the OWNER, shall be in addition to the OWNER'S coverage provided under the CONTRACTOR'S Liability Insurance policy.

- N. *PROPERTY INSURANCE* - Delete Paragraph 6.04B of the Standard General Conditions in its entirety and insert the following in its place:

CONTRACTOR shall purchase and maintain until final payment property insurance upon the Work at the site to the full insurable value thereof (subject to such deductible amounts as may be provided in these Supplementary Conditions or

required by laws and regulations). This insurance shall include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, and ENGINEER'S Consultants in the Work (all of whom shall be listed as insured or additional insured parties), shall insure against the perils of fire and extended coverage, shall include "all-risk" insurance for physical loss and damage including theft, vandalism and malicious mischief, collapse and water damage, and such other perils as may be provided in these Supplementary Conditions, and shall include damages, losses and expenses arising out of or resulting from any insured loss or incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers, architects, attorneys and other professionals). If not covered under the "all-risk" insurance or otherwise provided in these Supplementary Conditions, CONTRACTOR shall purchase and maintain similar property insurance on portions of the Work stored on and off the site or in transit when such portions of the Work are to be included in an Application for Payment. The policies of insurance required to be purchased and maintained by CONTRACTOR in accordance with this paragraph 6.04B shall comply with the requirements of paragraph 5.06.C of the Standard General Conditions.

- O. *BOILER, MACHINERY AND OTHER PROPERTY INSURANCE* - Amend the first sentence of Paragraph 5.06.B by deleting the first word "OWNER" and inserting in its place: CONTRACTOR and as so amended Paragraph 5.06.B remains in effect.
- P. *SPECIAL INSURANCE* - Delete paragraph 5.06.E in its entirety and insert the following in its place:

CONTRACTOR shall, at its discretion, purchase any special property insurance, as necessary and such additional coverage may be a part of the required property insurance policy.

- Q. *RECEIPT AND APPLICATION OF PROCEEDS* - Delete all references to OWNER and substitute with: OWNER and CONTRACTOR. and as so amended paragraph 5.08 remains in effect.

- R. *ACCEPTANCE OF INSURANCE* - Delete paragraph 5.09.A of the Standard General Conditions in its entirety and insert the following in its place:

If OWNER has any objection to the coverage afforded by or other provisions of the insurance required to be purchased and maintained by CONTRACTOR in accordance with paragraphs 5.04, 5.06, and 5.07 on the basis of its not complying with the Contract Documents, OWNER shall notify CONTRACTOR in writing thereof within ten days of the date of delivery of such certificates in accordance with paragraph 2.05.C. CONTRACTOR shall provide to the OWNER such additional information in respect to insurance provided as the OWNER may reasonably request. Failure by OWNER to give any such notice of objection within the time provided shall constitute acceptance of such insurance purchased by the CONTRACTOR as complying with the Contract Documents.

At the request of OWNER, CONTRACTOR shall provide a copy of the insurance policy under which the coverage for the contract is provided.

OWNER shall review insurance coverage or will assign, at its discretion, a qualified party to review all insurance coverage's to be provided. Upon completion of review and in accordance with Paragraph 5.07 in the Standard General Conditions, CONTRACTOR and CONTRACTOR'S property insurer or insurers may be required to sign an Insured Claim Waiver, or CONTRACTOR, if required, shall secure similar signatures on such forms from all subcontractors and their property insurers.

ENGINEER shall have no responsibilities regarding the advising, requiring, or obtaining of any form of insurance.

SC-6.04 Supplement Paragraph 6.04 of the General Conditions with the following provisions:

F. *Builder's Risk Requirements*: The builder's risk insurance must:

1. be written on a builder's risk "all risk" policy form that at a minimum includes insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment stored and in transit, and must not exclude the coverage of the following risks: fire; windstorm; hail; flood; earthquake, volcanic activity, and other earth movement; lightning; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; and water damage (other than that caused by flood).
 - a. Such policy will include an exception that results in coverage for ensuing losses from physical damage or loss with respect to any defective workmanship, methods, design, or materials exclusions.
 - b. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake, volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance will be provided through other insurance policies acceptable to Owner and Contractor.
2. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.
3. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of contractors, engineers, and architects).
4. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).
5. extend to cover damage or loss to insured property while in transit.

6. allow for the waiver of the insurer's subrogation rights, as set forth in this Contract.
7. allow for partial occupancy or use by Owner by endorsement, and without cancellation or lapse of coverage.
8. include performance/hot testing and start-up, if applicable.
9. be maintained in effect until the Work is complete, as set forth in Paragraph 15.06.D of the General Conditions, or until written confirmation of Owner's procurement of property insurance following Substantial Completion, whichever occurs first.
10. include as named insureds the Owner, Contractor, Subcontractors (of every tier), and any other individuals or entities required by this Contract to be insured under such builder's risk policy. For purposes of Paragraphs 6.04, 6.05, and 6.06 of the General Conditions, and this and all other corresponding Supplementary Conditions, the parties required to be insured will be referred to collectively as "insureds."

SC-6.04 Supplement Paragraph 6.04 of the General Conditions with the following provision:

- G. *Coverage for Completion Delays:* The builder's risk policy will include, for the benefit of Owner, loss of revenue and soft cost coverage for losses arising from delays in completion that result from covered physical losses or damage. Such coverage will include, without limitation, fixed expenses and debt service for a minimum of 12 months with a maximum deductible of 30 days, compensation for loss of net revenues, rental costs, and attorneys' fees and engineering or other consultants' fees, if not otherwise covered.

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.03 *Labor; Working Hours*

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

1. Regular working hours will be Mondays through Friday from 0800 hours to 1600. Contractor shall request in writing and obtain written approval to work on Weekends and Holidays
 2. Owner's legal holidays are: New Year's Day (January 1st); Martin Luther King Jr. Day (third Monday in January); President's Day (third Monday in February); Memorial Day (last Monday in May); Juneteenth National Freedom Day (June 19th); Independence Day (July 4th); Labor Day (first Monday in September); Columbus Day (second Monday in September); General Election Day (biennially on Tuesday following the first Monday in November); Veteran's Day (November 11th); Thanksgiving Day (fourth Thursday in November); Day after Thanksgiving; Christmas Eve (December 24th); and Christmas Day (December 25th).SC-7.03 Add the following new paragraph immediately after Paragraph 7.03.C:
- D. **Contractor** shall be responsible for the cost of any overtime pay or other expense incurred by the Owner for Engineer's services (including those of the Resident Project Representative, if any), Owner's representative, and construction observation services, occasioned by the performance of Work on Saturday, Sunday, any legal holiday, or as overtime on any regular work day. If Contractor is responsible but does not pay, or if the parties are unable to agree as

to the amount owed, then Owner may impose a reasonable set-off against payments due under Article 15.

SC-7.03 Add the following new subparagraph immediately after Paragraph SC-7.03.D:

1. For purposes of administering the foregoing requirement, additional overtime costs are defined as **the Resident Project Representative's hourly rate over 40 hours in a given week.**

SC-7.04.D – Add the following new paragraph immediately after Paragraph 7.04.C:

D. All products must meet Domestic Preference requirements.

SC-7.04.E – Add the following new paragraph immediately after Paragraph 7.04.D:

E. For projects utilizing a *De Minimis* waiver, Contractor shall maintain an itemized list of non-domestically produced components and ensure that the cost is less than 5% of total project cost for project up to a maximum of \$1,000,000.

SC-7.05.A – Amend the third sentence of paragraph by striking out the following words:

Unless the specification or description contains or is followed by words reading that no like, equivalent, or “or-equal” item is permitted,

SC-7.05.A.1.a.3 – Amend the last sentence of Paragraph a.3 by striking out “and;” and adding a period at the end of Paragraph a.3.

SC-7.05.A.1.a.4 – Delete paragraph in its entirety and insert “Deleted.”

SC-7.05.B – Add the following at the end of paragraph:

Contractor shall include a Manufacturer's Certification or waiver for compliance with Domestic Preference requirements and supporting data, as applicable. Refer to Sample Language for Manufacturer's Certification provided in these Contract Documents.

SC-7.06.A.3.a.2 – Remove “and” from the end of paragraph.

SC-7.06.A.3.a.3 – Add “; and” to the end of paragraph.

SC-7.06.A.3.a.4 – Add the following new paragraph immediately after Paragraph 7.06.A.3.a.3:

4. **Comply with Domestic Preference requirements by providing Manufacturer's Certification or waiver , as applicable. Refer to Sample Language for Manufacturers' Certification provided in these Contract Documents.**

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

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

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

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

Owner may not require that Contractor use a specific replacement.

7.10 *Taxes*

SC-7.10 Add a new paragraph immediately after Paragraph 7.10.A:

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

1. The County will provide a tax exemption certificate number. It is the responsibility of the Contractor to determine what costs are tax exempt.

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

Manufacturers' Certifications,

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

, including Manufacturer's Certification, or waiver for any item in the submittal subject to Domestic Preference requirements. Refer to the Sample Language for Manufacturers' Certification provided in these Contract Documents.

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

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

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

F. Contractor shall certify upon Substantial Completion that all Work and Materials have complied with Domestic Preference requirements. Contractor shall provide Certification to Owner and Engineer. Refer to the Sample Language for Contractor's Certification provided in these Contract Documents.

ARTICLE 10 - ENGINEER'S STATUS DURING CONSTRUCTION

10.03 *Resident Project Representative*

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

C. The Resident Project Representative (RPR) will be Engineer's representative at the Site. RPR's dealings in matters pertaining to the Work in general will be with Engineer and Contractor. RPR's dealings with Subcontractors will only be through or with the full knowledge or approval of Contractor. The RPR will:

1. *Conferences and Meetings:* Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings (but not including Contractor's safety meetings), and as appropriate prepare and circulate copies of minutes thereof.

2. *Safety Compliance:* Comply with Site safety programs, as they apply to RPR, and if required to do so by such safety programs, receive safety training specifically related to RPR's own personal safety while at the Site.
 3. *Liaison*
 - a. Serve as Engineer's liaison with Contractor. Working principally through Contractor's authorized representative or designee, assist in providing information regarding the provisions and intent of the Contract Documents.
 - b. Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on-Site operations.
 - c. Assist in obtaining from Owner additional details or information, when required for Contractor's proper execution of the Work.
 4. *Review of Work; Defective Work*
 - a. Conduct on-Site observations of the Work to assist Engineer in determining, to the extent set forth in Paragraph 10.02, if the Work is in general proceeding in accordance with the Contract Documents.
 - b. Observe whether any Work in place appears to be defective.
 - c. Observe whether any Work in place should be uncovered for observation, or requires special testing, inspection or approval.
 5. *Inspections and Tests*
 - a. Observe Contractor-arranged inspections required by Laws and Regulations, including but not limited to those performed by public or other agencies having jurisdiction over the Work.
 - b. Accompany visiting inspectors representing public or other agencies having jurisdiction over the Work.
 6. *Payment Requests:* Review Applications for Payment with Contractor.
 7. *Completion*
 - a. Participate in Engineer's visits regarding Substantial Completion.
 - b. Assist in the preparation of a punch list of items to be completed or corrected.
 - c. Participate in Engineer's visit to the Site in the company of Owner and Contractor regarding completion of the Work, and prepare a final punch list of items to be completed or corrected by Contractor.
 - d. Observe whether items on the final punch list have been completed or corrected.
- D. The RPR will not:
1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items).
 2. Exceed limitations of Engineer's authority as set forth in the Contract Documents.
 3. Undertake any of the responsibilities of Contractor, Subcontractors, or Suppliers.

4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of construction.
- 5 Advise on, issue directions regarding, or assume control over security or safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.
6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Engineer.
7. Authorize Owner to occupy the Project in whole or in part.

ARTICLE 11 - CHANGES TO THE CONTRACT

~~Deleted No suggested Supplementary Conditions in this Article.~~

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

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

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

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

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

For Owner-authorized changes in the Work, the Contractor will provide the Manufacturer's Certification, or waiver, for materials subject to Domestic Preference requirements except when sole-source is specified, in which case the Engineer will provide the Manufacturer's Certification, or waiver.

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

c. For change orders involving materials subject to Domestic Preference requirements, Contractor shall include a Manufacturer's Certification or waiver, as applicable. Refer to the Sample Language for Manufacturer's Certification provided in these Contract Documents.

ARTICLE 12 - CLAIMS

No suggested Supplementary Conditions in this Article.

ARTICLE 13 - COST OF WORK; ALLOWANCES, UNIT PRICE WORK

13.01 *Cost of the Work*

SC-13.01 Supplement Paragraph 13.01.C.2 by adding the following definition of small tools and hand tools:

- a. For purposes of this paragraph, “small tools and hand tools” means any tool or equipment whose current price if it were purchased new at retail would be less than \$500.

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

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

E. *Adjustments in Unit Price*

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:
 - a. the extended price of a particular item of Unit Price Work amounts to **25** percent or more of the Contract Price (based on estimated quantities at the time of Contract formation) and the variation in the quantity of that particular item of Unit Price Work actually furnished or performed by Contractor differs by more than **25** percent from the estimated quantity of such item indicated in the Agreement; and
 - b. Contractor’s unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.
2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor’s costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.
3. Adjusted unit prices will apply to all units of that item.

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

~~Deleted No suggested Supplementary Conditions in this Article.~~

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

G. Installation of materials that are non-compliant with Domestic Preference requirements shall be considered defective work. Contractor should ensure that Engineer has an approved Manufacturer’s Certification, or waiver, prior to any domestic preference compliant item being delivered to the project site.

ARTICLE 15 - PAYMENTS TO CONTRACTOR, SET OFFS; COMPLETIONS; CORRECTION PERIOD

~~Deleted No suggested Supplementary Conditions in this Article.~~

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

No payments will be made that would deplete the retainage, place in escrow any funds

EJCDC® C-800, Supplementary Conditions of the Construction Contract.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies,
and American Society of Civil Engineers. All rights reserved.

that are required for retainage or invest the retainage for the benefit of the Contractor.

SC-15.01.B.5 – Add new paragraph immediately after Paragraph 15.01.B.4:

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

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

6. By submitting an Application for Payment, based in whole or in part on furnishing equipment or materials, Contractor certifies that such equipment and materials are compliant with Domestic Preference requirements. Manufacturer's Certification for material(s) satisfy these requirements. Refer to the Sample Language for Manufacturer's Certification provided in these Contract Documents.

SC-15.01.C.2.d – Add the following new paragraph immediately after Paragraph 15.01.C.2.c:

d. The materials presented for payment in an Application for Payment comply with Domestic Preference requirements.

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

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

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

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

Contractor shall also submit the Contractor's Certification of Compliance certifying that to the best of the Contractor's knowledge and belief all Iron and Steel products, Manufactured Products, and Construction Materials proposed in the Shop Drawings, Change Orders, and Partial Payment Estimates, and those installed for the Project, comply with Domestic Preference requirements.

ARTICLE 16 - SUSPENSION OF WORK AND TERMINATION

No suggested Supplementary Conditions in this Article.

ARTICLE 17 - FINAL RESOLUTIONS OF DISPUTES

17.02 Arbitration

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

17.02 Arbitration

- A. All matters subject to final resolution under this Article will be settled by arbitration administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules (subject to the conditions and limitations of this Paragraph SC-17.02). Any controversy or claim in the amount of \$100,000 or less will be settled in accordance with the American Arbitration Association's supplemental rules for Fixed Time and Cost Construction Arbitration. This agreement to arbitrate will be specifically enforceable under the prevailing law of any court having jurisdiction.
- B. The demand for arbitration will be filed in writing with the other party to the Contract and with the selected arbitration administrator, and a copy will be sent to Engineer for information. The demand for arbitration will be made within the specific time required in Article 17, or if no specified time is applicable within a reasonable time after the matter in question has arisen, and in no event will any such demand be made after the date when institution of legal or equitable proceedings based on such matter in question would be barred by the applicable statute of limitations.
- C. The arbitrator(s) must be licensed engineers, contractors, attorneys, or construction managers. Hearings will take place pursuant to the standard procedures of the Construction Arbitration Rules that contemplate in-person hearings. The arbitrators will have no authority to award punitive or other damages not measured by the prevailing party's actual damages, except as may be required by statute or the Contract. Any award in an arbitration initiated under this clause will be limited to monetary damages and include no injunction or direction to any party other than the direction to pay a monetary amount.
- D. The Arbitrators will have the authority to allocate the costs of the arbitration process among the parties, but will only have the authority to allocate attorneys' fees if a specific Law or Regulation or this Contract permits them to do so.
- E. The award of the arbitrators must be accompanied by a reasoned written opinion and a concise breakdown of the award. The written opinion will cite the Contract provisions deemed applicable and relied on in making the award.
- F. The parties agree that failure or refusal of a party to pay its required share of the deposits for arbitrator compensation or administrative charges will constitute a waiver by that party to present evidence or cross-examine witness. In such event, the other party shall be required to present evidence and legal argument as the arbitrator(s) may require for the making of an award. Such waiver will not allow for a default judgment against the non-paying party in the absence of evidence presented as provided for above.
- G. No arbitration arising out of or relating to the Contract will include by consolidation, joinder, or in any other manner any other individual or entity (including Engineer, and Engineer's consultants and the officers, directors, partners, agents, employees or consultants of any of them) who is not a party to this Contract unless:
 - 1. the inclusion of such other individual or entity will allow complete relief to be afforded among those who are already parties to the arbitration;
 - 2. such other individual or entity is substantially involved in a question of law or fact which is common to those who are already parties to the arbitration, and which will arise in such proceedings;

3. such other individual or entity is subject to arbitration under a contract with either Owner or Contractor, or consents to being joined in the arbitration; and
 4. the consolidation or joinder is in compliance with the arbitration administrator's procedural rules.
- H. The award will be final. Judgment may be entered upon it in any court having jurisdiction thereof, and it will not be subject to modification or appeal, subject to provisions of the Laws and Regulations relating to vacating or modifying an arbitral award.
- I. Except as may be required by Laws or Regulations, neither party nor an arbitrator may disclose the existence, content, or results of any arbitration hereunder without the prior written consent of both parties, with the exception of any disclosure required by Laws and Regulations or the Contract. To the extent any disclosure is allowed pursuant to the exception, the disclosure must be strictly and narrowly limited to maintain confidentiality to the extent possible.

17.03 *Attorneys' Fees*

SC-17.03 Add the following new paragraph immediately after Paragraph 17.02.

17.03 *Attorneys' Fees*

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

ARTICLE 18 – MISCELLANEOUS

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

18.11 *Tribal Sovereignty*

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

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

ARTICLE 19 - FEDERAL REQUIREMENTS

19.01 *Agency Not a Party*

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

19.02 *Contract Approval*

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

- B. Agency concurrence is required on both the Bid and the Contract before the Contract is effective.

19.03 Conflict of Interest

- A. Contractor may not knowingly contract with a Supplier or Manufacturer if the individual or entity who prepared the Drawings and Specifications has a corporate or financial affiliation with the Supplier or Manufacturer. Owner's officers, employees, or agents shall not engage in the award or administration of this Contract if a conflict of interest, real or apparent, would be involved. Such a conflict would arise when: (i) the employee, officer or agent; (ii) any member of their immediate family; (iii) their partner or (iv) an organization that employs, or is about to employ, any of the above, has a financial interest or other interest in or a tangible personal benefit from the Contractor. Owner's officers, employees, or agents shall neither solicit nor accept gratuities, favors or anything of monetary value from Contractor or subcontractors.

19.04 Gratuities

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

19.05 Small, Minority and Women's Businesses

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

business enterprises;

Using the services and assistance, as appropriate, of such organizations as the Small Business Administration and the Minority Business Development Agency of the Department of Commerce.

19.06 Anti-Kickback

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

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

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

19.08 Equal Employment Opportunity

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

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

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

19.10 Environmental Requirements

- A. When constructing a Project involving trenching and/or other related earth excavations, Contractor shall comply with the following environmental conditions:
 - 1. Wetlands – When disposing of excess, spoil, or other Construction Materials on public or private property, Contractor shall not fill in or otherwise convert wetlands.
 - 2. Floodplains – When disposing of excess, spoil, or other Construction Materials on public or private property, Contractor shall not fill in or otherwise convert 100-year floodplain areas (Standard Flood Hazard Area) delineated on the latest Federal Emergency Management Agency Floodplain Maps, or other appropriate maps, e.g., alluvial soils on NRCS Soil Survey Maps.
 - 3. Historic Preservation - Applicants shall ensure that Contractors maintain a copy of the following inadvertent discovery plan onsite for review:
 - a. If during the course of any ground disturbance related to any Project, any post review discovery, including but not limited to, any artifacts, foundations, or other indications of past human occupation of the area are uncovered, shall be protected by complying with 36 CFR § 800.13(b)(3) and (c) and shall include the following:
 - i. All Work, including vehicular traffic, shall immediately stop within a 50 ft. radius around the area of discovery. The Contractor shall ensure barriers are established to protect the area of discovery and notify the Engineer to contact the appropriate RD personnel. The Engineer shall engage a Secretary of the Interior (SOI) qualified professional archeologist to quickly assess the nature and scope of the discovery; implement interim measures to protect the discovery from looting and vandalism; and establish broader barriers if further historic and/or precontact properties, can reasonably be expected to occur.
 - ii. The RD personnel shall notify the appropriate RD environmental staff member, the Federal Preservation Officer (FPO), and State Historic Preservation Office (SHPO) immediately. Indian tribe(s) or Native Hawaiian Organization (NHOs) that have an interest in the area of discovery shall be contacted immediately. The SHPO may require additional tribes or NHOs who may have an interest in the area of discovery also be contacted. The notification shall include an assessment of the discovery provided by the SOI qualified professional archeologist.
 - iii. When the discovery contains burial sites or human remains, the Contractor shall immediately notify the appropriate RD personnel who will contact the RD environmental staff member, FPO, and the SHPO. The relevant law enforcement authorities shall be immediately contacted by onsite personnel to reduce delay times, in accordance with tribal, state, or local laws including 36 CFR Part 800.13; 43 CFR Part 10, Subpart B; and the Advisory Council on Historic Preservation's Policy Statement Regarding treatment of Burial Sites, Human Remains, or Funerary Objects (February 23, 2007).
 - iv. When the discovery contains burial sites or human remains, all construction activities, including vehicular traffic shall stop within a 100 ft. radius of the discovery and barriers shall be established. The evaluation of human remains shall be conducted at the site of discovery by a SOI qualified professional. Remains that have been removed from their primary context and where that context may be in question may be retained in a secure location, pending further decisions on treatment and disposition. RD may expand this radius based on the SOI professional's assessment of the discovery and establish broader barriers if further

- subsurface burial sites, or human remains can reasonably be expected to occur. RD, in consultation with the SHPO and interested tribes or NHOs, shall develop a plan for the treatment of native human remains.
- v. Work may continue in other areas of the undertaking where no historic properties, burial sites, or human remains are present. If the inadvertent discovery appears to be a consequence of illegal activity such as looting, the onsite personnel shall contact the appropriate legal authorities immediately if the landowner has not already done so.
 - vi. Work may not resume in the area of the discovery until a notice to proceed has been issued by RD. RD shall not issue the notice to proceed until it has determined that the appropriate local protocols and consulting parties have been consulted.
 - vii. Inadvertent discoveries on federal and tribal land shall follow the processes required by the federal or tribal entity.
4. Endangered Species – Contractor shall comply with the Endangered Species Act, which provides for the protection of endangered and/or threatened species and critical habitat. Should any evidence of the presence of endangered and/or threatened species or their critical habitat be brought to the attention of Contractor, Contractor will immediately report this evidence to Owner and a representative of Agency. Construction shall be temporarily halted pending the notification process and further directions issued by Agency after consultation with the U.S. Fish and Wildlife Service.
5. Mitigation Measures – The following environmental mitigation measures are required on this Project: *None*

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

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

19.12 Debarment and Suspension (Executive Orders 12549 and 12689)

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

regulatory authority other than Executive Order 12549.

19.13 Procurement of recovered materials

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

19.14 Domestic Preference

- A. Build America, Buy America Act (BABAA). All Iron and Steel Products, Manufactured Products, and Construction Materials used in this project must comply with the Build America, Buy America Act (BABAA) requirements mandated by Title IX of the Infrastructure Investment and Jobs Act (IIJA), Pub. L. 117-58, §§ 70901-70953. Aggregates such as stone, sand, or gravel do not apply to BABAA.
- B. The following waivers apply to this Contract:
 - 1. BABAA De Minimis, Small Grants and Minor Components

EXHIBIT B—SOFTWARE REQUIREMENTS FOR ELECTRONIC DOCUMENT EXCHANGE

Item	Electronic Documents	Transmittal Means	Data Format	Note (1)
a.1	General communications, transmittal covers, meeting notices and responses to general information requests for which there is no specific prescribed form.	Email	Email	
a.2	Meeting agendas, meeting minutes, RFI’s and responses to RFI’s, and Contract forms.	Email w/ Attachment	PDF	(2)
a.3	Contactors Submittals (Shop Drawings, “or equal” requests, substitution requests, documentation accompanying Sample submittals and other submittals) to Owner and Engineer, and Owner’s and Engineer’s responses to Contractor’s Submittals, Shop Drawings, correspondence, and Applications for Payment.	Email w/ Attachment	PDF	
a.4	Correspondence; milestone and final version Submittals of reports, layouts, Drawings, maps, calculations and spreadsheets, Specifications, Drawings and other Submittals from Contractor to Owner or Engineer and for responses from Engineer and Owner to Contractor regarding Submittals.	Email w/ Attachment or LFE	PDF	
a.5	Layouts and drawings to be submitted to Owner for future use and modification.	Email w/ Attachment or LFE	DWG	
a.6	Correspondence, reports and Specifications to be submitted to Owner for future word processing use and modification.	Email w/ Attachment or LFE	DOC	
a.7	Spreadsheets and data to be submitted to Owner for future data processing use and modification.	Email w/ Attachment or LFE	EXC	
a.8	Database files and data to be submitted to Owner for future data processing use and modification.	Email w/ Attachment or LFE	DB	
Notes				
(1)	All exchanges and uses of transmitted data are subject to the appropriate provisions of Contract Documents.			
(2)	Transmittal of written notices is governed by Paragraph 18.01 of the General Conditions.			
Key				
Email	Standard Email formats (.htm, .rtf, or .txt). Do not use stationery formatting or other features that impair legibility of content on screen or in printed copies			
LFE	Agreed upon Large File Exchange method (FTP, CD, DVD, hard drive)			
PDF	Portable Document Format readable by Adobe® Acrobat Reader Version 2022.001.20169 or later			
DWG	Autodesk® AutoCAD .dwg format Version - NA			
DOC	Microsoft® Word .docx format Version 2202 (Microsoft 365)			
EXC	Microsoft® Excel .xls or .xml format Version 2202 (Microsoft 365)			
DB	Microsoft® Access .mdb format Version 2202 (Microsoft 365)			

SECTION D

BONDS AND BID FORMS

BID FORM FOR CONSTRUCTION CONTRACT

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

ARTICLE 1—OWNER AND BIDDER

- 1.01 This Bid is submitted to: **County Commissioners of Worcester County, One West Market Street, Room 1103, Snow Hill, Maryland 21863**
- 1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2—ATTACHMENTS TO THIS BID

- 2.01 The following documents are submitted with and made a condition of this Bid:
- A. Required Bid security;
 - B. List of Proposed Subcontractors;
 - C. List of Proposed Suppliers;
 - D. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such authority within the time for acceptance of Bids;
 - E. Contractor's license number as evidence of Bidder's State Contractor's License or a covenant by Bidder to obtain said license within the time for acceptance of Bids;
 - F. Required Bidder Qualification Statement with supporting data;~~and~~
 - G. **If Bid amount exceeds \$10,000, signed Compliance Statement (RD 400-6). Refer to specific equal opportunity requirements set forth in the Supplementary Conditions of the Construction Contract (EJCDC C-800);**
 - H. **If Bid amount exceeds \$25,000, signed Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions (AD-1048);**
 - I. **If Bid amount exceeds \$100,000, signed RD Instruction 1940-Q Exhibit A-1, Certification for Contracts, Grants, and Loans."**

ARTICLE 3—BASIS OF BID—LUMP SUM BID AND UNIT PRICES

3.01 *Unit Price Bids*

- A. Bidder will perform the following Work at the indicated unit prices:

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
1	MOBILIZATION, DEMOBILIZATION, TESTING, AND PERMITTING	LS	1	\$	\$

2	E-ONE SIMPLEX GRINDER PUMP STATION	EA	2	\$	\$
3	1.5" HDPE SDR-11 FORCEMAIN	LF	648	\$	\$
4	4" FORCE MAIN (VARIOUS MATERIALS)	LF	1,002	\$	\$
5	6" SDR-35 PVC SEWER SERVICES FROM RIGHT OF WAY TO GRAVITY MAIN	EA	40	\$	\$
6	6" SDR-35 PVC GRAVITY SEWER LATERAL (RIGHT OF WAY TO RESIDENCE)	LF	2,370	\$	\$
7	8" SDR-35 PVC GRAVITY SEWER MAIN (0' TO 8' DEEP)	LF	186	\$	\$
8	10" SDR-35 PVC GRAVITY SEWER MAIN (0' TO 8' DEEP)	LF	1,617	\$	\$
9	10" D.I. CLASS 52 GRAVITY SEWER	LF	70	\$	\$
10	10" SDR-35 PVC GRAVITY SEWER MAIN (8' TO 20' DEEP)	LF	3,304	\$	\$
11	THE LANDING WWTP WET WELL CONNECTION	EA	1	\$	\$
12	PUMP STATION - CIVIL AND MECHANICAL	LS	1	\$	\$
13	PUMP STATION - ELECTRICAL AND CONTROL	LS	1	\$	\$
14	PRECAST CONCRETE SEWER MANHOLES	EA	22	\$	\$
15	DEWATERING AND WELL POINT SYSTEMS	LS	1	\$	\$
16	2.5" BASE SUPERPAVE ASPHALT 19.5MM	TON	870	\$	\$
17	2" SURFACE SUPERPAVE ASPHALT 9.5MM	TON	690	\$	\$
18	8" CR-6 ROAD BASE AGGREGATE	SY	2,800	\$	\$
19	DEMOLITION AND ABANDONMENT OF SEPTIC TANKS, PLUMBING CONNECTIONS, AND APPURTENANCES	EA	23	\$	\$
20	EROSION/SEDIMENT CONTROL, SITE RESTORATION, AND STABILIZATION	LS	1	\$	\$
21	TRAFFIC CONTROL	LS	1	\$	\$
Total of All Unit Price Bid Items					\$

B. Bidder acknowledges that:

- each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and

2. estimated quantities are not guaranteed and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Work will be based on actual quantities, determined as provided in the Contract Documents.

3.02 *Total Bid Price (Lump Sum and Unit Prices)*

Total Bid Price (Total of all Lump Sum and Unit Price Bids)	\$

TOTAL BID PRICE IN WORDS

ARTICLE 4—BASIS OF BID—COST-PLUS FEE - DELETED

ARTICLE 5—PRICE-PLUS-TIME BID - DELETED

ARTICLE 6—TIME OF COMPLETION

- 6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.
- 6.02 ~~Bidder~~ Bidder agrees that the Work will be substantially complete on or before ~~[Bidder inserts date]~~, and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before ~~[Bidder inserts date]~~.
- 6.03 ~~Bidder~~ Bidder agrees that the Work will be substantially complete within ~~[Bidder inserts number]~~ calendar days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within ~~[Bidder inserts number]~~ calendar days after the date when the Contract Times commence to run.
- 6.04 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 7—BIDDER'S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, AND RECEIPT OF ADDENDA

7.01 *Bid Acceptance Period*

- A. This Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

7.02 *Instructions to Bidders*

- A. Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security.

7.03 *Receipt of Addenda*

- A. Bidder hereby acknowledges receipt of the following Addenda: **[Add rows as needed. Bidder is to complete table.]**

Addendum Number	Addendum Date

ARTICLE 8—BIDDER’S REPRESENTATIONS AND CERTIFICATIONS

8.01 *Bidder’s Representations*

A. In submitting this Bid, Bidder represents the following:

1. Bidder has examined and carefully studied the Bidding Documents, including Addenda.
2. Bidder has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
3. Bidder is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work **including all Domestic Preference requirements**.
4. Bidder has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
5. Bidder has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.
6. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, if selected as Contractor; and (c) Bidder’s (Contractor’s) safety precautions and programs.
7. Based on the information and observations referred to in the preceding paragraph, Bidder agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
8. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
9. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

10. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
11. The submission of this Bid constitutes an incontrovertible representation by Bidder that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

8.02 *Bidder's Certifications*

A. The Bidder certifies the following:

1. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation.
2. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid.
3. Bidder has not solicited or induced any individual or entity to refrain from bidding.
4. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 8.02.A:
 - a. Corrupt practice means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process.
 - b. Fraudulent practice means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition.
 - c. Collusive practice means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels.
 - d. Coercive practice means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

BIDDER hereby submits this Bid as set forth above:

Bidder:

(typed or printed name of organization)

By:

(individual's signature)

Name:

(typed or printed)

Title:

(typed or printed)

Date:

(typed or printed)

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

Attest:

(individual's signature)

Name:

(typed or printed)

Title:

(typed or printed)

Date:

(typed or printed)

Address for giving notices:

Bidder's Contact:

Name:

(typed or printed)

Title:

(typed or printed)

Phone:

Email:

Address:

Bidder's Contractor License No.: (if applicable)

BID BOND (PENAL SUM FORM)

Bidder Name: Address <i>(principal place of business)</i> :	Surety Name: Address <i>(principal place of business)</i> :
Owner Name: Address <i>(principal place of business)</i> :	Bid Project <i>(name and location)</i> : Worcester County Department of Public Works – Lewis Road Gravity Sewer System and Pump Station Bid Due Date:
Bond Penal Sum: Date of Bond:	
Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth in this Bid Bond, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.	
Bidder	Surety
_____ <i>(Full formal name of Bidder)</i>	_____ <i>(Full formal name of Surety) (corporate seal)</i>
By: _____ <i>(Signature)</i>	By: _____ <i>(Signature) (Attach Power of Attorney)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
Attest: _____ <i>(Signature)</i>	Attest: _____ <i>(Signature)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
<i>Notes: (1) Note: Addresses are to be used for giving any required notice. (2) Provide execution by any additional parties, such as joint venturers, if necessary.</i>	

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

ARTICLE 1—GENERAL INFORMATION

1.01 Provide contact information for the Business:

Legal Name of Business:			
Corporate Office			
Name:		Phone number:	
Title:		Email address:	
Business address of corporate office:			
Local Office			
Name:		Phone number:	
Title:		Email address:	
Business address of local office:			

1.02 Provide information on the Business's organizational structure:

Form of Business:	☐ Sole Proprietorship ☐ Partnership ☐ Corporation		
☐ Limited Liability Company ☐ Joint Venture comprised of the following companies:			
1.			
2.			
3.			
Provide a separate Qualification Statement for each Joint Venturer.			
Date Business was formed:		State in which Business was formed:	
Is this Business authorized to operate in the Project location?		☐ Yes ☐ No ☐ Pending	

1.03 Identify all businesses that own Business in whole or in part (25% or greater), or that are wholly or partly (25% or greater) owned by Business:

Name of business:		Affiliation:	
Address:			
Name of business:		Affiliation:	
Address:			
Name of business:		Affiliation:	
Address:			

1.04 Provide information regarding the Business's officers, partners, and limits of authority.

Name:		Title:	
Authorized to sign contracts: ☐ Yes ☐ No		Limit of Authority:	\$
Name:		Title:	
Authorized to sign contracts: ☐ Yes ☐ No		Limit of Authority:	\$
Name:		Title:	
Authorized to sign contracts: ☐ Yes ☐ No		Limit of Authority:	\$
Name:		Title:	

ARTICLE 2—LICENSING

2.01 Provide information regarding licensure for Business:

Name of License:			
Licensing Agency:			
License No:		Expiration Date:	
Name of License:			
Licensing Agency:			
License No:		Expiration Date:	

ARTICLE 3—DIVERSE BUSINESS CERTIFICATIONS

3.01 Provide information regarding Business's Diverse Business Certification, if any. Provide evidence of current certification.

Certification	Certifying Agency	Certification Date
☐ Disadvantaged Business Enterprise		
☐ Minority Business Enterprise		
☐ Woman-Owned Business Enterprise		
☐ Small Business Enterprise		
☐ Disabled Business Enterprise		
☐ Veteran-Owned Business Enterprise		
☐ Service-Disabled Veteran-Owned Business		
☐ HUBZone Business (Historically Underutilized) Business		
☐ Other		
☐ None		

ARTICLE 4—SAFETY

- 4.01 Provide information regarding Business's safety organization and safety performance.

Name of Business's Safety Officer:		
Safety Certifications		
Certification Name	Issuing Agency	Expiration

- 4.02 Provide Worker's Compensation Insurance Experience Modification Rate (EMR), Total Recordable Frequency Rate (TRFR) for incidents, and Total Number of Recorded Manhours (MH) for the last 3 years and the EMR, TRFR, and MH history for the last 3 years of any proposed Subcontractor(s) that will provide Work valued at 10% or more of the Contract Price. Provide documentation of the EMR history for Business and Subcontractor(s).

Year									
Company	EMR	TRFR	MH	EMR	TRFR	MH	EMR	TRFR	MH

ARTICLE 5—FINANCIAL

- 5.01 Provide information regarding the Business's financial stability. Provide the most recent audited financial statement, and if such audited financial statement is not current, also provide the most current financial statement.

Financial Institution:		
Business address:		
Date of Business's most recent financial statement:		☐ Attached
Date of Business's most recent audited financial statement:		☐ Attached
Financial indicators from the most recent financial statement		
Contractor's Current Ratio (Current Assets ÷ Current Liabilities)		
Contractor's Quick Ratio ((Cash and Cash Equivalents + Accounts Receivable + Short Term Investments) ÷ Current Liabilities)		

ARTICLE 6—SURETY INFORMATION

- 6.01 Provide information regarding the surety company that will issue required bonds on behalf of the Business, including but not limited to performance and payment bonds.

Surety Name:			
Surety is a corporation organized and existing under the laws of the state of:			
Is surety authorized to provide surety bonds in the Project location?	☐ Yes ☐ No		
Is surety listed in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" published in Department Circular 570 (as amended) by the Bureau of the Fiscal Service, U.S. Department of the Treasury? ☐ Yes ☐ No			
Mailing Address (principal place of business):			
Physical Address (principal place of business):			
Phone (main):		Phone (claims):	

ARTICLE 7—INSURANCE

- 7.01 Provide information regarding Business's insurance company(s), including but not limited to its Commercial General Liability carrier. Provide information for each provider.

Name of insurance provider, and type of policy (CLE, auto, etc.):			
Insurance Provider		Type of Policy (Coverage Provided)	
Are providers licensed or authorized to issue policies in the Project location?		☐ Yes ☐ No	
Does provider have an A.M. Best Rating of A-VII or better?		☐ Yes ☐ No	
Mailing Address (principal place of business):			
Physical Address (principal place of business):			
Phone (main):		Phone (claims):	

ARTICLE 8—CONSTRUCTION EXPERIENCE

8.01 Provide information that will identify the overall size and capacity of the Business.

Average number of current full-time employees:	
Estimate of revenue for the current year:	
Estimate of revenue for the previous year:	

8.02 Provide information regarding the Business's previous contracting experience.

Years of experience with projects like the proposed project:				
As a general contractor:		As a joint venturer:		
Has Business, or a predecessor in interest, or an affiliate identified in Paragraph 1.03:				
Been disqualified as a bidder by any local, state, or federal agency within the last 5 years? ☐ Yes ☐ No				
Been barred from contracting by any local, state, or federal agency within the last 5 years? ☐ Yes ☐ No				
Been released from a bid in the past 5 years? ☐ Yes ☐ No				
Defaulted on a project or failed to complete any contract awarded to it? ☐ Yes ☐ No				
Refused to construct or refused to provide materials defined in the contract documents or in a change order? ☐ Yes ☐ No				
Been a party to any currently pending litigation or arbitration? ☐ Yes ☐ No				
Provide full details in a separate attachment if the response to any of these questions is Yes.				

8.03 List all projects currently under contract in Schedule A and provide indicated information.

8.04 List a minimum of three and a maximum of six projects completed in the last 5 years in Schedule B and provide indicated information to demonstrate the Business's experience with projects similar in type and cost of construction.

8.05 In Schedule C, provide information on key individuals whom Business intends to assign to the Project. Provide resumes for those individuals included in Schedule C. Key individuals include the Project Manager, Project Superintendent, Quality Manager, and Safety Manager. Resumes may be provided for Business's key leaders as well.

ARTICLE 9—REQUIRED ATTACHMENTS

9.01 Provide the following information with the Statement of Qualifications:

- A. If Business is a Joint Venture, separate Qualifications Statements for each Joint Venturer, as required in Paragraph 1.02.
- B. Diverse Business Certifications if required by Paragraph 3.01.
- C. Certification of Business's safety performance if required by Paragraph 4.02.
- D. Financial statements as required by Paragraph 5.01.

- E. Attachments providing additional information as required by Paragraph 8.02.
- F. Schedule A (Current Projects) as required by Paragraph 8.03.
- G. Schedule B (Previous Experience with Similar Projects) as required by Paragraph 8.04.
- H. Schedule C (Key Individuals) and resumes for the key individuals listed, as required by Paragraph 8.05.
- I. Additional items as pertinent.

This Statement of Qualifications is offered by:

Business:

(typed or printed name of organization)

By:

(individual's signature)

Name:

(typed or printed)

Title:

(typed or printed)

Date:

(date signed)

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

Attest:

(individual's signature)

Name:

(typed or printed)

Title:

(typed or printed)

Address for giving notices:

Designated Representative:

Name:

(typed or printed)

Title:

(typed or printed)

Address:

Phone:

Email:

Schedule A—Current Projects

Name of Organization					
Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Schedule B—Previous Experience with Similar Projects

Name of Organization					
Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Schedule B—Previous Experience with Similar Projects

Name of Organization					
Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Schedule C—Key Individuals

Project Manager			
Name of individual			
Years of experience as project manager			
Years of experience with this organization			
Number of similar projects as project manager			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	
Project Superintendent			
Name of individual			
Years of experience as project superintendent			
Years of experience with this organization			
Number of similar projects as project superintendent			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	

Safety Manager			
Name of individual			
Years of experience as project manager			
Years of experience with this organization			
Number of similar projects as project manager			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	
Quality Control Manager			
Name of individual			
Years of experience as project superintendent			
Years of experience with this organization			
Number of similar projects as project superintendent			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	

CERTIFICATE OF OWNER'S ATTORNEY AND AGENCY CONCURRENCE

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

CERTIFICATE OF OWNER'S ATTORNEY

PROJECT NAME:

CONTRACTOR NAME AND CONTRACT NUMBER:

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

Name

Date

AGENCY CONCURRENCE

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

Agency Representative

Date

Name

COMPLIANCE STATEMENT

This statement relates to a proposed contract with _____

(Name of borrower or grantee)

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

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

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

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

A federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with a collection of information subject to the requirements of the Paperwork Reduction Act unless that collection of information displays a currently valid OMB Control Number. The OMB Control Number for this information collection is 0575-0201. Public reporting for this collection of information is estimated to be approximately 10 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, completing and reviewing the collection of information. All responses to this collection of information are voluntary. However, in order to obtain or retain a benefit, the information in this form is required 7 CFR 1901-E. Rural Development has no plans to publish information collected under the provisions of this program. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to: Information Collection Clearance Officer, Rural Development Innovation Center, Regulations Management Division at ICRMTRRequests@usda.gov.

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

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

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

Date _____

(Signature of Bidder or Prospective Contractor)

Address (including Zip Code)



Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion Lower Tier Covered Transactions

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

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

(Read instructions on page two before completing certification.)

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

ORGANIZATION NAME

PR/AWARD NUMBER OR PROJECT NAME

NAME(S) AND TITLE(S) OF AUTHORIZED REPRESENTATIVE(S)

SIGNATURE

DATE

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

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

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at [How to File a Program Discrimination Complaint](#) and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3) email: program.intake@usda.gov.

USDA is an equal opportunity provider, employer, and lender.

Instructions for Certification

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

CERTIFICATION FOR CONTRACTS, GRANTS AND LOANS

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

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

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

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

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

(name)

(date)

(title)

oOo

DOMESTIC PREFERENCE *DE MINIMIS* LIST FORMAT

Notes to User: This exhibit is an example format for Contractors to use in maintaining a list of items to document the use of the De Minimis waiver of the Domestic Preference requirements. This list or similar is required to be filled out throughout the construction Contract as needed. The State Engineer may periodically ask to review this information. At the Contract completion, this list, along with all Manufacturers' certifications, are to be given to the Engineer for delivery to the Owner. This list is applicable for projects governed by BABAA. USDA-RD State Office can provide guidance if AIS applies to the project instead.

DE MINIMIS COSTING WORKSHEET

Project Name:	_____
Contract Name/# (if more than one)	_____
Contractor (Company Name):	_____
Representative:	_____
Date:	_____
Total Project Costs :	_____ \$
Allowable Total <i>De Minimis</i> Costs (5% of project costs)	_____ \$
Total Cost of all <i>De Minimis</i> Items	_____ \$
Remaining Amount Allowed for Future <i>De Minimis</i> Items	_____ \$

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

SAMPLE LANGUAGE FOR CONTRACTOR'S
CERTIFICATION OF COMPLIANCE

Notes to User: This exhibit provides sample language that the Contractor can use to certify compliance with the Build America Buy America Act requirements. Note that the language can be modified (for example if the project is subject to AIS the BABAA reference should be replaced with language such as "American Iron and Steel (AIS) requirements mandated by Section 746 of Title VII of the Consolidated Appropriations Act of 2017 and subsequent annual appropriations for WWD programs"). A certification is to be provided by Contractor to Engineer for delivery to the Owner and Agency at Substantial Completion. The certification should be on letterhead and should be signed and dated by an authorized company representative.

Project Name
Owner / Applicant
Contract Number

I hereby certify, that to the best of my knowledge and belief, all Iron and Steel products, Manufactured Products, and Construction Materials installed for this project by my company and by any and all subcontractors and Manufacturers my company has contracted with for this project comply with the Build America, Buy America Act (BABAA) requirements under Title IX of the Infrastructure Investment and Jobs Act (IIJA), Pub. L. 117-58, §§ 70901-70953 or are the subject of a waiver approved by the Secretary of Agriculture or designee.

SAMPLE LANGUAGE FOR MANUFACTURER'S CERTIFICATION OF COMPLIANCE

Notes to User: This exhibit provides sample language for the Manufacturer's Certification of Compliance with Domestic Preference requirements. Contractor should ensure that Engineer has an approved Manufacturers' Certification prior to any domestic preference item being delivered to the project site. The Manufacturer's Certification should be on letterhead and should indicate the project, specific item being certified, reference which domestic preference requirement is being certified and be signed by an authorized company representative. The Manufacturer's Certification may include multiple domestic preference requirements. It is important for the governing domestic preference requirement (whether AIS, BABAA or other) to be clearly included within the certification.

Date:

Company Name:

Company Address:

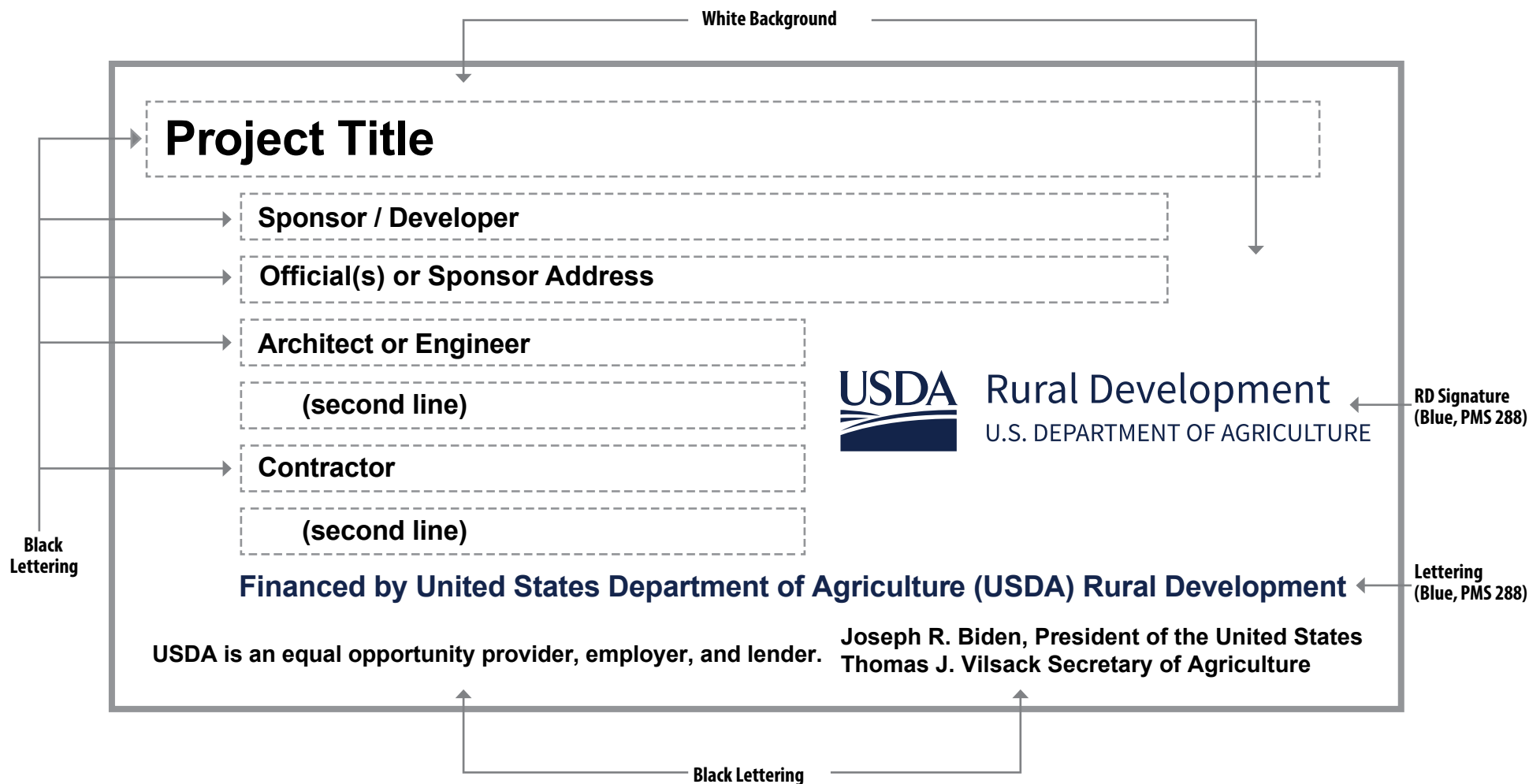
Subject: Domestic Preference Requirement Certification for {Owner's Name and Project Name (City, State)} Certification for Project (X), Owner's Name, and Contract Number
Sample text:

I hereby certify that the following product(s) and / or material(s) shipped or provided for the subject project are in full compliance with the Build America, Buy America Act (BABAA) requirements under Title IX of the Infrastructure Investment and Jobs Act (IIJA), Pub. L. 117-58, §§ 70901-70953.

[List common name of items, products and/or materials]

TEMPORARY CONSTRUCTION SIGN FOR RURAL DEVELOPMENT PROJECTS

Recommended Fonts: Helvetica or Arial



SIGN DIMENSIONS : 1200 mm x 2400 mm x 19 mm (approx. 4' x 8' x 3/4")
PLYWOOD PANEL (APA RATED A-B GRADE-EXTERIOR)

NOTICE OF AWARD

Date of Issuance:

Owner:

Owner's Project No.:

Engineer:

Engineer's Project No.: 6250909

Project:

Contract Name:

Bidder:

Bidder's Address:

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

Lewis Road Gravity Sewer and Pump Station – Worcester County, Maryland

The Contract Price of the awarded Contract is \$**[Contract Price]**. Contract Price is subject to adjustment based on the provisions of the Contract, including but not limited to those governing changes, Unit Price Work, and Work performed on a cost-plus-fee basis, as applicable.

Two copies of the unexecuted counterparts of the Agreement accompany this Notice of Award, and one copy of the Contract Documents accompanies this Notice of Award or has been transmitted or made available to Bidder electronically.

☐ Drawings will be delivered separately from the other Contract Documents.

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

1. Deliver to Owner **two copies** counterparts of the Agreement, signed by Bidder (as Contractor).
2. Deliver with the signed Agreement(s) the Contract security (such as required performance and payment bonds) and insurance documentation, as specified in the Instructions to Bidders and in the General Conditions, Articles 2 and 6.
3. Other conditions precedent (if any): **Performance, Payment, and Warranty Bonds in place.**

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

Within 10 days after you comply with the above conditions, Owner will return to you one fully signed counterpart of the Agreement, together with any additional copies of the Contract Documents as indicated in Paragraph 2.02 of the General Conditions.

Owner: **County Commissioners of Worcester County**

By (signature): _____

Name (printed): _____

Title: _____

Copy: Engineer

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

This Agreement is by and between **the County Commissioners of Worcester County** ("Owner") and _____ ("Contractor").

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

Owner and Contractor hereby agree as follows:

ARTICLE 1—WORK

- 1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows: **Work of the Project generally includes construction of a gravity sanitary sewer, manholes, new pump station, force main, wet well, electrical controls, site fencing and stormwater management, startup of the improved process, and all necessary work to provide the sanitary sewer collection, pump station and force main as stipulated in the contract documents.**

ARTICLE 2—THE PROJECT

- 2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: **Work of the Project generally includes construction of a gravity sanitary sewer, manholes, new pump station, force main, wet well, electrical controls, site fencing and stormwater management, startup of the improved process, and all necessary work to provide the sanitary sewer collection, pump station and force main as stipulated in the contract documents.**

ARTICLE 3—ENGINEER

- 3.01 The Owner has retained **EA Engineering, Science, and Technology Inc. PBC.** ("Engineer") to act as Owner's representative, assume all duties and responsibilities of Engineer, and have the rights and authority assigned to Engineer in the Contract.
- 3.02 The part of the Project that pertains to the Work has been designed by **EA Engineering, Science, and Technology Inc. PBC.**

ARTICLE 4—CONTRACT TIMES

- 4.01 *Time is of the Essence*
- A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.
- 4.03 *Contract Times: Days*
- A. The Work will be substantially complete within **240** days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within **300** days after the date when the Contract Times commence to run.

4.05 *Liquidated Damages*

- A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the Contract Times, as duly modified. The parties also recognize the delays, expense, and difficulties involved in proving, in a legal or arbitration proceeding, the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):
1. *Substantial Completion*: Contractor shall pay Owner **\$500** for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for Substantial Completion, until the Work is substantially complete.
 2. *Completion of Remaining Work*: After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner **\$500** for each day that expires after such time until the Work is completed and ready for final payment.
 3. Liquidated damages for failing to timely attain Milestones, Substantial Completion, and final completion are not additive, and will not be imposed concurrently.
- B. If Owner recovers liquidated damages for a delay in completion by Contractor, then such liquidated damages are Owner's sole and exclusive remedy for such delay, and Owner is precluded from recovering any other damages, whether actual, direct, excess, or consequential, for such delay, except for special damages (if any) specified in this Agreement.
- C. ~~Deleted Bonus: Contractor and Owner further recognize the Owner will realize financial and other benefits if the Work is completed prior to the time specified for Substantial Completion. Accordingly, Owner and Contractor agree that as a bonus for early completion, Owner shall pay Contractor \$[number] for each day prior to the time specified above for Substantial Completion (as duly adjusted pursuant to the Contract) that the Work is substantially complete. The maximum value of the bonus will be limited to \$[number].~~

4.06 *Special Damages*

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

ARTICLE 5—CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents, the amounts that follow, subject to adjustment under the Contract:

A. For all Work, at the prices stated in Contractor's Bid, attached hereto as an exhibit.

ARTICLE 6—PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

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

6.02 *Progress Payments; Retainage*

A. Owner shall make progress payments on the basis of Contractor's Applications for Payment on or about the **5th** day of each month during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract.

a. **95** percent of the value of the Work completed (with the balance being retainage).

1) ~~Deleted If 50 percent or more of the Work has been completed, as determined by Engineer, and if the character and progress of the Work have been satisfactory to Owner and Engineer, then as long as the character and progress of the Work remain satisfactory to Owner and Engineer, there will be no additional retainage; and~~

b. **95** percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).

B. Upon Substantial Completion **of the entire construction to be provided under the construction Contract Documents**, Owner shall pay an amount sufficient to increase total payments to Contractor to **100** percent of the Work completed, less such amounts set off by Owner pursuant to Paragraph 15.01.E of the General Conditions, and less **200** percent of Engineer's estimate of the value of Work to be completed or corrected as shown on the punch list of items to be completed or corrected prior to final payment.

6.03 *Final Payment*

A. Upon final completion and acceptance of the Work, Owner shall pay the remainder of the Contract Price in accordance with Paragraph 15.06 of the General Conditions.

6.04 *Consent of Surety*

- A. Owner will not make final payment or return or release retainage at Substantial Completion or any other time, unless Contractor submits written consent of the surety to such payment, return, or release.

6.05 *Interest*

- A. All amounts not paid when due will bear interest at the rate of 5 percent per annum.

ARTICLE 7—CONTRACT DOCUMENTS

7.01 *Contents*

- A. The Contract Documents consist of all of the following:
 - 1. This Agreement.
 - 2. Bonds:
 - a. Performance bond (together with power of attorney).
 - b. Payment bond (together with power of attorney).
 - 3. General Conditions.
 - 4. Supplementary Conditions.
 - 5. Specifications as listed in the table of contents of the project manual (copy of list attached).
 - 7. Drawings listed on the attached sheet index.
 - 8. Addenda (numbers ____ to ____, inclusive).
 - 9. Exhibits to this Agreement (enumerated as follows):
 - 1. **Preliminary Engineering Report for Lewis Road Sewer Extension, Worcester County, Maryland, prepared by Davis, Bowen & Friedel, November 2017, Updated January 2018.**
 - 2. **Subsurface Investigation and Geotechnical Analysis, Lewis Road Sewer Pump Station, prepared by Hardin Kight and Associates, Inc. April 1, 2022.**
 - 3. **The Landings West Worcester County, Maryland Drinking Water and Wastewater Treatment Plants, prepared by George, Miles, and Buhr, LLC, October 2004.**
 - 10. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
 - a. Notice to Proceed.
 - b. Work Change Directives.
 - c. Change Orders.
 - d. Field Orders.
 - e. Warranty Bond, if any.

- B. The Contract Documents listed in Paragraph 7.01.A are attached to this Agreement (except as expressly noted otherwise above).
- C. There are no Contract Documents other than those listed above in this Article 7.
- D. The Contract Documents may only be amended, modified, or supplemented as provided in the Contract.

ARTICLE 8—REPRESENTATIONS, CERTIFICATIONS, AND STIPULATIONS

8.01 Contractor's Representations

- A. In order to induce Owner to enter into this Contract, Contractor makes the following representations:
 - 1. Contractor has examined and carefully studied the Contract Documents, including Addenda.
 - 2. Contractor has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
 - 3. Contractor is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
 - 4. Contractor has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
 - 5. Contractor has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.
 - 6. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (c) Contractor's safety precautions and programs.
 - 7. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
 - 8. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.

9. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
10. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
11. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

8.02 *Contractor's Certifications*

- A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 8.02:
 1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process or in the Contract execution;
 2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
 3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and
 4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

8.03 *Standard General Conditions*

- A. Owner stipulates that if the General Conditions that are made a part of this Contract are EJCDC® C-700, Standard General Conditions for the Construction Contract (2018), published by the Engineers Joint Contract Documents Committee, and if Owner is the party that has furnished said General Conditions, then Owner has plainly shown all modifications to the standard wording of such published document to the Contractor, through a process such as highlighting or "track changes" (redline/strikeout), or in the Supplementary Conditions.

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

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

Owner:

Contractor:

(typed or printed name of organization)

(typed or printed name of organization)

By:

(individual's signature)

By:

(individual's signature)

Date:

(date signed)

Date:

(date signed)

Name:

(typed or printed)

Name:

(typed or printed)

Title:

(typed or printed)

Title:

(typed or printed)

(If **[Type of Entity]** is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest:

(individual's signature)

Attest:

(individual's signature)

Title:

(typed or printed)

Title:

(typed or printed)

Address for giving notices:

Address for giving notices:

Designated Representative:

Designated Representative:

Name:

(typed or printed)

Name:

(typed or printed)

Title:

(typed or printed)

Title:

(typed or printed)

Address:

Address:

Phone:

Phone:

Email:

Email:

(If **[Type of Entity]** is a corporation, attach evidence of authority to sign. If **[Type of Entity]** is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)

License No.:

(where applicable)

State:

NOTICE TO PROCEED

Owner: _____ Owner's Project No.: _____
Engineer: _____ Engineer's Project No.: 6250909
Contractor: _____ Contractor's Project No.: _____
Project: _____
Contract Name: _____
Effective Date of Contract: _____

Owner hereby notifies Contractor that the Contract Times under the above Contract will commence to run on **[date Contract Times are to start]** pursuant to Paragraph 4.01 of the General Conditions.

On that date, Contractor shall start performing its obligations under the Contract Documents. No Work will be done at the Site prior to such date.

In accordance with the Agreement:

The date by which Substantial Completion must be achieved is **[date for Substantial Completion, from Agreement]**, and the date by which readiness for final payment must be achieved is **[date for readiness, from Agreement]**.

Before starting any Work at the Site, Contractor must comply with the following:

Contractor and their key subcontractors shall attend a pre-construction meeting and concur with the subsequent meeting minutes.

Owner: County Commissioners of
Worcester County
By *(signature)*: _____
Name *(printed)*: _____
Title: _____
Date Issued: _____

Copy: Engineer

PERFORMANCE BOND

Contractor Name: Address <i>(principal place of business)</i> :	Surety Name: Address <i>(principal place of business)</i> :
Owner Name: Mailing address <i>(principal place of business)</i> :	Contract Description <i>(name and location)</i> : Worcester County Department of Public Works – Lewis Road Gravity Sewer System and Pump Station Contract Price: Effective Date of Contract:
Bond Bond Amount: Date of Bond: <i>(Date of Bond cannot be earlier than Effective Date of Contract)</i> Modifications to this Bond form: ☐ None ☐ See Paragraph 16	
Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Performance Bond, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.	
Contractor as Principal	Surety
<i>(Full formal name of Contractor)</i>	<i>(Full formal name of Surety) (corporate seal)</i>
By: _____ <i>(Signature)</i>	By: _____ <i>(Signature)(Attach Power of Attorney)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
Attest: _____ <i>(Signature)</i>	Attest: _____ <i>(Signature)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
<i>Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.</i>	

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.
2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond will arise after:
 - 3.1. The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice may indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 will be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement does not waive the Owner's right, if any, subsequently to declare a Contractor Default;
 - 3.2. The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
 - 3.3. The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.
4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 does not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.
5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:
 - 5.1. Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;
 - 5.2. Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;
 - 5.3. Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or
 - 5.4. Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:

- 5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or
 - 5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.
- 6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment, or the Surety has denied liability, in whole or in part, without further notice, the Owner shall be entitled to enforce any remedy available to the Owner.
- 7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner will not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety will not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:
 - 7.1. the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
 - 7.2. additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and
 - 7.3. liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.
- 8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.
- 9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price will not be reduced or set off on account of any such unrelated obligations. No right of action will accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.
- 10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
- 11. Any proceeding, legal or equitable, under this Bond must be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and must be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit will be applicable.
- 12. Notice to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears.
- 13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted therefrom and provisions conforming to such

statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.

14. Definitions

- 14.1. *Balance of the Contract Price*—The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.
 - 14.2. *Construction Contract*—The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.
 - 14.3. *Contractor Default*—Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.
 - 14.4. *Owner Default*—Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.
 - 14.5. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.
15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.
16. Modifications to this Bond are as follows: **[Describe modification or enter “None”]**

PAYMENT BOND

Contractor Name: Address <i>(principal place of business)</i> :	Surety Name: Address <i>(principal place of business)</i> :
Owner Name: Mailing address <i>(principal place of business)</i> :	Contract Description <i>(name and location)</i> : Worcester County Department of Public Works – Lewis Road Gravity Sewer System and Pump Station Contract Price: Effective Date of Contract:
Bond Bond Amount: Date of Bond: <i>(Date of Bond cannot be earlier than Effective Date of Contract)</i> Modifications to this Bond form: ☐ None ☐ See Paragraph 18	
Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Payment Bond, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.	
Contractor as Principal	Surety
<i>(Full formal name of Contractor)</i>	<i>(Full formal name of Surety) (corporate seal)</i>
By: _____ <i>(Signature)</i>	By: _____ <i>(Signature)(Attach Power of Attorney)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
Attest: _____ <i>(Signature)</i>	Attest: _____ <i>(Signature)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
<i>Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.</i>	

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.
2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond will arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.
4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.
5. The Surety's obligations to a Claimant under this Bond will arise after the following:
 - 5.1. Claimants who do not have a direct contract with the Contractor
 - 5.1.1. have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
 - 5.1.2. have sent a Claim to the Surety (at the address described in Paragraph 13).
 - 5.2. Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).
6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.
7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:
 - 7.1. Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and
 - 7.2. Pay or arrange for payment of any undisputed amounts.
 - 7.3. The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 will not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

8. The Surety's total obligation will not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond will be credited for any payments made in good faith by the Surety.
9. Amounts owed by the Owner to the Contractor under the Construction Contract will be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfying obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.
10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.
11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
12. No suit or action will be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit will be applicable.
13. Notice and Claims to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, will be sufficient compliance as of the date received.
14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted here from and provisions conforming to such statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.
15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.
16. Definitions
 - 16.1. *Claim*—A written statement by the Claimant including at a minimum:
 - 16.1.1. The name of the Claimant;
 - 16.1.2. The name of the person for whom the labor was done, or materials or equipment furnished;
 - 16.1.3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
 - 16.1.4. A brief description of the labor, materials, or equipment furnished;

- 16.1.5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
 - 16.1.6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
 - 16.1.7. The total amount of previous payments received by the Claimant; and
 - 16.1.8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.
- 16.2. *Claimant*—An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond is to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.
- 16.3. *Construction Contract*—The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.
- 16.4. *Owner Default*—Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.
- 16.5. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.
17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.
18. Modifications to this Bond are as follows: **[Describe modification or enter "None"]**

Contractor's Application for Payment

Owner: _____ Engineer: _____ Contractor: _____ Project: _____ Contract: _____	Owner's Project No.: _____ Engineer's Project No.: _____ Contractor's Project No.: _____																																				
Application No.: _____ Application Date: _____																																					
Application Period: From _____ to _____																																					
<table border="1" style="width: 100%; border-collapse: collapse;"><tr><td style="width: 70%;">1. Original Contract Price</td><td style="width: 10%; text-align: center;">\$</td><td style="width: 20%; text-align: center;">-</td></tr><tr><td>2. Net change by Change Orders</td><td style="text-align: center;">\$</td><td style="text-align: center;">-</td></tr><tr><td>3. Current Contract Price (Line 1 + Line 2)</td><td style="text-align: center;">\$</td><td style="text-align: center;">-</td></tr><tr><td>4. Total Work completed and materials stored to date (Sum of Column G Lump Sum Total and Column J Unit Price Total)</td><td style="text-align: center;">\$</td><td style="text-align: center;">-</td></tr><tr><td>5. Retainage</td><td></td><td></td></tr><tr><td> a. _____ X \$ - Work Completed</td><td style="text-align: center;">\$</td><td style="text-align: center;">-</td></tr><tr><td> b. _____ X \$ - Stored Materials</td><td style="text-align: center;">\$</td><td style="text-align: center;">-</td></tr><tr><td> c. Total Retainage (Line 5.a + Line 5.b)</td><td style="text-align: center;">\$</td><td style="text-align: center;">-</td></tr><tr><td>6. Amount eligible to date (Line 4 - Line 5.c)</td><td style="text-align: center;">\$</td><td style="text-align: center;">-</td></tr><tr><td>7. Less previous payments (Line 6 from prior application)</td><td></td><td></td></tr><tr><td>8. Amount due this application</td><td style="text-align: center;">\$</td><td style="text-align: center;">-</td></tr><tr><td>9. Balance to finish, including retainage (Line 3 - Line 4)</td><td style="text-align: center;">\$</td><td style="text-align: center;">-</td></tr></table>		1. Original Contract Price	\$	-	2. Net change by Change Orders	\$	-	3. Current Contract Price (Line 1 + Line 2)	\$	-	4. Total Work completed and materials stored to date (Sum of Column G Lump Sum Total and Column J Unit Price Total)	\$	-	5. Retainage			a. _____ X \$ - Work Completed	\$	-	b. _____ X \$ - Stored Materials	\$	-	c. Total Retainage (Line 5.a + Line 5.b)	\$	-	6. Amount eligible to date (Line 4 - Line 5.c)	\$	-	7. Less previous payments (Line 6 from prior application)			8. Amount due this application	\$	-	9. Balance to finish, including retainage (Line 3 - Line 4)	\$	-
1. Original Contract Price	\$	-																																			
2. Net change by Change Orders	\$	-																																			
3. Current Contract Price (Line 1 + Line 2)	\$	-																																			
4. Total Work completed and materials stored to date (Sum of Column G Lump Sum Total and Column J Unit Price Total)	\$	-																																			
5. Retainage																																					
a. _____ X \$ - Work Completed	\$	-																																			
b. _____ X \$ - Stored Materials	\$	-																																			
c. Total Retainage (Line 5.a + Line 5.b)	\$	-																																			
6. Amount eligible to date (Line 4 - Line 5.c)	\$	-																																			
7. Less previous payments (Line 6 from prior application)																																					
8. Amount due this application	\$	-																																			
9. Balance to finish, including retainage (Line 3 - Line 4)	\$	-																																			
Contractor's Certification The undersigned Contractor certifies, to the best of its knowledge, the following: (1) All previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with the Work covered by prior Applications for Payment; (2) Title to all Work, materials and equipment incorporated in said Work, or otherwise listed in or covered by this Application for Payment, will pass to Owner at time of payment free and clear of all liens, security interests, and encumbrances (except such as are covered by a bond acceptable to Owner indemnifying Owner against any such liens, security interest, or encumbrances); and (3) All the Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.																																					
Contractor: _____																																					
Signature: _____ Date: _____																																					
Recommended by Engineer By: _____ Title: _____ Date: _____	Approved by Owner By: _____ Title: _____ Date: _____																																				
Approved by Funding Agency By: _____ Title: _____ Date: _____	 By: _____ Title: _____ Date: _____																																				

Progress Estimate - Unit Price Work

Contractor's Application for Payment

Owner: _____
 Engineer: _____
 Contractor: _____
 Project: _____
 Contract: _____

Owner's Project No.: _____
 Engineer's Project No.: _____
 Contractor's Project No.: _____

Application No.: _____ Application Period: From _____ to _____ Application Date: _____

A	B	C	D	E	F	G	H	I	J	K	L
Bid Item No.	Description	Contract Information				Work Completed		Materials Currently Stored (not in G) (\$)	Work Completed and Materials Stored to Date (H + I) (\$)	% of Value of Item (J / F) (%)	Balance to Finish (F - J) (\$)
		Item Quantity	Units	Unit Price (\$)	Value of Bid Item (C X E) (\$)	Estimated Quantity Incorporated in the Work	Value of Work Completed to Date (E X G) (\$)				
Original Contract											
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-

Contractor's Application for Payment

Owner:	_____	Owner's Project No.:	_____
Engineer:	_____	Engineer's Project No.:	_____
Contractor:	_____	Contractor's Project No.:	_____
Project:	_____		
Contract:	_____		

Application No.:	Application Period:	From	to	Application Date:

A	B	C	D	E	F	G	H	I	J	K	L
Bid Item No.	Description	Contract Information				Work Completed		Materials Currently Stored (not in G) (\$)	Work Completed and Materials Stored to Date (H + I) (\$)	% of Value of Item (J / F) (%)	Balance to Finish (- J) (\$)
		Item Quantity	Units	Unit Price (\$)	Value of Bid Item (C X E) (\$)	Estimated Quantity Incorporated in the Work	Value of Work Completed to Date (E X G) (\$)				
Change Orders											
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
Change Order Totals					\$ -		\$ -	\$ -	\$ -		\$ -
Original Contract and Change Orders											
Project Totals					\$ -		\$ -	\$ -	\$ -		\$ -

Contractor's Application for Payment

Owner:		Owner's Project No.:	
Engineer:		Engineer's Project No.:	
Contractor:		Contractor's Project No.:	
Project:			
Contract:			

Application No.:	Application Period:	From	to	Application Date:

A	B	C	D	E	F	G	H	I	J	K	L	M
Item No. (Lump Sum Tab) or Bid Item No. (Unit Price Tab)	Supplier Invoice No.	Submittal No. (with Specification Section No.)	Description of Materials or Equipment Stored	Storage Location	Application No. When Materials Placed in Storage	Materials Stored			Incorporated in Work			Materials Remaining in Storage (I-L) (\$)
						Previous Amount Stored (\$)	Amount Stored this Period (\$)	Amount Stored to Date (G+H) (\$)	Amount Previously Incorporated in the Work (\$)	Amount Incorporated in the Work this Period (\$)	Total Amount Incorporated in the Work (J+K) (\$)	
								-			-	
								-			-	
								-			-	
								-			-	
								-			-	
								-			-	
								-			-	
								-			-	
								-			-	
								-			-	
								-			-	
								-			-	
								-			-	
								-			-	
								-			-	
								-			-	
								-			-	
								-			-	
								-			-	
								-			-	
					Totals	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -

CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner:
Engineer:
Contractor:
Project:
Contract Name:

Owner's Project No.:
Engineer's Project No.: 6250909
Contractor's Project No.:

This ☐ Preliminary ☐ Final Certificate of Substantial Completion applies to:

☐ All Work ☐ The following specified portions of the Work:

[Describe the portion of the work for which Certificate of Substantial Completion is issued]

Date of Substantial Completion: **[Enter date, as determined by Engineer]**

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

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

Amendments of contractual responsibilities recorded in this Certificate should be the product of mutual agreement of Owner and Contractor; see Paragraph 15.03.D of the General Conditions.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance, and warranties upon Owner's use or occupancy of the Work must be as provided in the Contract, except as amended as follows:

Amendments to Owner's Responsibilities: ☐ None ☐ As follows:

[List amendments to Owner's Responsibilities]

Amendments to Contractor's Responsibilities: ☐ None ☐ As follows:

[List amendments to Contractor's Responsibilities]

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

[List attachments such as punch list; other documents]

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

Engineer

By *(signature)*: _____

Name *(printed)*: _____

Title: _____

NOTICE OF ACCEPTABILITY OF WORK

Owner:	Owner's Project No.:	
Engineer:	Engineer's Project No.:	6250909
Contractor:	Contractor's Project No.:	
Project:		
Contract Name:		
Notice Date:	Effective Date of the Construction Contract:	

The Engineer hereby gives notice to the Owner and Contractor that Engineer recommends final payment to Contractor, and that the Work furnished and performed by Contractor under the Construction Contract is acceptable, expressly subject to the provisions of the Construction Contract's Contract Documents ("Contract Documents") and of the Agreement between Owner and Engineer for Professional Services dated **[date of professional services agreement]** ("Owner-Engineer Agreement"). This Notice of Acceptability of Work (Notice) is made expressly subject to the following terms and conditions to which all who receive and rely on said Notice agree:

1. This Notice has been prepared with the skill and care ordinarily used by members of the engineering profession practicing under similar conditions at the same time and in the same locality.
2. This Notice reflects and is an expression of the Engineer's professional opinion.
3. This Notice has been prepared to the best of Engineer's knowledge, information, and belief as of the Notice Date.
4. This Notice is based entirely on and expressly limited by the scope of services Engineer has been employed by Owner to perform or furnish during construction of the Project (including observation of the Contractor's Work) under the Owner-Engineer Agreement, and applies only to facts that are within Engineer's knowledge or could reasonably have been ascertained by Engineer as a result of carrying out the responsibilities specifically assigned to Engineer under such Owner-Engineer Agreement.
5. This Notice is not a guarantee or warranty of Contractor's performance under the Construction Contract, an acceptance of Work that is not in accordance with the Contract Documents, including but not limited to defective Work discovered after final inspection, nor an assumption of responsibility for any failure of Contractor to furnish and perform the Work thereunder in accordance with the Contract Documents, or to otherwise comply with the Contract Documents or the terms of any special guarantees specified therein.
6. This Notice does not relieve Contractor of any surviving obligations under the Construction Contract, and is subject to Owner's reservations of rights with respect to completion and final payment.

Engineer

By *(signature)*: _____

Name *(printed)*: _____

Title: _____

WORK CHANGE DIRECTIVE NO.: [Number of Work Change Directive]

Owner:

Owner's Project No.:

Engineer:

Engineer's Project No.:

Contractor:

Contractor's Project No.:

Project:

Contract Name:

Date Issued:

Effective Date of Work Change Directive:

Contractor is directed to proceed promptly with the following change(s):

Description:

[Description of the change to the Work]

Attachments:

[List documents related to the change to the Work]

Purpose for the Work Change Directive:

[Describe the purpose for the change to the Work]

Directive to proceed promptly with the Work described herein, prior to agreeing to change in Contract Price and Contract Time, is issued due to:

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

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

Contract Price: \$ _____ **[increase] [decrease] [not yet estimated].**

Contract Time: _____ days **[increase] [decrease] [not yet estimated].**

Basis of estimated change in Contract Price:

☐ Lump Sum ☐ Unit Price ☐ Cost of the Work ☐ Other

Recommended by Engineer

Authorized by Owner

By:

Title:

Date:

CHANGE ORDER NO.: [Number of Change Order]

Owner:

Engineer:

Contractor:

Project:

Contract Name:

Date Issued:

Owner's Project No.:

Engineer's Project No.:

Contractor's Project No.:

Effective Date of Change Order:

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

Description:

[Description of the change]

Attachments:

[List documents related to the change]

Change in Contract Price	Change in Contract Times [State Contract Times as either a specific date or a number of days]
Original Contract Price: \$ _____	Original Contract Times: Substantial Completion: _____ Ready for final payment: _____
[Increase] [Decrease] from previously approved Change Orders No. 1 to No. [Number of previous Change Order] : \$ _____	[Increase] [Decrease] from previously approved Change Orders No.1 to No. [Number of previous Change Order] : Substantial Completion: _____ Ready for final payment: _____
Contract Price prior to this Change Order: \$ _____	Contract Times prior to this Change Order: Substantial Completion: _____ Ready for final payment: _____
[Increase] [Decrease] this Change Order: \$ _____	[Increase] [Decrease] this Change Order: Substantial Completion: _____ Ready for final payment: _____
Contract Price incorporating this Change Order: \$ _____	Contract Times with all approved Change Orders: Substantial Completion: _____ Ready for final payment: _____

Recommended by Engineer (if required)

Accepted by Contractor

By: _____

Title: _____

Date: _____

Authorized by Owner

Approved by Funding Agency (if applicable)

By: _____

Title: _____

Date: _____

FIELD ORDER NO.: [Number of Field Order]

Owner:

Owner's Project No.:

Engineer:

Engineer's Project No.:

Contractor:

Contractor's Project No.:

Project:

Contract Name:

Date Issued:

Effective Date of Field Order:

Contractor is hereby directed to promptly perform the Work described in this Field Order, issued in accordance with Paragraph 11.04 of the General Conditions, for minor changes in the Work without changes in Contract Price or Contract Times. If Contractor considers that a change in Contract Price or Contract Times is required, submit a Change Proposal before proceeding with this Work.

Reference:

Specification Section(s):

Drawing(s) / Details (s):

Description:

[Description of the change to the Work]

Attachments:

[List documents supporting change]

Issued by Engineer

By: _____

Title: _____

Date: _____

SECTION E
SPECIFICATIONS

SPECIFICATIONS CONTENTS

SECTION 01 00 50	FIELD ENGINEERING
SECTION 01 11 00	SUMMARY OF WORK
SECTION 01 20 00	MEASUREMENT AND PAYMENT
SECTION 01 20 50	MEETINGS
SECTION 01 33 00	SUBMITTALS
SECTION 01 40 00	QUALITY CONTROL
SECTION 01 50 00	MOBILIZATION AND TRAFFIC CONTROL
SECTION 01 60 00	TEMPORARY CONTROLS
SECTION 01 70 00	CONTRACT CLOSEOUT
SECTION 02 25 00	EXCAVATION, BACKFILL, AND COMPACTION
SECTION 02 74 10	ASPHALT PAVING
SECTION 02 80 00	RESTORATION
SECTION 03 05 16	PRECAST CONCRETE STRUCTURES
SECTION 03 10 00	CONCRETE FORMING AND ACCESSORIES
SECTION 03 20 00	CONCRETE REINFORCING
SECTION 03 30 00	CAST-IN-PLACE CONCRETE
SECTION 05 50 00	METAL AND GRATING FABRICATIONS
SECTION 26 00 00	ELECTRICAL GENERAL
SECTION 26 05 01	CONDUCTORS AND CABLES
SECTION 26 05 26	ELECTRICAL GROUNDING
SECTION 26 05 33	CONDUITS AND RACEWAY SYSTEMS
SECTION 26 05 43	UNDERGROUND DISTRIBUTION SYSTEM
SECTION 26 05 53	IDENTIFICATION FOR ELECTRICAL SYSTEMS
SECTION 26 09 00	MISCELLANEOUS ELECTRICAL CONTROLS
SECTION 26 09 10	CONTROL PANELS
SECTION 26 09 16	INSTRUMENTATION
SECTION 26 09 20	HEAT TRACE
SECTION 26 21 01	INCOMING SERVICES
SECTION 26 27 16	ELECTRICAL CABINETS AND ENCLOSURES
SECTION 26 28 00	PANELBOARDS AND CIRCUIT PROTECTIVE DEVICES
SECTION 26 29 13	MOTOR CONTROLLERS
SECTION 26 32 13	ENGINE GENERATOR
SECTION 26 36 13	AUTOMATIC TRANSFER SWITCHES
SECTION 26 43 13	TRANSIENT VOLTAGE SURGE SUPPRESSION
SECTION 27 27 10	SPREAD SPECTRUM RADIO SYSTEM
SECTION 31 25 00	EROSION AND SEDIMENT CONTROL
SECTION 32 92 00	LAWNS AND GRASSES

SECTION 33 05 13 MECHANICAL GENERAL REQUIREMENTS
SECTION 33 11 00 VALVE, PIPING, AND APPURTENANCES

DIVISION 1

SECTION 01 00 50	FIELD ENGINEERING
SECTION 01 11 00	SUMMARY OF WORK
SECTION 01 20 00	MEASUREMENT AND PAYMENT
SECTION 01 20 50	MEETINGS
SECTION 01 33 00	SUBMITTALS
SECTION 01 40 00	QUALITY CONTROL
SECTION 01 50 00	MOBILIZATION AND TRAFFIC CONTROL
SECTION 01 60 00	TEMPORARY CONTROLS
SECTION 01 70 00	CONTRACT CLOSEOUT

This page intentionally left blank

SECTION 01 00 50
FIELD ENGINEERING

PART I – GENERAL

1.1 DESCRIPTION

CONTRACTOR shall provide a final survey of the installed piping systems, valve locations and abandonment locations using Maryland State Plane NAD 83 for As-Built drawings and shall be provided electronically (AutoCADD latest version).

CONTRACTOR shall:

1. Provide civil, structural, testing, or engineering services specified or required to execute CONTRACTOR'S construction methods.
2. Develop and make all detail surveys and measurements needed for construction including slope stakes, batter boards, piling layouts and all other working lines, elevations, and cut sheets.
3. Keep a transit and leveling instrument on the site at all times and a skilled instrument man employed or obtained whenever necessary for layout of the Work.
4. Provide all material required for additional bench marks, control points, batter boards, grade stakes, and other items.
5. Be solely responsible for all locations, dimensions, and levels.
6. Safeguard all points, stakes, grade marks, monuments, and benchmarks made or established on the Work, re-establish same if disturbed, and rectify all the Work improperly installed because of not maintaining, not protecting or removing without authorization such established points, stakes, marks, and monuments.
7. When requested by ENGINEER, provide such facilities as may be necessary for ENGINEER to check line and grade points placed by CONTRACTOR.
8. Perform all measurements for payment required by the Contract Documents.

1.2 CONTRACTOR'S FIELD ENGINEER

CONTRACTOR shall employ and retain at the site of the Work a field engineer capable of performing all engineering tasks required of the CONTRACTOR. Tasks included are:

1. Daily reports of project activity to be submitted to the ENGINEER with all pertinent information pertaining to the project as described in Section 01 33 00.

2. Provide all surveying equipment required including transit, level, stakes and required surveying accessories.
3. Furnish all required lines and grades for construction of operations. Check all formwork, reinforcing, inserts, structural steel, bolts, sleeves, piping, other materials, and equipment.
4. Maintain field office files and drawings, record drawings, and coordinate engineering services with Subcontractors. Prepare layout and coordination drawings for construction operations.
5. Check and coordinate Work for conflicts and interferences and immediately advise ENGINEER of all discrepancies noted.
6. Cooperate with ENGINEER in field inspections as required.

1.3 QUALIFICATIONS OF FIELD ENGINEER

Qualified engineer or land surveyor, acceptable to ENGINEER.

1.4 RECORDS

Maintain a complete, accurate log of all control and survey work as it progresses.

1.5 SUBMITTALS

Submit name and address of CONTRACTOR'S field engineer to ENGINEER.

On request of ENGINEER, submit documentation to verify accuracy of field engineering work.

When requested by ENGINEER, submit certificate signed by registered engineer or registered land surveyor certifying that elevations and locations of Work are in conformance with Contract Documents. Explain all deviations.

PART II – PRODUCTS

Not used.

PART III – EXECUTION

Not used.

+ + END OF SECTION + +

SECTION 01 11 00
SUMMARY OF WORK

PART 1 GENERAL

1.1 LOCATION

- A. The work to be performed hereunder for the Worcester County Department of Public LEWIS ROAD GRAVITY SEWER AND PUMP STATION PROJECT is in Worcester County, Maryland.

1.2 SCOPE

- A. The work to be performed hereunder includes the furnishing of all labor, materials, transportation, tools, supplies, equipment, electrical work, and appurtenances necessary for the complete and in-place, satisfactory construction, dewatering as needed, and testing of all work shown on the Contract Drawings and required by the Contract for Worcester County Department of Public Works Lewis Road Gravity Sewer System and Pump Station Project. Work associated with the project shall include the new sewer gravity pipe, force main pipe, traffic control, clearing and grubbing, dewatering, back filling, testing, grading, installation of manholes, cleanouts, connections, laterals, trench pavement repair, new piping, test pitting, new surface coat asphalt, valves, connection to existing sewer force mains, working pumpstation, generator, controls, SCADA connections, and seeding and stabilization of the area described in and required by the Contract Documents.
- B. It is the intent of the Contract Documents to describe a complete project and any work that may be reasonably inferred as being required to produce a finished job for the intended purposes, and this work shall be completed whether or not such incidental or related work is explicitly stated in the Contract Documents.
- C. The project Work generally includes the following:
1. **Force main** - Includes installation of approximately 930 linear feet (LF) of 4-inch HDPE DR-11 open trench sewer force main, 72 (LF) of 4-inch D.I. open trench sewer force main, 27 LF of 4" C900 force main at The Landings WWTP, and 650 LF of 1.5-inch HDPE DR-11 open trench sewer force main. Includes valves, backfill, compaction, tracer wire, warning tape, fittings, buttresses, dewatering, testing, pavement restoration, 2 grinder pumps, site restoration and all other work and appurtenances not specifically mentioned.
 2. **Gravity Sewer** - Includes installation of approximately 4,921 LF of 10-inch SDR-35 open trench gravity sewer main, 70 LF of 10" D.I. gravity sewer main, and 186 LF of 8-inch SDR-35 gravity sewer main. Includes precast manholes, tracer wire, warning tape, backfill, compaction, dewatering, testing, sewer

cleanouts, pavement restoration, site restoration, and all other work and appurtenances not specifically mentioned.

3. **Pump Station** – Includes the installation of precast wet well, valve vault, piping, pumps, valves, fittings, pumps, cast in place concrete, precast concrete, generator, meter and pit, fencing, driveway, pavement, stormwater management, site restoration, by-pass manhole, power distribution, electrical connection, electrical controls, temporary power, clearing, tree removal, and all other work and appurtenances not specifically mentioned.
 4. **Sewer laterals and Abandonment of Septic Tanks** – Includes the coordination with homeowners for the location of existing septic tanks, pipes, and fittings. Abandonment of the existing tank shall be completed per state and local regulations. Connections from the house/tank shall be rerouted and connected proposed 2,370 LF of 6” SDR-35 sewer laterals. Shall include all materials and equipment for the demolition of the tank, fittings, connections, tracer wire, warning tape, backfill, compaction, and all other work and appurtenances not specifically mentioned.
- D. The CONTRACTOR shall provide and install materials and labor to construct the upgrades and make all connections and install all appurtenant items as shown in or required by the Contract Documents.
- E. All spoil material shall be removed and disposed of by the CONTRACTOR. The OWNER shall have the right of salvage for all equipment removed; however, if the OWNER does not claim this equipment, it shall be disposed of at the CONTRACTOR’S expense.
- F. Lump Sum Items
- Measurement for all items listed as Lump Sum will be on a lump sum basis and are reflected as such on the bid form. Payment for each of the items will be as a percent complete in accordance with the schedule of values established prior to initiating construction and in accordance with the work completed each month. Payment is not to exceed each lump sum price from bid.
- G. Measurement and Payment, Unit Price Items
- Measurement for all items listed as Unit Price with quantities identified will be at the unit prices bid, and shall include the furnishing of all labor, tools, equipment and materials and the performance for all work required to complete the project as indicated and specified in accordance with all requirements on the Contract Documents and to the entire satisfaction of the ENGINEER.

H. Measurement and Payment, General

1. All incidental, minor and miscellaneous items, work and materials for which no specific lump sum or unit price bid item is shown and which are necessary to complete the work and to maintain and/or repair the work, shall be done and furnished by the CONTRACTOR without extra charge.

1.3 BOUNDARIES OF WORK

- A. The OWNER shall provide land for the work specified in these Contract Documents and shall provide suitable provisions for ingress and egress, and the CONTRACTOR shall not enter on or occupy with men, tools, equipment, or material any ground outside the property of the OWNER without the written consent of the OWNER of such ground. Other contractors and employees or agents of the OWNER may, for all necessary purposes, enter upon the work and premises used by the CONTRACTOR, and the CONTRACTOR shall conduct his work so as not to impede unnecessarily any work being done by others on or adjacent to the site.
- B. Staging Area shall be on the property. Additional storage required shall be obtained by the CONTRACTOR and shall be the CONTRACTOR'S responsibility.

1.4 WATER SUPPLY

- A. The CONTRACTOR is responsible for providing the construction water necessary to perform the work. The CONTRACTOR shall not take water from the OWNER'S system without written approval of the ENGINEER.

1.5 PERMITS, INSPECTIONS, TESTS

- A. The CONTRACTOR will acquire all permits, inspections, and tests necessary for the proper execution of the work in accordance with all federal, state, and local rules, regulations, and codes. Copies of all permits shall be presented to the OWNER upon receipt and shall be posted, as required, at the project site. The CONTRACTOR is required to immediately notify Worcester County and the Maryland Department of the Environment in the event of any spills or discharges.
- B. The CONTRACTOR shall notify the ENGINEER two (2) working days prior to all inspections and tests and shall furnish certificates of test results and approvals to the ENGINEER upon receipt

1.6 CONTINUITY OF SERVICES

- A. Coordination with Worcester County to maintain operations of the Landings WWTP during the connection of the force main.

1.7 MATERIAL AND WORKMANSHIP WARRANTY

- A. The CONTRACTOR shall warrant that all workmanship, material, and equipment furnished and installed by him shall be free of defects for a period of one (1) year after acceptance of the work. Should such defects appear, the CONTRACTOR shall repair or replace such defects at no cost to the OWNER.

1.8 INSTRUCTION OF OWNER'S REPRESENTATIVES

- A. The CONTRACTOR shall thoroughly and completely instruct the OWNER or his representative in the operation and maintenance of all equipment and systems installed under this Contract to the satisfaction of the ENGINEER.

1.9 COORDINATION WITH OTHER CONTRACTORS, UTILITIES, AND GOVERNMENT AGENCIES

- A. There will be construction activities by other contractors, utilities, and government agencies at the project site. The CONTRACTOR will be required to coordinate and cooperate with others in carrying out his work.

1.10 REFERENCED SPECIFICATIONS

- A. The requirements of the ACI, ASA, API, ASME ASTM, AWS, AWWA, CFR, COMAR, EPA, MDE, MSS, UL and other specifications shall mean the latest edition thereof and shall apply to all of the latest edition thereof, and shall apply to all of the applicable work to be performed, except as modified or revised by the Contract Documents, which shall govern.
- B. The requirements of referenced specifications shall be as binding upon the performance of the work as if they were fully written out herein.

1.11 FIELD ADJUSTMENTS

- A. The alignment and placement of the work shall be subject to adjustments in the field as directed by the ENGINEER.
- B. Calibration of instruments and sensors shall be subject to adjustments in the field as directed by the ENGINEER. All instruments shall be accurately and completely calibrated by the CONTRACTOR.

** End of Section **

SECTION 01 20 00
MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope of Work

1. The items listed in this Section refer to and are the same pay items listed on the Bid Form. They constitute all of the pay items for the completion of the Work. Compensation for all such services and materials shall be included in the prices stipulated for the lump sum and unit price pay items listed herein. Items of Work not specifically included in this Section for measurement and payment as described herein will not be measured for payment but will be considered incidental to the Contract with the associated costs borne solely by the CONTRACTOR.
2. Schedule of Values
 - a. The Schedule of Values is a list of line items, corresponding to each aspect of the Work, establishing in detail the value or cost of each major part of the Work, and is submitted to ENGINEER for acceptance.
 - b. Upon request of ENGINEER, support values with data that substantiate their correctness.
 - c. The preliminary Schedule of Values is submitted to the ENGINEER for initial review. The CONTRACTOR shall incorporate the ENGINEER's comments into the Schedule of Values and provide a re-submittal to the ENGINEER. The ENGINEER may require corrections and re-submittal of the Schedule of Values until it is acceptable.
 - d. The Schedule of Values and the Progress Schedule updates specified in Section 01 33 00, Submittals, shall be used as the basis for preparing each Application for Payment. The Schedule of Values having sufficient breakdown of materials, labor and installation costs may be used as a basis for negotiating the price of changes in the Work.
 - e. Unit price payment items with their associated quantity shall be included in the Schedule of Values. Provide in the Schedule of Values a detailed breakdown of the unit prices when required by the ENGINEER.

1.2 SUBMITTALS

A. Schedule of Values

1. The CONTRACTOR shall submit to the ENGINEER for acceptance a Schedule of Values that allocates cost to each item of the Work.
2. The Schedule of Values shall include an itemized list of Work for each major part of the Contract, for each payment item as listed in the Bid Form.
3. This schedule, when approved by the ENGINEER, shall be used as the basis for the CONTRACTOR's Applications for Progress Payments.
4. Submit the required number of copies of the Schedule of Values to ENGINEER at or before the Pre-construction meeting. The first Application for Payment will not be processed without a Schedule of Values approved by the ENGINEER.
5. When required by the ENGINEER, promptly submit an updated Schedule of Values to include cost breakdowns for changes in the Work, including Change Orders.

1.3 MEASUREMENT

Measurement shall be made in accordance with the Bid Form items and as described in the following sections.

A. Estimate of Quantities

1. The estimated quantities for unit price pay items, as listed in the Bid Form, are approximate only and are included solely for the purpose of comparison of Bids. The ENGINEER does not expressly or by implication agree that the nature of the materials encountered below the surface of the ground or the actual quantities of material encountered or required will correspond therewith, and reserves the right to increase or decrease any quantity or to eliminate any quantity as the ENGINEER may deem necessary in accordance with the Contract Documents. CONTRACTOR shall not be entitled to any adjustment in a unit bid price as a result of any change in an estimated quantity and agrees to accept the aforesaid unit bid prices as complete and total compensation for any additions or deductions caused by changes or alterations in the Work directed by the COUNTY. Increased or decreased Work involving change orders will be paid for as stipulated in the Contract Documents.

1.4 PAYMENT

- A. Payments to the CONTRACTOR shall be in accordance with Article 15 of the General Conditions and the Agreement.
- B. Lump sum price items shall be paid for the actual percentage of Work completed as identified in the approved Schedule of Values as required in Paragraph 1.1.A.2.
- C. Unit price items shall be paid in accordance of Article 15 of the General Conditions and the Agreement.
- D. Payment for the Work shall be made in accordance with the Bid Form items as described in the following sections.
- E. Payment Items: The items listed in the Contract Documents refer to the pay items listed on the Bid Form. They constitute all of the pay items for the completion of the Work. Compensation for all such services and materials shall be included in the prices stipulated for the unit price and lump sum pay items listed on the Bid Form.
 - 1. Each lump sum and unit bid price will be deemed to include an amount considered by the CONTRACTOR to be adequate to cover the CONTRACTOR's overhead and profit for each separately identified item.
 - 2. No progress payments will be made by the ENGINEER until the Construction Schedule and the Schedule of Values have been submitted to and approved by the ENGINEER.
 - 3. The CONTRACTOR shall accept in compensation, as herein provided, full payment for furnishing all materials, labor, tools, equipment, and incidentals necessary to the completed Work and for performing all Work contemplated and embraced by the Contract, also for all loss or damage arising from weather or other unforeseen conditions which may be encountered during the execution of the Work and until its final acceptance by the ENGINEER, and for all risks of every description connected with the prosecution of the Work, except as provided herein, also for all expenses incurred as a result of the suspension of the Work as herein authorized.
 - 4. The payment of any partial estimate or of any retained percentage, except by and under the approved final invoice, in no way shall affect the obligation of the CONTRACTOR to repair or renew any defective parts of the construction or to be responsible for all damage due to such defects.
- F. Eliminated Items: Should any items contained in the Schedule of Values be found unnecessary for the proper completion of the Work contracted, the ENGINEER may

eliminate such items from the Contract, and such action shall in no way invalidate the Contract. No allowance will be made for payment of items so eliminated.

G. Progress Payments:

1. Percentage of Work Complete – At the end of each pay period, the CONTRACTOR's Superintendent or other authorized representative of the CONTRACTOR shall meet with the ENGINEER and determine and agree upon the percentage of the project completed during the pay period.
2. Application for Payment – The CONTRACTOR will then prepare and submit an Application for Payment to the ENGINEER. The ENGINEER will evaluate the Application for Payment, determine the amounts owed, and issue a Recommendation of Payment in such amounts as provided in the Contract Documents. Progress payments shall be made monthly as the Work progresses. All progress invoices and payments shall be subject to correction in the final invoice and payment. The progress payment will be based on invoices prepared by the CONTRACTOR and approved by the ENGINEER for the value of the Work performed, and materials complete in place in accordance with the Contract. Retainage shall be as specified in the Contract Documents. The payment schedule shall be in accordance with the Contract Documents.

H. Final Payment: The CONTRACTOR shall make and the ENGINEER shall approve, as soon as practicable after the completion of the project, a final invoice for the amount of Work performed under the Contract and establish the value of such Work. Final payment shall be made in accordance with the Contract Documents.

1.5 MEASUREMENT AND PAYMENT OF BASE BID ITEMS

Bid Item No. 1 – Mobilization, Demobilization, Testing, and Permitting

This item shall include all items necessary to prepare CONTRACTOR onsite for project commencement as well as all items necessary for disassembly at project completion and required bonds.

All soils, pipe, electrical, compaction, gravity sewer, pressure, concrete, and any testing required not specifically mentioned shall be included within this measurement and payment item.

All permits required to construct the project including but not limits to grading, electrical, plumbing, and any other county or state permit required not specifically mentioned. MDE Dewatering Discharge permit shall be under Bid Item No. 15.

Bid Item No. 1 will not be Measured and Payment shall be by lump sum at the Contract price.

Bid Item No. 2 – E-One Simplex Grinder Pump Station

This item consists of all materials, labor, and equipment to complete all Work activities relating to the installation of the sewer Grinder Pump Stations as shown on the Contract Drawings, including the excavation, backfill, compaction, and removal of excess soils, restoration, setting of pump station, household residential electrical and plumbing connections from the house to service forcemain and station, backfilling, appurtenances and all other associated work not specifically mentioned hereon.

Any permits needed for the residential plumbing and electrical connections shall be under Bid Item No. 1.

Measurement and Payment for Bid Item No. 2 will be on a per each basis at the Contract Price.

Bid Item No. 3 – 1.5” HDPE SDR-11 Forcemain

This item consists of all materials, labor, and equipment to complete Work activities that include, but not be limited to, excavation, trench dewatering, installation, backfill, compaction, tracer wire, valves, and work associated with the 1.5” forcemain from Grinder pump station to gravity sewer main inclusive of continuity stations, manhole connections, low pressure service connections, terminal flushing connections, and all other associated work not specifically mentioned hereon as shown on the Contract Drawings.

Measurement for Bid Item No. 3 will be field performed by the inspector and Payment shall be by the linear foot at the Contract Price.

Bid Item No. 4 – 4” Forcemain (Various materials)

This item consists of all materials, labor, and equipment to complete Work activities relating to the furnishing, installation of, and testing associated with the installation of the 4” ductile iron and 4” HDPE forcemain from connection point at the pump station site valve vault to the existing connection point on Lewis Road, inclusive of continuity stations, buttress, fittings, transition couplings, plug valves, blow off assembly, test pitting, warning tape, tracer wire, compaction, excavation, backfill, and all other associated appurtenances required for a complete, safe, and satisfactory installation as shown on the Contract Drawings.

Measurement for Bid Item No. 4 will be field performed by the inspector and Payment shall be by the linear foot at the Contract Price.

Bid Item No. 5 – 6” SDR-35 PVC Sewer Services from Right of Way to Gravity Main

This item shall include all equipment, labor, and materials to furnish and install all items necessary to install gravity sewer service laterals as shown on the Contract Drawings from the sewer main to the property line, install cleanout, fittings, excavation, warning tape, tracer wire, backfilling, trench dewatering compaction, and all other items required for a complete, safe, and satisfactory installation.

Measurement and Payment for Bid Item No. 5 shall be on a per each price basis at the Contract Price.

Bid Item No. 6 – 6” SDR-35 PVC Gravity Sewer Laterals (Right of Way to Residence)

This item shall include all equipment, labor, and materials to furnish and install all items necessary to install gravity sewer service laterals as shown on the Contract Drawings from the right of way cleanout to the residence, install cleanout, fittings, excavation, warning tape, tracer wire, backfilling, compaction, and all other items required for a complete, safe, and satisfactory installation.

Measurement for Bid Item No. 6 will be field performed by the inspector and Payment shall be by the linear foot at the Contract Price.

Bid Item No. 7 – 8” SDR-35 PVC Gravity Sewer Main (0’ to 8’ deep)

This item shall include all equipment, labor, and materials necessary to install the 8” gravity sewer main where it resides at a depth between 0 and 8 feet from the roadway surface, fittings, excavation, warning tape, tracer wire, backfilling, compaction, and all other items required for a complete, safe, and satisfactory installation.

Measurement for Bid Item No. 7 will be field performed by the inspector and Payment shall be by the linear foot at the Contract Price.

Bid Item No. 8 – 10” SDR-35 PVC Gravity Sewer Main (0’ to 8’ Deep)

This item shall include all equipment, labor, and materials necessary to install the 10” gravity sewer main where it resides at a depth between 0 and 8 feet from the roadway surface, fittings, shoring, excavation, warning tape, tracer wire, testing, backfilling, compaction, and all other items required for a complete, safe, and satisfactory installation.

Measurement for Bid Item No. 8 will be field performed by the inspector and Payment shall be by the linear foot at the Contract Price.

Bid Item No. 9 – 10” D.I. Class 52 Gravity Sewer

This item shall include all equipment, labor, and materials necessary to install the 10” ductile iron gravity sewer main from manhole S-1 to the pump station wetwell, fittings, excavation, shoring, warning tape, backfilling, compaction, and all other appurtenances required for a complete, safe, and satisfactory installation.

Measurement for Bid Item No. 9 will be field performed by the inspector and Payment shall be by the linear foot at the Contract Price.

Bid Item No. 10 – 10” SDR-35 PVC Gravity Sewer Main (8’ to 20’ Deep)

This item shall include all equipment, labor, and materials necessary to install the 10” gravity sewer main where it resides at a depth between 8 feet and 20 feet from the roadway surface, shoring, fittings, excavation, warning tape, tracer wire, backfilling, compaction, and all other items required for a complete, safe, and satisfactory installation.

Measurement for Bid Item No. 10 will be field performed by the inspector and Payment shall be by the linear foot at the Contract Price.

Bid Item No. 11 – The Landings WWTP Wet Well Connection

This item shall include all equipment, labor, and materials necessary to perform the connection of the existing forcemain pipe to the existing wet well at The Landing Wastewater Treatment Plant as shown on Drawing C-503 of the Contract Drawings. Contractor shall coordinate with the Local Plant Operator for shut down and scheduling.

Bid Item No. 11 will not be measured and shall be paid on a Lump Sum basis at the Contract price.

Bid Item No. 12 – Pump Station - Civil and Mechanical

This item consists of all materials, labor, and equipment to complete all Work activities associated with the complete installation of all of the civil and mechanical work associated with the proposed pump station site. The Work shall include, but not be limited to, tree and stump removal, clearing, grubbing, stockpiling, rough grading, hauling of materials offsite, excavation, backfill, link seals, structural design, buoyancy calculations, exterior coatings, strapping, buttress, minor dewatering, precast wet well and lid, submersible pumps, slide rails, wet well piping, all wet well appurtenances, precast valve vault and lid, valve vault piping, valve vault valves, all valve vault appurtenances and drains, precast meter pit and lid, mag meter, meter vault bypass piping, meter vault bypass valves, cast in place concrete, concrete testing, concrete reinforcement, all appurtenances associated with cast in place concrete installation, complete installation of the stormwater management rain

grading, ventilation blower and piping, yard hydrant, 1" water service connection and lateral, curb stops, roadway restoration associated with water service lateral connection, site fence, driveway aggregate for asphalt pavement, driveway asphalt pavements, aggregate for non-paved areas, installation of 15" RCP driveway culvert stormwater pipe, seeding and stabilization for disturbed areas.

This lump sum item shall include all work associated with the complete installation of all items as shown on the contract drawings relating to the civil and mechanical items.

Contractor shall provide a pump station start up and operational test the functionality of the completed station

Erosion and Sediment Control items associated with the Pump Station Site shall be under Bid Item No. 20. Ductile Iron Gravity 10" sewer shall be under Bid Item No. 9. Various material 4" forcemain shall be Bid Item No. 4 with the exception of the meter vault by-pass piping and connections and valves.

While working on the Pump station Site area contractor shall work in accordance with the MDE JPA permit rule and regulations.

Measurement and Payment for Bid Item No. 12 shall be on lump sum basis at the Contract Price.

Bid Item No. 13 – Pump Station – Electrical and Controls

This item shall include all items related to the conduits, conductors, site light, Scada, emergency generator, transformer, motor starters, ATS, hatch limits switches, power and control wiring for all electrical items, ventilation, equipment mounting and enclosures, setup and programming, installation of the Pump Control Panel, and programming of the PLC and operator interface in the pump control panel. Installation of service entrance conductors, meter, panelboards, and disconnects. All other appurtenances required for a complete, safe, and satisfactory installation of all power and control related to the full operation of the pump station.

Measurement and Payment for Bid Item No. 13 will not be measured and shall be paid by lump sum at the Contract price as shown on Bid Item No. 13 in accordance with the Contract Documents.

Bid Item No. 14 – Precast Concrete Sewer Manholes

This item shall include all equipment, labor, and materials to furnish and install the Worcester County standard Precast Concrete Manholes, testing, dewatering, subgrade preparation, excavation, trucking, backfilling, compaction, parging, flow channels, exterior coatings, frame and lid, and all other items required for a complete, safe, and satisfactory installation.

Measurement and Payment for Bid Item No. 14 shall be on a per each price basis at the Contract Price.

Bid Item No. 15 – Dewatering and Well Point Systems

This item shall include all equipment, labor, and materials to furnish and install and permit a fully functional dewatering well point system in accordance with the state requirement set for by the permit. System shall be designed to accommodate all dewatering needs for the installation of structures, pipes, forcemain, laterals, wetwell, valve vault, or anything not specially mentioned that will need the groundwater level lowered for a complete, safe, and satisfactory installation.

Measurement and Payment for Bid Item No. 15 shall be on a lump sum price basis at the Contract Price.

Bid Item No. 16 – 2.5” Base Superpave Asphalt, 19.5mm

This item shall include all equipment, labor, and materials to furnish and install the 2.5” thick base course (19.5mm) of asphalt pavement per trench pavement restoration detail on Drawing C-501, milling, tack, and all other items required for a complete, safe, and satisfactory installation.

Measurement for Bid Item No. 16 will be based on tickets provided to the field inspector and Payment shall be by the Ton at the Contract Price.

Bid Item No. 17 – 2” Surface Superpave Asphalt, 9.5mm

This item shall include all equipment, labor, and materials to furnish and install the 2” thick surface course (9.5mm) of asphalt pavement per the trench pavement restoration detail on Drawing C-501, milling, tack, and all other items required for a complete, safe, and satisfactory installation.

Measurement for Bid Item No. 16 will be based on tickets provided to the field inspector and Payment shall be by the Ton at the Contract Price.

Bid Item No. 18 – 8” CR-6 Road Base Aggregate

This item consists of all materials, labor, and equipment to complete Work activities for providing Crusher Run (CR-6) road base. The Work shall include, but not be limited to, furnishing and placing CR-6 to include delivery, placement, excavation, backfill and compaction. The price bid shall include furnishing all labor, tools, equipment, and materials necessary to satisfactorily complete the work as shown and specified in accordance with the Contract Documents

Measurement for Bid Item No. 18 will be field performed by the inspector and Payment shall be by the square yard at the Contract Price.

Bid Item No. 19 – Demolition and Abandonment of Septic Tanks, Plumbing, Connections, and Appurtenances

This item consists of all materials, labor, and equipment to complete Work activities to demolish and abandon in place the existing septic tanks in accordance with the requirements set for by County and State agencies. The Work shall include, but not be limited to electrical connections/disconnection for pumps associated with septic tanks, sewer plumbing connections associated with house disconnection from the septic tank and new connection from the house to the new sewer gravity lateral, excavation, backfill, compaction, grading, and all other items required for a complete, safe, and satisfactory installation.

Contractor shall submit a procedure and demolition plan to Worcester County for Approval prior to any septic tank demolition occurring.

Associated permits and testing requirements shall be under bid items No. 1.

Bid Item No. 19 will not be measured and shall be paid on a Per Each basis at the Contract price.

Bid Item No. 20 – Erosion/Sediment Control, Site Restoration, and Stabilization

This item shall include erosion and sediment control items as described in the Contract Specifications which includes, but is not limited to a setup a preconstruction meeting, stabilized construction entrance, silt fence, perimeter controls, bypass pumping, filter bag, silt fence, sump pit, topsoil, fertilizer, maintenance of controls, weekly inspections and reporting, and other necessary controls that may be required by the owner, state, or representative. This item also includes site restoration including temporary and permanent seeding and stabilization. Item will not be considered complete until project completion, approval from the regulatory agency, and appropriate removal of controls are performed.

Measurement and Payment for Bid Item No. 20 will be on a Lump Sum price basis at the Contract Price.

Bid Item No. 21 – Traffic Control

This item shall include all items necessary to furnish all materials and labor needed to provide adequate traffic control to provide a safe work zone within Lewis Road. This item also includes preparation and mailing of letters to affected residents, and emergency services as to location, durations, and driveways closures that will be occurring. Includes all other items required for a safe and satisfactory work zone.

During the submittal process the Traffic Control Plan Shall be submitted and approved by Worcester County.

Bid Item No. 21 will not be Measured and Payment shall be on a Lump Sum Basis at the Contract Price.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

**** End of Section ****

SECTION 01 20 50 MEETINGS

PART I – GENERAL

1.1 PRECONSTRUCTION CONFERENCE

1.1.1 Date, Time and Location

Conference will be held after Contract award or intent to award is issued and before construction is started at the site. ENGINEER will fix the date, time, and location of the meeting in accordance with requirements of the General Conditions.

ENGINEER shall prepare agenda, preside at meeting, and prepare and distribute minutes of proceedings to all parties.

CONTRACTOR shall provide data required, contribute appropriate items for discussion, and be prepared to discuss all items on agenda.

1.1.2 Required Attendance

- CONTRACTOR and major Subcontractors.
- OWNER'S representatives.
- ENGINEER.

1.2 PROGRESS MEETINGS

1.2.1 Date and Time

1.2.1.1 Regular Meetings

A minimum of one progress meeting monthly shall be held as mutually agreed upon by ENGINEER and CONTRACTOR, and OWNER.

1.2.1.2 Other Meetings

Gravity and Force Main Test Meeting, Pump Station Start-up, and others on call.

1.2.2 Place

CONTRACTOR'S field office, or as designated by ENGINEER.

ENGINEER shall prepare agenda, preside at meetings, and prepare and distribute a transcript of proceedings to OWNER and CONTRACTOR.

CONTRACTOR shall provide data required and be prepared to discuss all items on agenda.

1.2.3 Minimum Attendance

- CONTRACTOR, Subcontractors, and suppliers. Representatives present for each party shall be authorized to act on their behalf.
- ENGINEER.
- OWNER'S representative.
- Others as appropriate.

PART II – PRODUCTS

Not used.

PART III – EXECUTION

Not used.

+ + END OF SECTION + +

SECTION 01 33 00
SUBMITTALS

PART 1 GENERAL

1.1 DESCRIPTION

- A. This Section includes general requirements and procedures related to the CONTRACTOR'S responsibilities for preparing and transmitting submittals to the ENGINEER to demonstrate that the performance of the work will be in accordance with the Contract documents and requirements. Submittals include, but are not limited to, schedules, pumps, valves, piping, flow meter, blower and vent, electrical controls, control panels, cabinets, asphalt, concrete mix design, erosion and sediment controls, lighting, fencing materials, and test results, CONTRACTOR'S Drawings, samples, manuals, methods of construction, and Record Drawings. Other requirements for submittals are specified under applicable sections of the Specifications.
- B. The Contract Documents were developed utilizing specific Manufacturer's, makes, models, and part numbers as a basis of design for the project. All references to these manufacturer's, model numbers, and/or part numbers do not constitute the intention of sole sources of these items. As a part of the submittal process detailed hereon, the Contractor may submit in writing to the Owner and Engineer requests for approved equals.

1.2 SUBMITTAL REQUIREMENTS

- A. CONTRACTOR shall submit a written list of materials and equipment that will be purchased giving name, address, and telephone number of supplier, manufacturer, or processor within ten (10) calendar days after the receipt of Notice to Proceed. No material shall be incorporated into the Work until approval of the source has been given by the ENGINEER. Delivery of materials to the contract site prior to approval is made at the CONTRACTOR'S risk and is subject to immediate removal at no cost to the OWNER should it be determined that the source is not acceptable.
- B. Submittals shall be scheduled and coordinated with the ENGINEER and CONTRACTOR'S construction schedule.
- C. A complete submittal schedule and list of required submittals shall be submitted with the first submittal, but not later than 10 calendar days after receipt of the Notice to Proceed. The schedule for submission of submittals shall be arranged so that related equipment items are submitted concurrently. The ENGINEER may require changes to the submittal schedule to permit concurrent review of related equipment. Submittals for each Specification Section shall be submitted in their

entirety; partial submittals are not acceptable unless specifically requested by the CONTRACTOR with the ENGINEER'S approval of this partial submittal.

- D. Within ten (10) calendar days after the date set forth in the Notice to Proceed for the construction to start, the CONTRACTOR shall prepare and submit for review to the ENGINEER a construction schedule showing the order in which the CONTRACTOR proposes to execute the Work and the dates upon which he proposes to start and complete each major work item. The schedule shall show each major work item with usage of the entire contract time provided in the Contract, and shall include the dates for submittals, sample testing, approval of materials and CONTRACTOR'S Shop Drawings, and the procurement of materials and equipment. The schedule shall detail the sequence of construction required to maintain continuous operation of the existing transfer station. The construction schedule shall be in chart form showing contemplated completion percentages and arranged to record actual completion percentages at stated intervals. The schedule will outline in detail the proposed equipment, manpower, and production rates necessary to achieve the schedule. The CONTRACTOR shall update the schedule every week with any and all changes, including but not limited to changes in equipment, manpower, and completion dates being annotated.
- E. The ENGINEER may require that the CONTRACTOR furnish additional information and data as required to justify the basis of the schedule.
- F. The accepted construction schedule shall be kept up-to-date as work progresses, including work added by change order, and shall be submitted to the ENGINEER every week and with the request for payment. If the CONTRACTOR fails to submit the required updated schedule within the time prescribed, the ENGINEER may withhold approval of progress payment estimates until such time as the CONTRACTOR submits the required current updated schedule.
- G. The construction schedule shall generally determine the order in which the work is to proceed. However, the ENGINEER may request and authorize minor changes to this schedule whenever such changes are of definite advantage to or necessary for the operations of the OWNER.

1.3 CONTRACTOR'S SHOP DRAWINGS

- A. The CONTRACTOR'S Shop Drawings shall be neat in appearance, legible, and explicit to enable proper review and to ensure compliance with the Contract Documents. They shall be complete and detailed to show fabrication methods and shall include, but not be limited to, assembly and installation details, wiring and control diagrams, catalog data, pamphlets and descriptive literature, and performance and test data. They shall be accompanied by calculations, reports, or other sufficient information to provide a comprehensive description of the structure, machine, or system provided and its intended manner of use. If the

CONTRACTOR'S Shop Drawings deviate from the Contract Documents, the CONTRACTOR shall advise the ENGINEER in writing with the submittal and state deviations and the reasons for the deviations with the Contract Documents.

- B. No portion of the work requiring a CONTRACTOR'S Shop Drawing submittal shall be started nor shall any materials be fabricated, delivered to the site, or installed prior to approval by the ENGINEER. Fabrication performed, materials purchased, or onsite construction accomplished that does not conform to approved CONTRACTOR'S Shop Drawings shall be at the CONTRACTOR'S risk. The OWNER will not be liable for any expense or delay due to corrections or remedies to accomplish conformity.
- C. The review and approval of CONTRACTOR'S Shop Drawings 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 therefore the ENGINEER, will have no responsibility.
- D. Contract work, materials, fabrication, and installation shall conform with approved CONTRACTOR'S Shop Drawings.
- E. Shop Drawings shall show types, sizes, accessories, and layouts, and shall include plans, elevations, sectional views, components, assembly and installation details, and all other information required to illustrate how applicable portions of the Contract requirements will be fabricated and installed. In the case of fixed mechanical and electrical equipment, layout drawings drawn to scale shall be submitted to show required clearances for operation, maintenance, and replacement of parts. This will include manufacturer's catalog data sheets, pamphlets, descriptive literature, installation, and recommended application as required. Shop Drawings for closely related items shall be submitted together. Additional Shop Drawings and information required for electrical equipment shall be listed in appropriate Specification Sections. All equipment in a given Specification Section shall be submitted together.
- F. Manufacturer's catalog, product, and equipment data shall be certified and shall include materials type, performance characteristics, voltage, phase, capacity, and similar information. Wiring diagrams will be provided when applicable. Indicate catalog, model, and serial numbers representing specified equipment. Provide manufacturer's catalog or part number for all equipment. Provide complete component information for all equipment.
- G. When so specified or directed by the ENGINEER, submit proposed method of construction for specific portions of the work for review and approval. This submittal shall include a detailed written description of all phases of the construction operation to fully explain to the ENGINEER the proposed method of construction. If required by the Specifications, submit installation drawings to

supplement the description. Review and approval by the ENGINEER will be in accordance with the approval process herein and shall not relieve the CONTRACTOR from his responsibility with regard to fulfillment of the terms of the Contract. All risks associated with the proposed method remain the CONTRACTOR'S responsibility, and therefore the ENGINEER shall have no responsibility. After review and approval, if, in the opinion of the CONTRACTOR, modifications are necessary, submit such modifications in detail, including reasons for the modifications. Modifications shall not be implemented without review and approval by the ENGINEER.

- H. Each CONTRACTOR'S Shop Drawing submitted by the CONTRACTOR shall have affixed to it the following certification statement signed by the CONTRACTOR:

“Certification Statement: By this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers, and pertinent data, and I have checked and coordinated each item with other applicable approved drawings and all contract requirements.”

- I. With the first submittal, submit a CONTRACTOR'S Shop Drawing submittal schedule listing as nearly as practical, by Specification Section number, all submittals required and the approximate date the submittal will be made. All submittals for approval shall have the following identification data, as applicable, contained thereon or permanently adhere thereto:
1. OWNER'S Name
 2. Project name and location
 3. Product identification
 4. Drawing title, drawing number, revision number, and date of drawing revision
 5. Subcontractor's, vendor's, and/or manufacturer's name, address, and telephone number
 6. CONTRACTOR'S certification statement.
- J. For the original submittal and each subsequent resubmittal that may be required, submit six (6) legible prints each of all shop and working drawings, and six copies of catalog data, method of construction, and manufacturer's installation recommendation to the ENGINEER for approval. Three (3) copies of all CONTRACTOR'S Shop Drawings will be returned to the CONTRACTOR.

- K. Each submittal shall be made in accordance with the CONTRACTOR'S Drawings submission schedule. Allow twenty (20) calendar days for checking and appropriate action by the ENGINEER. CONTRACTOR'S Drawings will be returned stamped with one of the following classifications:
1. APPROVED – No corrections, no marks.
 2. APPROVED AS NOTED – A few minor corrections. All items may be fabricated as marked without further resubmission. Resubmit a corrected copy to the ENGINEER.
 3. REVISE AND RESUBMIT – Minor corrections. Resubmit Drawings as per original submissions with corrections noted. Allow 20 calendar days for checking and appropriate action by the ENGINEER.
 4. REJECTED – Requires corrections or is otherwise not in accordance with the Contract Documents. No items shall be fabricated. Allow twenty (20) calendar days for checking and appropriate action by the ENGINEER.

1.4 RECORD DRAWINGS (AS-BUILT DRAWINGS)

- A. The CONTRACTOR shall maintain and keep one record copy of all Contract Documents at the site in good order and annotated to show all revisions made during construction. Such annotations shall be kept current and shall be available to be inspected by the ENGINEER at any time. Failure to maintain current Record Drawings will be cause to delay progress payments. Record Drawings shall be available to the ENGINEER at all times during the life of the Contract. All drawings shall be made a part of the Record Drawings and shall include the following:
1. Contract Drawings – Annotate or redraft, as required, to show all revisions, substitutions, variations, omissions, and discrepancies made or discovered during construction concerning location and depth of concrete pads, conduits, lighting, and fencing. Revisions shall be made and shown on all drawing views with actual dimensions established to permanent points.
- B. At the completion of the Contract, or at the ENGINEER'S request and before final payment is made, furnish the ENGINEER one set of drawings, of a quality that allows reproductions, of the final Record Drawings (as-builts) reflecting all revisions herein described.
- C. The CONTRACTOR shall be responsible for coordination and cooperation with OWNER'S personnel and shall not permanently seal or bolt any equipment covers or material surfaces until after as-built surveys have been made, and shall

assist OWNER'S personnel as required in ascertaining necessary location information.

1.5 HEALTH AND SAFETY PLAN (HASP)

- A. Prepare and submit a site HASP for review and acceptance by the ENGINEER. Acceptance by the ENGINEER is required prior to commencement of onsite activities. The HASP shall comply with appropriate local, state, and federal requirements. The HASP shall address how the CONTRACTOR will monitor excavation, installation of new electrical systems, and construction of proposed features and determine if additional safety procedures are necessary. The plan shall address how the work will be managed, worker safety, and procedures to notify ENGINEER.
- B. The following is a list of items which, at a minimum, shall be included in the HASP:
 - 1. Key Personnel. Names of key personnel responsible for site health and safety, including a site Superintendent and site Safety Officer. The Safety Officer shall have the authority to stop work if hazardous conditions are encountered. The Safety Officer shall have management and supervisor training as required. The Superintendent may serve as the Safety Officer if he has the required training. The Safety Officer shall be onsite during excavation activities.
 - 2. Site Assessment. An assessment of the site health and safety hazards as related to all onsite activities. Physical and biological hazards shall be addressed. Potential physical hazards include slips, trips, falls, heavy equipment hazards, excavation hazards, electrical hazards, and heat and cold stress.
 - 3. Emergency Response Plan. This Plan shall address the action required to safely and effectively deal with emergency situations, which may occur during construction activities. At a minimum, the Emergency Response Plan shall address the following list of items:
 - a. Personnel Roles
 - b. Emergency Recognition and Prevention
 - c. Evacuation Procedures and Routes
 - d. Emergency Equipment
 - e. Emergency Medical Treatment.
 - 4. Site Monitoring Plan. This Plan shall address air monitoring and personnel monitoring and potential onsite environmental sampling including monitoring equipment maintenance and calibration requirements. A list of hazardous (toxic and flammable) substances that may be encountered

onsite and their respective permissible exposure limits shall be included in the site HASP.

5. Revisions to the HASP. The CONTRACTOR may be required to revise the HASP under certain conditions to meet more or less stringent requirements in the event additional contamination is discovered. Any revisions to the HASP shall be reviewed and accepted by the ENGINEER.
6. CONTRACTOR Responsibilities: The CONTRACTOR shall assume total responsibility for the development, implementation, and enforcement of the Health and Safety Plan and for protection of all onsite personnel's safety, health and welfare and in no way places these responsibilities, partially or in whole, on the ENGINEER, OWNER, or any other onsite personnel.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

**** End of Section ****

This page intentionally left blank

SECTION 01 40 00 QUALITY CONTROL

PART I – GENERAL

1.1 DESCRIPTION

This section includes requirements of a general nature related to the CONTRACTOR'S responsibility for quality control involving inspections, tests, certificates, and reports.

1.2 INSPECTION

The ENGINEER has the right to inspect all materials and equipment at all stages of development or fabrication, and shall be allowed access to the site and to the CONTRACTOR'S and supplier's shops to conduct such inspection. Onsite work will be subject to continuous inspection. Inspection by the ENGINEER will not release the CONTRACTOR from responsibility or liability with respect to material or equipment. The ENGINEER will provide the CONTRACTOR a minimum of twenty-four (24) hours' notice prior to unscheduled offsite inspections.

When a shop test of mechanical equipment is required by the manufacturer before shipment to the Contract site, the CONTRACTOR shall give the ENGINEER a minimum of ten (10) working days' written notice of the appropriate time for the required test. The CONTRACTOR shall ensure that the test site is safe, accessible, dry, ventilated, and well lit. Work involved with the installation of such equipment shall not proceed until the work required test results are approved by the ENGINEER.

When local codes or laws require approval and inspection of the work by other agencies or organizations before installation or operation, the CONTRACTOR shall obtain such approval and submit one signed original and three copies of the approval to the ENGINEER.

1.3 TESTING

1.3.1 Field and Laboratory

The CONTRACTOR shall contract with an independent geotechnical subcontractor to perform laboratory testing as required by these Specifications, including the following periodic inspections, engineering, and associated services:

- Soils – Inspect and test the placement and compaction of soils used as compacted fill. Perform field density testing as described in Sections 02 25 00.
- Bituminous Pavement – Inspect and test the placement and compaction of Bituminous Pavement. Perform field density testing as described in Section 02 25 00.

- Concrete – Inspect forms and reinforcement; inspect placement; witness CONTRACTOR’S slump and air entrainment tests; make cylinder samples and provide storage onsite; and perform 7- and 28-day unconfined compression tests on specimen cylinders.

The CONTRACTOR shall contract with an independent geotechnical firm as an approved subcontractor with certified field technicians to perform required testing (including soils, concrete and compaction testing) as specified in the Contract Documents, ASHTO, ACI, ASTM, and NAPA. The independent testing firm shall have performed previous similar work in a satisfactory manner and be an approved subcontractor. The CONTRACTOR will include the costs of this service in his lump sum bid.

The CONTRACTOR shall cooperate with the ENGINEER and the laboratory testing representatives and provide at least twenty-four (24) hours’ notice prior to specified testing. The CONTRACTOR shall provide labor and materials and necessary testing facilities at the site as required by Specifications and the approved subcontractor.

The CONTRACTOR shall be solely responsible for the adequate stability of cut soil slopes at the site and for providing a safe working condition within the excavated areas.

1.3.2 Pipeline and Other Testing

Test procedures and requirements are specified in the appropriate specification section.

1.4 REPORTS

1.4.1 Certified Test Reports

Where transcripts or certified test reports are required by the Contract Documents, they shall meet the following requirements:

- Submit for approval by the ENGINEER required transcripts, certified test reports, certified copies of the reports of all tests required in referenced Specifications or specified in the Contract Documents, and have subsequent approval of the ENGINEER before delivery of materials. The testing shall have been performed in an approved independent laboratory within six (6) months of submittal of the reports for approval or as approved by the ENGINEER. Transcripts of test reports shall be accompanied by a notarized certificate in the form of a letter from the manufacturer or supplier certifying that the tested material meets the specified requirements and is of the same type, quality, manufacturer, and make as that specified. The certificate shall be signed by an officer of the manufacturer or supplier.

1.4.2 Certificate of Compliance

At the option of the ENGINEER, or where specified, the CONTRACTOR may, in lieu of the specified tests and other tests required in the various reference documents, submit for approval a notarized Certificate of Compliance in the form of a letter from the manufacturer. The Certificate shall state the following:

- Manufacturer has performed all required tests.
- Materials supplied meet all test requirements.
- Tests were performed within six (6) months of submittal of the Certificate.
- Materials that were tested are of the same type, quality, manufacture, and make as those specified.
- Include identification of the materials.

The Certificate shall be signed by an officer of the manufacturer. Materials shall not be delivered until approval of the Certificate is received by the CONTRACTOR.

1.4.3 Manufacturer's Certificates

The CONTRACTOR shall submit Manufacturer's Certificates for the installation of those items listed in the Specifications.

Manufacturer's Certificates shall state that the equipment has been installed under either the continuous or periodic supervision of the manufacturer's authorized representative, that it has been adjusted and initially operated in the presence of the manufacturer's authorized representative, and that it is operating in accordance with the specified requirements to the manufacturer's satisfaction.

1.5 MANUFACTURER SERVICES

When required, manufacturer services are specified in appropriate specification sections.

1.5.1 Equipment Calibration

All field test equipment will be kept under control of the CONTRACTOR. The CONTRACTOR will be fully trained in the use of equipment, test procedures, and interpretation of results for each piece of test equipment. A copy of the Calibration Certificate will be kept by the Quality Control technician and supplied to the ENGINEER.

Calibration of nuclear-density gauges shall conform to the frequencies and methods outlined in ASTM D2922-78 and D3017. Unstable or erratic gauges shall not be used in density testing and shall be immediately removed from the site.

PART II – PRODUCTS

Not used.

PART III – EXECUTION

Not used.

+ + END OF SECTION + +

SECTION 01 50 00
MOBILIZATION AND TRAFFIC CONTROL

PART I – GENERAL

1.1 DESCRIPTION

Perform construction preparatory operations, including the movement of personnel and equipment to the project site and for the establishment of CONTRACTOR'S offices, buildings, and other facilities necessary to begin work.

1.2 TRAFFIC CONTROL

Maintain traffic control in accordance with the most current addition of Maryland State Highway Administration Manual on Uniform Traffic Control Devices (MdMUTCD), and Section 104 of SHA STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MATERIALS, for both vehicular and pedestrian, on any facility affected by the Work. Provide maintenance, sweeping, and dust control per MDSHA Section 501 on access roadways as required by the ENGINEER. CONTRACTOR shall submit a traffic control plan for COUNTY approval in compliance with MdMUTCD

PART II – PRODUCTS

2.1 MATERIAL

All materials used for traffic maintenance, whether temporary or permanent, shall be approved per MUTCD specifications or the ENGINEER.

PART III – EXECUTION

All work performed in providing facilities and services shall be done in a safe and workmanlike manner.

CONTRACTOR shall provide all labor, materials, and equipment necessary to maintain vehicular and pedestrian traffic throughout the project duration. CONTRACTOR shall be responsible for obtaining all permits, approvals, and pay any fees necessary from local, county, and state regulatory agencies required to access public roads with earth-moving equipment. Signs, lights, barricades, and manpower shall be provided wherever necessary to protect the traveling public from hazardous conditions in accordance with local, county, and state transportation, MUTCD and OSHA requirements. A certified trained flagman shall be provided at all street intersections during activities requiring construction traffic to enter work zones.

The CONTRACTOR shall contact Miss Utility, Eastern Shore Gas, County Water and Wastewater, and Ocean Pines Public Works five (5) days prior to starting any work shown on these plans to confirm and identify the location of all utilities and protection requirements of the respective service lines within the limits of work.

Prior to initiating construction, the CONTRACTOR shall inspect the site for existing surface conditions, and stormwater drainage.

The CONTRACTOR shall provide for the protection and preservation of the existing structures, valve boxes, storm drainage devices, or existing utilities to remain unchanged within the project area. Any damage to these items caused by the CONTRACTOR'S activities shall be repaired by the CONTRACTOR at no additional expense to the County.

Due to the close proximity of residential properties, the CONTRACTOR shall not engage in work outside the limits of disturbance without the express written direction of the ENGINEER.

CONTRACTOR shall keep the premises free from accumulations of waste materials, rubbish, and other debris resulting from the Work, on a daily basis. Failure to comply herewith constitutes grounds for the ENGINEER to recommend not approving payment.

+ + END OF SECTION + +

SECTION 01 60 00 TEMPORARY CONTROLS

PART I – GENERAL

1.1 DESCRIPTION

Provide and maintain methods, equipment, and temporary construction, as necessary to provide controls over environmental conditions at the construction site and adjacent areas. Remove physical evidence of temporary facilities at completion of Work.

1.2 NOISE CONTROL

CONTRACTOR'S vehicles and equipment shall be such as to minimize noise to the greatest degree practicable. Noise levels shall conform to the latest OSHA standards and in no case will noise levels be permitted which interfere with the work of the OWNER or others.

1.3 DUST CONTROL

CONTRACTOR shall be responsible for controlling objectionable dust caused by his operation of vehicles and equipment, clearing or for any reason whatever. CONTRACTOR shall apply water or use other methods subject to the ENGINEER'S approval which will keep dust in the air to a minimum.

1.4 PEST AND RODENT CONTROL

Provide rodent and pest control as necessary to prevent infestation of construction or storage area. The use of pesticides and herbicides onsite must be approved in advance by the OWNER. Employ methods and use materials which will not adversely affect conditions at the site or on adjoining properties.

1.5 WATER CONTROL

Provide methods to control surface water and water from excavations and structures to prevent damage to the Work, the site, or adjoining properties:

- Control fill, grading, and ditching to direct water away from excavations, pits, tunnels and other construction areas; and to direct drainage to proper runoff courses so as to prevent any erosion, damage, or nuisance.
- It is solely the CONTRACTOR'S responsibility for maintaining the site in a dry and workable manner.
- Specifically, the CONTRACTOR shall maintain the anchor trench free of water at all times.

- No standing water shall be allowed within the limits of work. The CONTRACTOR shall employ all means necessary to remove the water. Dewatering is incidental to the lump sum cost of this project. If, after written notice from the ENGINEER to remove any standing water, the CONTRACTOR has not removed said water in twenty-four (24) hours, the OWNER has the option to employ any means necessary to remove the standing water. The cost of this effort will be deducted from any money owed to the CONTRACTOR.

Provide, operate, and maintain equipment and facilities of adequate size to control surface water.

Dispose of drainage water in a manner to prevent flooding, erosion, or other damage to any portion of the site or to adjoining areas and in conformance with all environmental requirements.

1.6 POLLUTION CONTROL

Provide methods, means, and facilities required to prevent contamination of soil, water, or atmosphere by the discharge of noxious substances from construction operations.

Provide equipment and personnel, and perform emergency measures required to contain any spillages, and to remove contaminated soils or liquids. Excavate and properly dispose of any contaminated earth offsite, and replace with suitable compacted fill and topsoil.

Take special measures to prevent harmful substances from entering public waters:

- Immediately notify OWNER of spill.
- Prevent disposal of wastes, effluents, chemicals, or other such substances adjacent to streams, or in sanitary or storm sewers.

Provide systems for control of atmospheric pollutants:

- Prevent toxic concentrations of chemicals.
- Prevent harmful dispersal of pollutants into the atmosphere.

CONTRACTOR'S equipment used during construction shall conform to all current federal, state, and local Laws and Regulations.

PART II – PRODUCTS

Not used.

PART III – EXECUTION

Not used.

+ + END OF SECTION + +

SECTION 01 70 00
CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 DESCRIPTION

- A. This Section includes requirements for cleanup, restabilization, and restoration, as required to prevent accidents to personnel, and OWNER employees, to protect all work in place, restabilize and restore all disturbed areas, removal of all evidence of construction activities, and to effect completion of the Contract in an orderly manner.

1.2 CLEANUP

- A. Construction cleanup shall proceed as construction progresses and shall consist of the removal of all mud, oil, grease, soil, gravel, trash, scrap, debris, and excess materials that are unsightly or may cause the tripping or sliding of workmen, ladders, or equipment. Remove water from floor areas where electrical power tools are to be used and prevent stains on concrete which will be exposed in the finished work. All cleaning materials and equipment used shall be selected and employed with care to avoid scratching, marring, defacing, staining, or discoloring the surfaces cleaned.
- B. Immediately prior to the CONTRACTOR'S written request for a final inspection of the Contract Work or any portion thereof, perform final cleanup.
- C. In addition to the normal "broom clean" requirements, the exposed surfaces of the following materials shall be cleaned as listed herein:
 - 1. Exposed slabs – Wash, scrape, and scrub, using a detergent, as necessary, to remove bond breaker, dirt, and discolorations.
 - 2. Asphalt paving – Remove mud, dirt, and trash; and hose down as required.
 - 3. Other surfaces – Remove all blemishes, leave clean, uniform, and dust free.
 - 4. Premises and site – Removal all trash, debris, surplus excavated material.
- D. No items shall remain on or be discarded on this site, or any other OWNER'S site. Items and excess materials that are to be discarded shall be removed at the CONTRACTOR'S expense. Leave premises orderly and "broom clean."

1.3 RESTORATION AND RESTABILIZATION

- A. All areas disturbed by the CONTRACTOR'S operation shall be restored and restabilized as specified herein. This shall include, but not be limited to, staging and excavation areas, construction strips, access to roads, and all areas within the limit of work.
- B. Final restoration and restabilization shall proceed in accordance with the construction schedule. This shall include seeding and sodding areas disturbed during the construction of the pumping station, disassembly and removal of all temporary construction facilities constructed by the CONTRACTOR, and the site left in an orderly and restored condition as required by the Contract Documents.
- C. Preserve existing site features, (such as signs, markers, guard rails, and fences), and maintain in their existing locations and condition unless written permission is obtained from the ENGINEER for their removal and restoration or replacement. Remove existing site features that conflict with construction operations and store in a manner to keep them clean and in their existing condition. Restore to their locations and existing conditions before removal, or install to new locations as directed. Repair or replace damaged items when directed, at no cost to the OWNER.
- D. Gravel surfaces and access road shoulders shall be restored as near as practicable to their condition prior to being disturbed. Do not reuse shoulder material if contaminated by foreign material. In such place, replace with new material of same quality and gradation. Materials and methods of construction shall be in accordance with specification requirements and with applicable permits secured for this Contract.

1.4 DISPOSAL OF WASTE AND EXCESS MATERIALS

- A. Construction waste and excess construction materials shall be disposed of at the CONTRACTOR'S expense.
- B. Waste and excess material disposed of in an unauthorized area shall be removed by the CONTRACTOR and the area shall be restored as near as practicable to its condition before disturbance, at no cost to the OWNER.

1.5 REMOVAL OF CONDEMNED MATERIAL

- A. Material delivered to the contract site, which has been determined by the ENGINEER to be unsuitable or not in accordance with the Contract Documents, shall be removed from the work site and disposed of at no cost to the OWNER.

PART 2 PRODUCTS

2.1 MATERIALS FOR RESTORATION

- A. Topsoil: Onsite topsoil or topsoil brought from offsite and which meets the requirements of MSHA Section 920.01.02. Topsoil shall only be provided for the permanent improved areas and shall be placed in six (6) inch (minimum) layers.
- B. Seed for Restoration
 - 1. Unless otherwise specified herein, seed shall be certified by the Maryland Department of Agriculture and shall conform to requirements of Maryland Seed Law and Regulations.
 - 2. Provide seed mix in accordance with the "2011 MD Standards and Specifications for Erosion and Sediment Control." Sowing of seed shall be conducted during the periods in accordance with the "2011 MD Standards and Specifications for Erosion and Sediment Control." Seeding shall not be done outside of these dates without prior approval of the ENGINEER.
- C. Fertilizer for Restoration
 - 1. The CONTRACTOR will submit soil samples to an approved soils testing laboratory for fertilizer recommendations. Recommendations shall be submitted to and approved by the ENGINEER before implementation.
 - 2. Fertilizer shall be uniform in composition, free flowing and delivered to the site fully labeled according to applicable State fertilizer laws and shall bear the name, tradename or trademark, and warranty of the producer. Fertilizer shall be in accordance with the "2011 MD Standards and Specifications for Erosion and Sediment Control."
- D. Lime for Restoration: Lime shall be ground limestone containing at least 50% total oxides, calcium oxide plus magnesium oxide. Limestone shall be ground to fineness such that at least 50% will pass through a 100-mesh sieve and 98% to 100% will pass through a 20-mesh sieve. Lime shall be applied as recommended by soil test results.
- E. Mulch for Restoration: Mulch for protection of seeding in restored areas shall conform to the following requirements:
 - 1. Straw shall be clean, weed free, unrotted, applied at a rate of not less than 70 to 90 pounds per 1,000 ft², 1.5 to 2.0 tons per acre, and shall be anchored with one of the following methods: Mulching anchoring tool for flat slopes, mulch nettings, cut back and emulsified asphalt applied five (5) gallons per 1,000 ft², Curasol AH applied five (5) gallons per 1,000 ft²,

Petroset applied per manufacturer's recommendations, RMH Plus Tackifier applied per manufacturer's recommendations, or other equivalent binding solutions. Increase application rate on slopes eight (8) feet or more high as recommended by the manufacturer.

2. Straw erosion control blanket shall be placed in all channel beds that are to be grass lined. Erosion control blankets shall be Type SC150 as manufactured by North American Green, Evansville, Indiana, or equal. Also, all slopes greater than or equal to 3H:1V shall have type SC150 erosion blanket or equal.
- F. Mulch utilized as temporary protection and stabilization shall conform to the above materials requirements. Rate of application shall be directed by the ENGINEER.

PART 3 EXECUTION

3.1 PERMANENT SEEDING

- A. Place six (6) inches of topsoil on all areas defined as permanent improved areas. Harrow, disc, or otherwise loosen topsoil to a depth of four (4) inches.
- B. Remove objectionable material such as stones (two [2] inches or larger), clods, brush, roots, and trash from the top four (4) inches of soil.
- C. Apply fertilizer and lime at the rates recommended by soil test results and as approved by the ENGINEER. Thoroughly mix into the top four (4) inches. Scarify the area and rake until the surface is leveled to provide a maximum of two (2) inches in variation, and the soil is friable and a uniform fine texture.
- D. Apply seed mixture uniformly with mechanical power driven seeders, mechanical cyclone hand seeders, or hydroseeding equipment. Slurry for hydroseeder may contain seed and fertilizer only. Disc seed one (1) inch into soil in drainage ditch areas. Do not rake, roll, or drag the seedbed in all other areas if hydroseeder is used.
- E. Apply mulch at the rates specified herein, to all other areas.

3.2 TIME RESTRICTIONS

- A. When permanent seeding is specified or directed and seeding is not allowed because of time restrictions specified, utilize one or more of the following methods to prevent erosion and sedimentation until such time as permanent seeding or sodding is allowed:
 1. Place and anchor straw mulch.

2. Apply temporary seeding.
 3. Prepare soil as for permanent seeding and then mulch as specified; overseed during next seasonal seeding period.
 4. Provide other erosion control measures acceptable to the ENGINEER.
- B. Remove straw or wood chips used as temporary mulch or work into subsoil at a minimum depth of six (6) inches prior to initiation of permanent seeding application.

3.3 MAINTENANCE OF SEEDED AREAS

- A. Maintain seeded areas until accepted in writing by the ENGINEER.
- B. Water seeded areas as necessary to maintain adequate moisture in the upper four (4) inches of soil and keep mowed to a height of two (2) to three (3) inches. Do not remove more than one-third (1/3) of the grass leaf during initial mowing.
- C. Inspect seeded areas for failures due to poor vegetative growth, traffic, or equipment damage, weather damage, or erosion. Make necessary repairs promptly.
- D. Provide replacements during the specified planting seasons for areas where repairs are deemed to be necessary by the Inspector at no cost to the OWNER. This shall include repairs and replacements due to erosional or weather-related damage.
- E. If stand of turf is inadequate as determined by the ENGINEER, overseed and fertilize using half of the rates originally applied, or reseed. If stand is over 60% damaged, as determined by the ENGINEER, reestablish following original fertilizer, seed bed preparation, and seeding recommendations.

3.4 FINAL WALK THROUGH

- A. Upon receiving the CONTRACTOR'S written request for substantial completion inspection, the ENGINEER will perform a walk through of the site area with the CONTRACTOR'S and the OWNER'S representative(s). All punchlist items identified by the walk through shall be repaired, replaced, as required to the satisfaction of the ENGINEER. Final payment will not be made until all of the punchlist items are resolved to the satisfaction of the ENGINEER.

**** End of Section ****

This page intentionally left blank

DIVISION 2

SECTION 02 25 00	EXCAVATION, BACKFILL, AND COMPACTION
SECTION 02 74 10	ASPHALT PAVING
SECTION 02 80 00	RESTORATION

This page intentionally left blank

SECTION 02 25 00
EXCAVATION, BACKFILL, AND COMPACTION

PART 1 GENERAL

1.1 DESCRIPTION

- A. Excavation, backfill, and compaction shall include, but not necessarily be limited to, the excavation, backfill, for aggregate placement, compaction for electrical conduits, concrete pads, and other concrete structures in accordance with the Contract Documents.

1.2 QUALITY ASSURANCE

- A. All materials removed from trench excavations and used for backfill will be subject to testing by an approved geotechnical engineer to determine the material's suitability for use as backfill. Additional density testing may be required by the ENGINEER. All materials testing shall be provided at no cost to the OWNER.

1.3 SUBMITTALS

- A. CONTRACTOR shall provide aggregate and soil gradations, Atterberg Limits, grain size, optimum compaction, moisture content, and classifications as required to verify conformance to Unified Soil Classification System (USCS). Provide 20-pound bag sample to ENGINEER for approval.

PART 2 PRODUCTS

2.1 MATERIALS FURNISHED BY THE OWNER

- A. The OWNER will not furnish any materials for trench backfill other than those materials which are available from the trench excavation limits as shown on the Standard Details and the Contract Documents.

2.2 DETAILED MATERIAL REQUIREMENTS

- A. Material for backfills may be from onsite excavations (if of proper quality) or from borrow sources. The material shall be free from organic material, sludge, grit, trash, muck, roots, logs, stumps, excess moisture or frozen material and other deleterious substances. Except as otherwise specified for pipe backfill below or approved by County and ENGINEER, the material shall not contain rocks or lumps larger than four (4) inches in greatest dimension. The material shall not contain mica in quantities, which in the judgment of the OWNER are sufficient to affect compaction characteristics. Materials having a maximum dry density of less than one hundred (100) pounds per cubic foot (AASHTO T 180) shall not be used

unless specifically approved in writing by the OWNER. Cinders, ashes, rubble, and construction debris shall not be used in the work. The use of any soil additive that in the judgment of the OWNER may adversely affect the proposed utility is strictly prohibited.

1. Use and Ownership of Excavated Material

- a. All suitable material excavated from utility trenches shall be used, as far as practicable, for backfill in trenches if meeting classification defined in these specifications.
 - b. The CONTRACTOR shall properly store, stockpile, and protect all materials that are to be reused in the work. The CONTRACTOR shall replace, at his own expense, material that was suitable when excavated, which has subsequently become unsuitable because of careless, neglectful, wasteful, or unprotected storage. The CONTRACTOR shall have no property right in any material taken from any excavation and no excavated material shall be wasted or otherwise removed from the project site without permission of the OWNER. All unsuitable and surplus suitable material, as determined by the OWNER, shall be removed from the site and disposed of off-site by and at the expense of the CONTRACTOR in accordance with all applicable Federal, State, and local regulations.
2. If insufficient suitable soils are available from excavation on the contract project, the CONTRACTOR shall submit for approval by the OWNER, borrow excavation sites from which such soils as may be required to complete the construction of excavation backfill on the contract project. CONTRACTOR shall make suitability tests as directed by the OWNER. Borrow material shall be supplied and placed at the contract unit price.
3. Excavation Backfills on rights-of-way, improved easements or supporting pavements or surface loads shall be constructed of material classified by the Unified Soil Classification System as GW, GP, GM, SW, or SP. Soils containing more than twenty (20) percent round rock (Pea Gravel) shall not be acceptable.
4. Excavation Backfills not supporting surface loads or pavements and in unimproved easements shall be constructed of materials listed above or GC, SM, SC, ML, or CL.
5. Backfill for pipe, electrical conduit, and structure installation, bedding and trench backfill shall be existing excavated material if meeting above classification, or other as approved by the OWNER. Backfill around

pipng shall not contain any stones greater than – three-quarter (3/4) inch in any dimension.

PART 3 EXECUTION

3.1 SEDIMENT CONTROL

- A. The CONTRACTOR shall install all required sediment control devices in accordance with the drawings, permits and all applicable Federal, State and local regulations.

3.2 TRAFFIC CONTROL

- A. The CONTRACTOR shall furnish all labor, tools, equipment, and materials required for the maintenance of traffic during construction.

3.3 EXCAVATION

A. General

1. Excavation for the installation of utilities shall be unclassified and shall consist of the excavation removal and/or disposition of all material encountered to the lines, grades, and sections shown on the Plans and/or the Standard Details, as specified, or as directed by the OWNER.
2. Unless otherwise indicated, excavation shall be by open cut, except that short sections of a trench may be tunneled, or the pipeline jacked, if, in the opinion of the OWNER, the pipe can be safely and properly installed.
3. Trenches may be excavated and backfilled either by hand or by machinery. The CONTRACTOR shall have no claims, nor will extra compensation be allowed, for hand excavation or backfill, which may be required by these Specifications or by the OWNER for protection of existing utilities or structures.

B. Protection of Property and Structures

1. The CONTRACTOR shall, at his own expense, sustain in place and protect from direct or indirect injury all existing facilities in the vicinity of the excavation, whether above or below the ground, or that may appear in the excavation. The CONTRACTOR shall be responsible for the implementation of protective measures associated with the presence or proximity of pipes, poles, tracks, walls, buildings, property markers, and other structures and property of every kind and description in or over his trenches or in the vicinity of his work whether above or below the surface

of the ground. The CONTRACTOR shall repair or replace damaged facilities at his expense.

C. Utility Adjustments

1. All adjustments to utilities other than those owned by the OWNER shall be performed by the utility owner.

D. Obstructions

1. It shall be the responsibility of the CONTRACTOR to notify "MISS UTILITY," all municipal and County utilities, all utility line owners, and any other parties affected prior to the beginning of work. It is the CONTRACTOR'S responsibility to reference and maintain the location markings during the construction of the project. In the event that a utility location needs to be re-established by Worcester County, the cost to provide this shall be borne by the CONTRACTOR.

E. Removing Obstruction

1. Should the unforeseen position of any pipe, conduit, or other structure above or below ground be such as, in the opinion of the OWNER, to require its removal, realignment, or change due to the work to be done under the Contract, the work of removal, realignment, or change will be done as a change in the work, or will be done by the owner of the obstructions without cost to the CONTRACTOR; but the CONTRACTOR shall uncover and support the structures in the limits of his trench at his own expense before such removal, and before and after such realignment or change. Whether the obstruction is shown on the Plans or not, the CONTRACTOR shall not be entitled to any claim for damage or extra compensation on account of the presence of said structure or on account of any delay in the removal or rearrangement of the same; however, if said structure is not shown on the Plans, time extension will be allowed if deemed to be warranted by the OWNER.
2. In the event that obstructions would delay the work of pipe installation, the CONTRACTOR may, with OWNER approval, be permitted to leave a gap in the work and return to fill the gap after the obstructions have been removed. The installation shall be completed by laying full pipe lengths and appropriate closure pieces.
3. The CONTRACTOR shall not interfere with any persons, firms, or corporations or with the OWNER in protecting, removing, changing or replacing pipes, conduits, poles, or other structures.

4. In the event that the OWNER has entered into any agreement with an affected utility owner or owners which will have an effect on the operations or financial responsibilities of the CONTRACTOR, the requirements of these agreements will be included in the Special Provisions of the Contract.

F. Change of Excavation Location

1. In the event the OWNER directs that the location of an excavation to a reasonable extent from that proposed on the drawing on account of the presence of an obstruction, or from other cause, or if a changed location shall be paid as allowed in the General Conditions upon the CONTRACTOR'S request as approved, the CONTRACTOR shall not be entitled to extra compensation or to a claim for damages, provided that the change is made before the excavation is begun.
2. If, however, such change, made at the direction of the OWNER involves the abandonment of excavation already made, such abandoned excavation together with the necessary backfill, will be considered extra work and the CONTRACTOR shall be compensated accordingly. In the event that the trench is abandoned in favor of a new location, at the CONTRACTOR'S request, the abandoned excavation and backfill shall be at the CONTRACTOR'S expense.
3. If an obstruction shall lie within the trench in such manner that the trench has to be excavated to extra width in order that sheeting or bracing may be properly placed, or in order that a structure to be placed in the trench may be properly built, such extra width of trench shall be classed as miscellaneous excavation. No sloping of sides of excavation, however, for the purpose of avoiding the necessity of placing sheeting or bracing, either in the presence or absence of obstructions, will be considered as excavation beyond pay limits.

G. Trench Width and Depth

1. Trenches shall be excavated to the necessary width and depth as may be shown on the Plans or Standard Details, as specified in the Special Conditions, or as directed. The trench subgrade shall be such as to provide a uniform and continuous bearing and support for foundations, or conduits solid undisturbed earth for the full length of excavation. Any part of the bottom of the trench excavated below subgrade shall be backfilled with approved material and compacted in accordance with Contract Documents, at no expense to the OWNER.
2. The sides of the trenches shall be practically plumb and under no circumstances will they be permitted to be sloped except with the written

approval of the OWNER. Should the CONTRACTOR elect to slope or cut-back the sides of the trench, no additional payment will be made for extra excavation, backfill, restoration, or contingent items beyond the limits indicated on the Standard Details.

H. Length of Open Trench

1. The CONTRACTOR shall limit trench excavation to what can be opened, constructed, and backfilled in a single working day.
2. All trenches shall be closed at the end of each work day.

I. Responsibility for Condition of Excavation

1. The CONTRACTOR shall be responsible for the condition of all excavations made by him.

J. Excavation Support

1. The support of the excavation and all structures shall be the sole responsibility of the CONTRACTOR.
2. The CONTRACTOR shall support the sides and ends of all excavations wherever necessary with braces, sheeting, shoring or stringers, trench boxes, or other acceptable excavation support systems. All trench support systems shall be installed by men skilled in such work and shall be so arranged that it may be withdrawn as backfilling proceeds, without injury to the utility or structure constructed or to any roadbed, adjacent structure or property. Supporting methods shall be included in CONTRACTOR'S Excavation Plan.
3. Wherever necessary, in running sand, or soft ground, or for the protection of any structure or property, sheeting shall be driven without extra compensation to such a depth below the bottom of the trench as may be required or directed. Where directed by the OWNER to leave sheeting in place, payment will be made under the appropriate contingent item.
4. All work shall be performed in accordance with the latest applicable Federal, State, and local safety and health regulations.

K. Drainage and Dewatering

1. The CONTRACTOR shall grade the site as necessary to prevent surface water ponding or from flowing into the trench or other utility excavations and shall provide all necessary temporary surface drainage and keep the same operating to the satisfaction of the OWNER until permanent

drainage or finished grading and permanent surface stabilization has been completed.

2. It shall be the CONTRACTOR'S responsibility to adequately control water that may be present in the excavation. A National Pollutant Discharge Elimination System (NPDES) permit shall be obtained by the CONTRACTOR to dewater excavations from the Maryland Department of the Environment for the anticipated dewatering period. If flow is more than 10,000 gallons per day or longer than 30 days, an NPDES permit is required. Fees shall be paid by the OWNER.
3. CONTRACTOR shall provide for the disposal of water removed from excavations in such a manner not to cause damage to public or private property or to any portion of the work completed or in progress or cause any impediment to the use of any area by the public; nor shall the CONTRACTOR discharge any flushing or groundwater or any material of any nature into existing sanitary sewer system during the construction of the facilities. All water shall be discharged through an approved sediment control device and under the threshold as required by the Maryland Department of the Environment requiring a groundwater discharge permit.

L. Excavation Below Subgrade

1. The CONTRACTOR shall, without additional compensation, before any pipe or appurtenance is installed, fill all unauthorized depressions or irregularities in the bottom of excavations with aggregate fill.
2. Where the bottom of the excavations, at subgrade, is in unstable or unsuitable material, excavation shall be carried to such depth as ordered by the OWNER. The trench bottom shall be restored to subgrade with aggregate fill.

3.4 BACKFILL

- A. The CONTRACTOR shall backfill as rapidly as practicable after the installation of the utility therein, or after the excavation has served its purpose. No more than one hundred (100) feet of trench may be open at any time except as approved by the OWNER.
- B. Backfill to twelve (12) inches above top of pipe: Suitable material shall be carefully placed around and to a depth of twelve (12) inches over the pipe. These initial lifts shall be carefully placed and hand-tamped in four (4) inch layers. Care should be exercised in this operation to insure that the alignment of the utility is not disturbed.

- C. From twelve (12) inches above top of pipe to top of trench: The remainder of the trench may be backfilled in layers not exceeding the specified compaction lift depths. However, if lift thickness is followed and the specified compaction is not obtained based on the testing during backfilling, the CONTRACTOR shall, at his own expense, remove, replace, and retest as many times as is required to obtain the specified compactions. In backfilling the remainder of the trench, stones of not more than four (4) inches in largest dimension which have been taken out in excavating may be mixed with earth in an amount not exceeding twenty-five (25) percent of the backfill volume. Stones of larger size or in greater quantities shall not be used, unless directed by the OWNER. The CONTRACTOR shall not permit excavations to be used for the disposal of refuse.
- D. In paved areas, the CONTRACTOR shall furnish and backfill the trench as per the requirements of the governing regulatory agency, and/or Contract Documents.
- E. Should additional material be required or deemed unsuitable by the geotechnical engineer for backfilling, the CONTRACTOR shall obtain Borrow material from offsite sources, to complete the trench backfill. If soil removed from the trench is determined to be suitable but too wet for immediate reuse as determined by the geotechnical engineer, the CONTRACTOR may be allowed to replace with approved material at their own expense.
- F. No layer of soil shall be placed on a frozen surface of a preceding layer or on a frozen subgrade.

3.5 COMPACTION

- A. The CONTRACTOR shall, in unimproved areas outside the public rights-of way, compact each backfill layer in such a manner as to obtain a dense backfill free of voids and not susceptible to undue settlement or depression. Backfilled lifts extending to not less than one (1) foot in depth or as approved by the OWNER shall be compacted to at least ninety (90) percent of maximum density at a moisture content within five (5) percent of the optimum in accordance with ASTM D 1556. Perform density testing per ASTM D 6938 Nuclear Density for soils and aggregate. ASTM D 2950 for Bituminous pavement.
- B. Backfill for any improved area beneath aggregates, paving, or concrete specified hereinafter shall be backfilled with suitable material and compacted in lifts not to exceed eight (8) inches in thickness to at least ninety-five (95) percent of maximum density at a moisture content within five (5) percent of the optimum in accordance with ASTM D 1556. All compaction must comply with the aforementioned or the latest edition of the governing applicable road code or permit whichever is most stringent. CONTRACTOR shall hire an independent testing agency to provide suitable Proctor curves for each type of backfill material used in the project. CONTRACTOR'S testing agency shall perform density tests at a rate of one (1) test per every one hundred (100) feet, for each eight (8) inch

lift of material placed. The CONTRACTOR'S independent testing agency shall be subject to approval by the OWNER. Perform density testing per ASTM D 6938 Nuclear Density, ASTM D 2950 for Bituminous pavement.

- C. Insofar as the specifications for mechanical tamping equipment or methods are concerned, no specific requirements are included in these Specifications other than that the use of any particular type of equipment is subject to the approval of the OWNER and that the OWNER has sole right to judge what equipment is suitable for the uses intended.

3.6 MAINTENANCE OF BACKFILLED TRENCH

- A. All backfilled trenches shall be maintained in an acceptable condition by and at the expense of the CONTRACTOR for a period of four months following the date of conditional acceptance of the work. Retainage may be held until the end of this period.
- B. If the CONTRACTOR fails to fill depressions in the backfilled trench within twenty-four (24) hours after the receipt of notice from the OWNER, the OWNER may refill said depressions and the cost thereof shall be retained from any monies due the CONTRACTOR, under the Contract. In case of emergency, the OWNER may refill any dangerous depression or protect with lights wherever necessary without giving previous notice to the CONTRACTOR; and the cost of so doing shall be retained from any monies due to become due the CONTRACTOR under the contract.
- B. The CONTRACTOR shall be responsible for any injury or damage that may result from lack of maintenance of any refilled excavation at any time prior to final acceptance of the Project.

** End of Section **

This page intentionally left blank

SECTION 02 74 10

ASPHALT PAVING

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Provide Super-pave asphalt pavement according to the materials, workmanship, and other applicable requirements of the Maryland State Highway Administration Standard Specifications for Constructions and Materials. This Section includes the following:
 - 1. Cold milling of existing hot-mix asphalt pavement
 - 2. Hot-mix asphalt patching
 - 3. Hot-mix asphalt paving
 - 4. Pavement-marking paint.

1.2 DEFINITIONS

- A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.
- B. MDSHA: Maryland State Highway Administration.

1.3 SUBMITTALS

1.3.1 Product Data

- A. For each type of product indicated, include technical data and tested physical and performance properties.
 - 1. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work
 - 2. Material Certificates: For each paving material, signed by manufacturers
 - 3. Density test results
 - 4. Lab testing results from field sampling
 - 5. Plant print out during production of all types of mixes.

1.4 PROJECT CONDITIONS

1.4.1 Environmental Limitations

- A. Do not apply asphalt materials if subgrade is wet or excessively damp, or if the following conditions are not met:
 - 1. Prime Coat: Minimum surface temperature of 60 degrees Fahrenheit
 - 2. Tack Coats: Minimum surface temperature of 60 degrees Fahrenheit
 - 3. Slurry Coat: Comply with weather limitations of ASTM D3910
 - 4. 12.5 MM Asphalt Base Course: Minimum surface temperature of 40 degrees Fahrenheit and rising at time of placement
 - 5. 9.5 MM Asphalt Surface Course: Minimum surface temperature of 60 degrees Fahrenheit at time of placement
 - 6. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 55 degrees Fahrenheit for water-based materials, and not exceeding 95 degrees Fahrenheit.

PART 2 – MATERIALS

2.1 AGGREGATES

2.1.1 General

- A. Use materials and gradations that have performed satisfactorily in previous installations.

2.1.2 Coarse Aggregate

- A. See MDSHA Specifications.

2.1.3 Fine Aggregate

- A. See MDSHA Specifications.

2.2 ASPHALT MATERIALS

2.2.1 Asphalt Binder

- A. See MDSHA Specifications.

2.2.2 Asphalt Cement

- A. See MDSHA Specifications.

2.2.3 Tack Coat

- A. See MDSHA Specifications.

2.3 AUXILIARY MATERIALS

2.3.1 Pavement-Marking Paint

- A. Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of less than 3 minutes.

1. Color: White, Yellow, as indicated.

2.4 MIXES

The Contractor shall provide 12.5 MM Super-pave base course, and 9.5 MM Super-pave surface course in accordance with MDSHA Specification.

PART 3 – EXECUTION

3.1 COLD MILLING

- A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross-sections indicated.
 1. Mill to a depth of 2 inches.
 2. Mill to a uniform finished surface free of excessive gouges, grooves, and ridges.
 3. Control rate of milling to prevent tearing of existing asphalt course.
 4. Repair or replace curbs, manholes, and other construction damaged during cold milling.
 5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
 6. Transport milled hot-mix asphalt to asphalt recycling facility.
 7. Keep milled pavement surface free of loose material and dust.

3.2 PATCHING

3.2.1 Hot-Mix Asphalt Pavement

- A. Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

3.2.2 Portland Cement Concrete Pavement

- A. Break cracked slabs and roll as required to reseat concrete pieces firmly.
 - 1. Pump hot undersealing asphalt under rocking slab until slab is stabilized or, if necessary, crack slab into pieces and roll to reseat pieces firmly.
 - 2. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.

3.2.3 Tack Coat

- A. Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gallon per square yard.
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.2.4 Patching

- A. Fill excavated pavements with 12.5 MM Super-pave base course in required maximum lifts for full thickness of patch and, while still hot, compact flush with adjacent surface. Follow with 9.5 MM Super-pave surface course per plan detail, finished flush with existing pavement.

3.3 HOT-MIX ASPHALT PLACEMENT

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross-section, and thickness when compacted.

1. Place 12.5 MM Super-pave base course in number of lifts and thicknesses indicated in plan detail for type of mix.
 2. Place 9.5 MM Super-pave base course in single lift per plan detail.
 3. Spread mix at minimum temperature of 275 degrees Fahrenheit.
 4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
 5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.4 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
1. Clean contact surfaces and apply tack coat to joints.
 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
 3. Offset transverse joints, in successive courses, a minimum of 24 inches.
 4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for "Resumption of Paving Operations."
 5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
 6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.5 COMPACTION

3.5.1 General

- A. Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

- 1. Complete compaction before mix temperature cools to 185 degrees Fahrenheit.

3.5.2 Breakdown Rolling

- A. Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

3.5.3 Intermediate Rolling

- A. Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

- 1. Average Density: 96 percent of reference laboratory density according to ASTM D6927, but not less than 94 percent nor greater than 100 percent.
 - 2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D2041, but not less than 90 percent nor greater than 96 percent.

3.5.4 Finish Rolling

- A. Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

3.5.5 Edge Shaping

- A. While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

3.5.6 Repairs

- A. Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

3.5.7 Protection

- A. After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- B. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.6 INSTALLATION TOLERANCES

3.6.1 Pavement Thickness

- A. Compact each course to produce the thickness indicated within the following tolerances:
 - 1. Base Course: Plus or minus $\frac{1}{2}$ inch
 - 2. Surface Course: Plus $\frac{1}{4}$ inch, no minus.

3.6.2 Pavement Surface Smoothness

- A. Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
 - 1. Base Course: one-quarter $\frac{1}{4}$ inch
 - 2. Surface Course: $\frac{1}{8}$ inch
 - 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is $\frac{1}{4}$ inch.

3.6.3 Traffic-Calming Devices

- A. Compact and form asphalt to produce the contour indicated and within a tolerance of plus or minus $\frac{1}{8}$ inch of height indicated above pavement surface.

3.7 PAVEMENT MARKING

Do not apply pavement-marking paint until layout, colors, and placement have been verified with the ENGINEER. Allow paving to age for thirty (30) days before starting pavement marking. Sweep and clean surface to eliminate loose material and dust. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mil. Broadcast glass beads uniformly into wet pavement markings at a rate of 6 pounds per gallon.

3.8 DISPOSAL

Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill. Do not allow milled materials to accumulate onsite.

+ + END OF SECTION + +

SECTION 02 80 00
RESTORATION

PART I – GENERAL

1.1 DESCRIPTION

Restoration shall include, but not necessarily be limited to all cleanup and disposal of waste materials and the restabilization of disturbed areas including paved areas, non-paved areas, concrete improvements, street signs, mail boxes, fences, trees, shrubs and other improvements whether or not shown in the Contract Documents.

1.2 QUALITY ASSURANCE

The COUNTY will inspect all materials before, during and after installation to ensure compliance with the Contract Documents.

PART II – PRODUCTS

2.1 GENERAL

Materials shall be furnished in accordance with the Contract Documents and the current edition of the Approved List of Suppliers and Materials for Water and Sewer Main Construction.

2.2 MATERIALS FURNISHED BY THE COUNTY

The COUNTY will not furnish any materials for restoration other than those acceptable materials which are available from the trench excavation limits.

PART III – EXECUTION

3.1 GENERAL

After the completion of backfilling, all materials not used therein shall be removed and disposed of in such a manner and at such point or points as shall be approved or directed by the COUNTY; and all roads, sidewalks, and other places on the line of the work shall be left free of debris, clean, and in good order. Said cleaning-up shall be done by the CONTRACTOR without extra compensation; and if he shall fail to do such work within twenty-four (24) hours after receipt of notice, the COUNTY may arrange to have the cleaning-up done by others; and the cost shall be retained out of the monies due or to become due to the CONTRACTOR under the Contract. In case of emergency, the COUNTY may restore or remove and dispose of materials wherever necessary without giving previous notice to the CONTRACTOR, and the cost of doing so shall be retained from any monies due to become due the CONTRACTOR under the Contract.

3.2 PAVED AREAS

1. Immediately upon completion of the trench backfill and compaction as previously specified, the CONTRACTOR shall provide graded aggregate subbase, temporary bituminous surfacing material as per the Contract Documents and/or direction of the governing regulatory agency.
2. Weather permitting, the CONTRACTOR shall remove and dispose of the temporary surfacing materials, cut-back the edge of the existing pavement as per the Contract Documents, and permanently patch-pave the area as specified in the Contract Documents and/or governing agency direction. This shall be done within thirty (30) calendar days after backfilling and compacting the trench as described in the paragraph above or within the time period specified by the governing agency.

3.3 CONCRETE IMPROVEMENTS

Sidewalks, curbs, combination curb and gutter, drive aprons, and other concrete improvements removed, soiled, or damaged by the CONTRACTOR'S activities shall be cleaned or replaced by the CONTRACTOR in kind, or as directed by the COUNTY and/or Contract Documents without extra compensation.

3.4 NON-PAVED AREAS

1. Immediately upon completion of the trench backfill and compaction as previously specified, the CONTRACTOR shall temporarily stabilize the area in accordance with the Contract Documents.
2. Weather permitting, within 14 days after the completion of trench backfill and compaction, the CONTRACTOR shall permanently stabilize the area with seeding and mulching or sodding, as noted in the Contract Documents.

3.5 STREET SIGNS, MAIL BOXES, FENCES, SHRUBS, TREES, AND OTHER IMPROVEMENTS

1. Existing street signs and traffic control devices stored or relocated by the CONTRACTOR will be reset by the CONTRACTOR after construction in the area is complete and the work approved by the COUNTY.
2. In case of emergency, the COUNTY may reset street signs and traffic control devices wherever necessary without giving previous notice to the CONTRACTOR; and the cost of doing so shall be retained from any monies due to become due the CONTRACTOR under the contract.
3. Mail boxes shall be carefully removed by the CONTRACTOR to the extent required to permit construction operations and as directed by the Postal Service. It shall be the CONTRACTOR'S responsibility to temporarily reset mail boxes during construction to

maintain service until the boxes are permanently reset in their original locations or at locations designated by the Postal Service. The CONTRACTOR shall comply with all Postal Service regulations regarding the location and height of all mail boxes disturbed by his activities.

4. Existing fences, paper boxes, signs, property markers, and other similar items shall be carefully removed by the CONTRACTOR to the extent required to permit construction operations and as directed by the COUNTY. The CONTRACTOR shall safely store all items during the time that they are down and when possible, re-erect them in the original locations or at locations designated by the COUNTY.
5. Shrubs, hedges, and other plantings shall be transplanted with sufficient earth to insure that no damage to their major root system occurs. After transplanting has been accomplished, it shall be the CONTRACTOR'S responsibility to water all plants until their growth is established.

+ + END OF SECTION + +

This page intentionally left blank

DIVISION 3

SECTION 03 05 16	PRECAST CONCRETE STRUCTURES
SECTION 03 10 00	CONCRETE FORMING AND ACCESSORIES
SECTION 03 20 00	CONCRETE REINFORCING
SECTION 03 30 00	CAST-IN-PLACE CONCRETE

This page intentionally left blank

SECTION 03 05 16
PRECAST CONCRETE STRUCTURES

PART 1 GENERAL

1.1 DESCRIPTION

- A. This Section includes requirements for providing precast vaults.

1.2 QUALITY ASSURANCE

- A. Precast concrete shall be supplied by a qualified firm with a minimum of two (2) years of continuous operation experience.
- B. The OWNER'S REPRESENTATIVE may inspect and test all precast structures, fittings, and joint material after delivery to the site or at the factory. The manufacturer or supplier shall furnish materials for the tests and labor as required to assist the OWNER'S REPRESENTATIVE with the tests. The OWNER'S REPRESENTATIVE may perform on a continual basis, plant certification and in-process inspections.
- C. The manufacturer or supplier shall provide the OWNER'S REPRESENTATIVE, prior to delivery of precast structures, a Certificate of Compliance with the CONTRACTOR'S name, section sizes, footage or number of pieces required to fill the order.
- D. Only the OWNER'S REPRESENTATIVE approved precast concrete structures shall be shipped to the contract site.

1.3 SUBMITTALS

- A. Submit the following CONTRACTOR'S Drawings in accordance with Section 01 33 00:
 - 1. Shop drawings showing complete details, pertinent calculations including buoyancy calculations, design loads, materials, strengths, sizes and thicknesses, joint and connection design, and details for all precast structures.
- B. Installation Methods for Precast Sections
 - 1. This submittal may be waived when the manufacturer has his recommended methods on file with the OWNER'S REPRESENTATIVE.
- C. Test Reports
 - 1. In accordance with Section 01 33 00 submit manufacturer's certified test reports specified in reference ASTM standards for vaults, inlets, and box culverts.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Precast structures are considered suitable for handling to transport to the Contract site after the concrete has cured to minimum strength of eighty (80) percent of the design strength.
- B. Delivery of precast structures shall be coordinated with installation or shall be unloaded with proper equipment along the line of Work, outside trench limits near as practicable to point of final placement. They shall be stored off the ground on wood blocks, pallets, or other appropriate means away from brush, poison oak or ivy, and in an accessible area for inspection. Excavated or other material shall not be placed over or against the stored precast structures.
- C. Precast structures and appurtenances shall be unloaded and handled with crane, backhoe, or equipment of adequate capacity, equipped with appropriate slings, and lifting devices to protect the material from damage.
- D. If damage occurs and is deemed repairable, it shall be repaired as directed by the OWNER'S REPRESENTATIVE in accordance with approved manufacturer's recommendations. If damage is not repairable in the opinion of the OWNER'S REPRESENTATIVE, such items of material will be rejected and shall be removed and replaced at the CONTRACTOR'S expense.

PART 2 PRODUCTS

2.1 PRECAST CONCRETE VAULTS

- A. Precast concrete vaults shall meet requirements and configurations as indicated on the Drawings. Precast concrete vaults shall meet the requirements of ASTM C858 for Underground Precast Concrete Utility Structures and AASHTO and DOT requirements.
- B. Each precast concrete vault section shall be clearly marked on the inside with the following information: ASTM Designation, vault or inlet size, date of manufacture, contract station location, and name or trademark of manufacture. Slabs shall be marked on the top and bottom surfaces.
- C. Concrete shall be designed to obtain a strength of 4,500 psi in twenty-eight (28) days.

2.2 PIPE PENETRATION SLEEVES

- A. Pipe penetration sleeves shall be located as indicated on the Drawings. Sleeves shall be cast into the inlet, vault, and/or manhole at manufacture and shall produce a positive watertight connection.
- B. Connectors shall be in conformance with ASTM C923 for Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes. Connectors may be Z-Lok model manufactured by A-LOK Products, Inc., or equal.

2.3 VAULT ACCESS DOORS

- A. Vault access doors shall be as shown on the Contract Drawings. Doors shall have heavy duty stainless steel hinges with stainless steel pins, drain coupling, standard slam lock, automatic hold open arm, with aluminum channel frame with recessed anchors, heavy duty check chain and stainless steel lifting mechanism. Manufacturer shall add appropriate number of hinges and reinforcement to provide the required design load. CONTRACTOR shall coordinate shop drawings of concrete vault with access door dimensions and mounting requirements. CONTRACTOR shall provide professional engineers seal on access vault shop drawing certifying it meets required structural capacity for traffic.

2.4 BEDDING

- A. Granular bedding shall be size 67 stone.

2.5 SOURCE QUALITY CONTROL

- A. Concrete compressive strength shall be determined from compressive tests made on concrete cylinders. Unless otherwise specified, the manufacturer shall retain an independent testing facility approved by the OWNER'S REPRESENTATIVE for the purpose of molding, capping, and testing concrete cylinders in accordance with appropriate ASTM requirements. The OWNER'S REPRESENTATIVE reserves the right to require core samples of finished products when he deems it necessary. When requested, the manufacturer or supplier shall provide the OWNER'S REPRESENTATIVE compressive test specimens for testing. This is in addition to the above requirements and does not relieve the manufacturer or supplier of the responsibility of monitoring the quality of the concrete as specified.

PART 3 EXECUTION

3.1 PRECAST CONCRETE VAULTS

- A. Place axis of precast vaults directly over the centerline of the pipes unless otherwise specified.
- B. Vault sections shall be installed in accordance with the vault manufacturer's written assembly instructions.

** End of Section **

This page intentionally left blank

SECTION 03 10 00
CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work to be furnished under this Section includes, but is not limited to the designing, furnishing, fabricating, erecting, and bracing required for the various concrete work on the site.

1.2 SUBMITTALS

- A. The CONTRACTOR shall prepare and submit for approval complete detailed plans of all formwork to be constructed. Submittals shall be in accordance with Section 01 33 00 of these Specifications. He shall not proceed with formwork construction until his plans have been approved. This requirement may be waived for minor foundations (less than one [1.0] cubic yard) only upon receipt of written approval from the ENGINEER. However, approval of these plans or lack thereof shall not relieve the CONTRACTOR of complete responsibility for the safety and adequacy of all formwork.

1.3 DESIGN CRITERIA

- A. Forms shall be designed in accordance with American Concrete Institute (ACI) 347 and such that the forms can be removed without injuring the concrete. The design and engineering of the formwork shall be the responsibility of the CONTRACTOR.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Forms for concrete work shall conform to ACI Standard 318 and shall be constructed of wood, steel, or other approved materials. Surfaces of forms shall be free from irregularities, dents and sags. Lumber used in forms shall be dressed to a uniform thickness, evenly matched and free from loose knots and other imperfections that would produce defects in the finished concrete surfaces. The CONTRACTOR may elect to employ prefabricated forms, upon prior approval as to both type and material, for concrete walls and structures. In either case a plain smooth surface of the desired contour must be obtained. For surfaces to be given a rubbed finish the material shall be heavy plywood unless otherwise specifically approved. For curved or special surfaces the above requirements may be modified.

- B. Form surfaces in contact with concrete shall be treated with an effective bond-breaking form coating, in accordance with Section 3.4 of ACI 347. Forms shall be designed to permit easy removal. Prying against the face of the concrete will not be allowed. Only wooden wedges shall be used.
- C. Plywood forming shall be B-B Plyform Class 1 Exterior, as manufactured and specified by the American Plywood Association.
- D. Form ties, spreaders, and other form accessories shall be commercial brands of standard manufacture. Form ties and accessories shall be of such design that upon removal of forms, no metal shall be less than one and a half (1-1/2) inch from the surface of concrete. All tie holes shall be filled entirely.

PART 3 EXECUTION

3.1 FABRICATION AND ERECTION

- A. The form material shall be placed so a smooth surface free from irregularities is obtained. Sheets of material shall be placed so that joints are in regular and true horizontal and vertical lines. Full sized plywood sheets shall be used except where a single smaller piece will cover an entire area. Where form lining is used it will be used in pieces as large as possible. All joints shall be solidly backed, butted tight together and sealed with white lead paste or other approved crack fillers. All holes shall be filled as well as depressions or hammer marks so that the completed surface is as smooth as possible. When steel forms are used the panels shall be as large as practical and of sufficient gage to prevent surface irregularities. Panels shall be assembled in uniform patterns and firmly locked and braced together to form a smooth surface. Bent or irregular panels will not be used. Round fiber column forms shall be furnished full height and shall be fitted with circular wooden templates at top and bottom and with wooden collars at intermediate points. Fiber forms shall be removed no later than ten (10) days after pouring.
- B. All lumber shall be free from knotholes, loose knots, cracks, splits, warps, or other defects impairing the strength or the appearance of the finished structure.
- C. The forms shall be built true to line and braced in a substantial and unyielding manner. They shall be mortar tight and shall be thoroughly soaked with water to close cracks due to shrinkage.
- D. Dimensions affecting the construction of subsequent portions of the work shall be carefully checked after the forms are erected and before any concrete is placed. The interior surfaces of the forms shall be adequately oiled, greased, or soaped to ensure nonadhesion of mortar. Form plywood and/or lumber which is used a second time shall be free from bulge, warp or damage and shall be thoroughly cleaned. The forms shall be inspected immediately preceding the placing of

concrete and any defects shall be remedied and all dirt, sawdust, shavings, or other debris within the forms shall be removed.

- E. Blocks and bracing shall be removed with the forms and in no case shall any portion of the wood forms be left in the concrete. Special attention shall be paid to the ties and bracing and when forms appear to be insufficiently braced or unsatisfactorily built, before or during construction, the work will be ordered stopped until the defects have been corrected. The forms shall be so constructed that the finished concrete shall be of the form and dimensions shown on the plans and true to line and grade.
- F. Securely install in the formwork required inserts, anchors, sleeves, and other items specified under other sections or as shown on the Contract Drawings. Wherever practicable, securely fasten embedded items to reinforcing steel.
- G. Set edge forms and screed to produce the indicated elevations and contours, and secure to prevent displacement during placing and consolidation of concrete.
- H. Construct formwork so as to result in concrete surfaces conforming to the tolerances specified herein.
- I. Concrete Tolerances
 - 1. Variations from the plumb:
 - In any 10 ft of length.....1/4 in.
 - Maximum for entire length 1 in.
 - 2. Variation from the level or from the grades indicated on the drawings.
 - In any 10 ft of length.....1/4 in.
 - In any bay or in any 20 ft of length....3/8 in.
 - Maximum for entire length 3/4 in.
 - 3. Variation of linear building lines from
 - Established position in plan 1/2in.
 - 4. Variation in cross-sectional dimensions of columns and beams and in the thickness of slabs and walls.
 - Minus 1/4 in.
 - Plus.....1/4 in.

5. Footings:

- a. Variation in dimensions in plan, when formed.

Minus 1/2 in.

Plus.....2 in.

- b. Variation in dimensions in plan against unformed excavation.

Minus 1/2 in.

Plus.....3 in.

3.2 REMOVAL OF FORMS, FALSEWORK, AND CENTERING

- A. Unless earlier removal is approved by the ENGINEER, maintain forms, falsework and centering in place until the concrete has attained the minimum of forty (40) percent of specified design strength.
- B. Do not disturb or remove forms until the concrete has hardened sufficiently to permit form removal with complete safety.
- C. Do not remove shoring until the member has acquired sufficient strength to support its own weight, the load upon it, and the added load of construction.
- D. Do not strip floor slabs in less than two (2) days.
- E. Do not strip vertical concrete in less than seven (7) days.

** End of Section **

SECTION 03 20 00
CONCRETE REINFORCING

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work to be performed under this Section includes, but is not limited to the furnishing, fabricating, bending and placing of all steel reinforcement as shown on the Contract Drawings and as specified herein.
- B. Details of concrete reinforcement and accessories not included in this Section shall be in accordance with American Concrete Institute (ACI) 315-80.

1.2 RELATED WORK SPECIFIED ELSEWHERE IN THESE SPECIFICATIONS

- A. Section 03 10 00, Concrete Forming and Accessories.

1.3 SUBMITTALS

- A. Shop drawings are required for all reinforcement and shall be in accordance with Section 01 33 00, as well as ACI 315-80, manual of standard practice for detailing concrete structures.
- B. Furnish certified copy of mill tests on each heat, showing chemical and physical analysis.

PART 2 PRODUCTS

- A. Reinforcing bars shall be new, intermediate grade billet steel, deformed, of domestic manufacture and in accordance with ASTM Designation A 615, Grade 60. Bars shall be of the sizes, shapes, laps, spacings, and clearances as shown on the Contract Drawings and detailed in accordance with the latest applicable provisions of ACI 318 and ACI 315.
- B. Metal accessories shall be in accordance with ACI 315 and shall include spacers, bolsters, chairs, tie bars, support bars, and all other items necessary for the proper support and location of the reinforcement and forms. All metal accessories shall be employed. No metal accessories shall be exposed on the surface of the finished concrete.

PART 3 EXECUTION

3.1 BONDING AGENT

- A. A bonding agent shall be used for:
 - 1. Vertical surfaces of concrete against which new concrete is to be placed.
 - 2. A thin uniform coating of bonding agent shall be brushed onto the prepared surface immediately before placing fresh concrete. Bonding agents shall be mixed by means of a mixer. Any bonding agent not used within thirty (30) minutes of mixing shall be discarded. Bonding agent that has dried shall be removed and replaced prior to placing concrete against it.

3.2 ADHESIVE DOWELS

- A. The CONTRACTOR shall drill holes to the required dimensions, clean holes, place dowel adhesive, and properly position the dowels as specified in the Contract Documents. Core drilling of the dowel holes shall not be permitted.
- B. Steel reinforcement and other existing embedments shall not be cut or damaged by the drilling process. Prior to drilling holes, the CONTRACTOR shall locate existing steel reinforcement using a cover meter, utility ducts, post tensioning hardware, and any unsound concrete in the vicinity of the dowel locations. If any of the above is encountered during drilling operations, the ENGINEER shall be notified immediately.
- C. The CONTRACTOR'S operations shall not cause spalling, cracking, or other damage to the surrounding concrete. Concrete spalled or otherwise damaged by the CONTRACTOR'S operations shall be repaired in a manner acceptable to the ENGINEER. The CONTRACTOR shall clean the holes using compressed air to remove all deleterious material, including dust and debris, and shall dry them prior to placing the dowel adhesive. Holes that are started but not completed shall be cleaned and filled with a proprietary patching material.
- D. The handling and placement of the dowel adhesive shall conform to the manufacturer's written instructions. All excess dowel adhesive shall be struck-off flush with the concrete surface and removed from the surrounding concrete surface area.
- E. Dowels shall be clean and free of deleterious material.
- F. The CONTRACTOR shall maintain dowels in the proper position during the setting of the dowel adhesive and shall prevent the loss of dowel adhesive from the holes.

3.3 FABRICATION

- A. Detailing and fabrication of reinforcement shall be in accordance with the latest editions of ACI 315 and ACI 301.

3.4 DELIVERY, STORAGE, AND HANDLING

- A. Immediately after delivery, reinforcing steel shall be sorted for size, shape, and length or by final usage. Steel shall be handled utilizing equipment and procedures to prevent bending, kinking, or damaging the steel. Reinforcing steel shall be stored on racks clear of the ground to protect it at all times from the weather. Sufficient supports shall be used to prevent damage to the steel.

3.5 PLACING

- A. Only material free from loose rust, scale, grease, or other adhering substances shall be placed in the forms. It shall be placed in exact positions and spacing shown. Spacing between forms and bars shown shall be maintained. Securely fasten in position so materials do not become displaced during placing of concrete. Cleaning, bending, placing, and splicing of reinforcement shall be done in accordance with requirements of the Contract Drawings and approved shop drawings. Mesh reinforcement in slabs shall have sides and ends lapped not less than one mesh. All mesh in slabs on grade shall be placed in top half of slabs.

3.6 CLEAR COVER

- A. All reinforcement shall have a clear cover measured from the outside of the bar to the concrete surface as listed below, unless otherwise noted on Contract Drawings.
 - 1. Concrete deposited against the ground shall be three (3) inches.
 - 2. Formed surfaces exposed to weather or in contact with the ground or process liquid shall be two (2) inches.
 - 3. Tops of Slabs
 - a. #6 through #18 bars shall be two (2) inches
 - b. #5 Bar, W31 or D31 wire and smaller one and one-half (1-1/2) inches.

3.7 SPLICING

- A. Where single lengths of bars are not available, shorter bars may be used. Splices shall overlap as shown on drawings or as specified in ACI 318 and ACI 315. Locations of splices are to be approved by ENGINEER.

3.8 INSERTS AND FASTENING DEVICES FOR OTHER WORK

- A. The CONTRACTOR shall provide for installation of inserts, conduit, pipe sleeves, drains, hangers, metal ties, anchors, bolts, angle guards, and other fastening devices required for attachment of other work. Reinforcing shall be properly located in cooperation with other trades and secured in position before concrete is poured.
- B. Sufficient time between erection of forms and placing of concrete shall be given to various trades to permit proper installation of their work. See Contract Drawings and other sections of these Specifications for extent, location, and details of items to be embedded or placed in concrete.
- C. All sleeves, chases, inserts, hangers, etc., which are provided and placed in forms by various trades shall be maintained in position and protected until concreting is completed.

3.9 INSPECTION

- A. All reinforcement shall be subject to inspection by the ENGINEER after placement in the forms. Approval of ENGINEER shall be obtained prior to pouring concrete.

** End of Section **

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope

1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified and required to furnish and install cast-in-place concrete and related materials.

B. Coordination

1. Review installation procedures under other sections and coordinate the installation of items that must be installed in the concrete.

1.2 QUALITY ASSURANCE

A. Reference Standards

1. Comply with the applicable provisions and recommendations of the following, except as otherwise shown or specified.
 - a. American Concrete Institute (ACI) 301, Specifications for Structural Concrete for Building (includes ASTM Standards referred to herein except ASTM A 36).
 - b. ACI 347, Recommended Practice for Concrete Formwork.
 - c. ACI 304, Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete.
 - d. ASTM A 36, Structural Steel.
 - e. Maryland Department of Transportation Specification Section 918, Cement Concrete Mixture.

1.3 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. All materials used for concrete must be kept clean and free from all foreign matter during transportation and handling and kept separate until measured and placed in the mixer. Bins or platforms having hard clean surface shall be provided for storage. Suitable means shall be taken during hauling, piling and handling to

ensure that segregation of the coarse and fine aggregate particles does not occur and the grading is not affected.

- B. Deliver concrete reinforcement materials to the site bundled, tagged, and marked. Use metal tags indicating bar size, lengths, and other information corresponding to markings shown on placement diagrams.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

- A. Portland Cement

- 1. ASTM C 150, Type II.

- B. Aggregates

- 1. ASTM C 33.

- a. Fine Aggregate: Clean, sharp, natural sand free from loam, clay, lumps or other deleterious substances. Dune sand, bank run sand and manufactured sand are not acceptable.
 - b. Coarse Aggregate: ASTM C 33 Clean, uncoated, processed aggregate containing no clay, mud, loam, or foreign matter, as follows:
 - i. Crushed stone, process from natural rock or stone,
 - ii. Washed gravel, either natural or crushed. Use of slag and pit or bank run gravel is not permitted.
 - c. Coarse Aggregate Size: Size to be ASTM C 33, Nos. 57 or 67, unless permitted otherwise by ENGINEER.
 - d. Water: Clean, potable.
 - e. Air-Entraining Admixture: ASTM C 260.
 - f. Water-Reducing Admixture: ASTM C 494. Only use admixtures which have been tested and accepted in mix designs.

2.2 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615, Grade 60.

PART 3 EXECUTION

3.1 INSPECTION

- A. CONTRACTOR shall examine the conditions under which concrete is to be placed, and notify ENGINEER in writing of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

3.2 FORMWORK

- A. Construction so that concrete members and structures are correct size, shape, alignment, elevation and position, complying with ACI 347.
- B. Clean and adjust forms prior to concrete placement. Apply form release agents or wet forms, as required. Retighten forms during and after concrete placement if required to eliminate leaks.

3.3 REINFORCEMENT, JOINTS, AND EMBEDDED ITEMS

- A. Comply with the applicable recommendations of specified codes and standards, and Concrete Reinforcing Steel Institute (CRSI), Manual of Standard Practice, for details and methods of reinforcement placement and supports.
- B. Clean reinforcement to remove loose rust and mill scale, earth, ice and other materials which reduce or destroy bond with concrete.
- C. Position, support, and secure reinforcement against displacement during formwork construction or concrete placement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers, as required.
 - 1. Place reinforcement to obtain the minimum concrete coverages as shown and as specified in ACI 318. Arrange, space, and securely tie bars and bar supports together with sixteen (16) gage wire to hold reinforcement accurately in position during concrete placement operations. Set with ties so that twisted ends are directed away from exposed concrete surfaces.
 - 2. Reinforcing steel shall not be secured to forms with wire, nails or other ferrous metal. Metal supports subject to corrosion shall not touch formed or exposed concrete surfaces.
- D. Concrete shall not be placed until the reinforcing steel is inspected and permission for placing concrete is granted by ENGINEER. All concrete placed in violation of this provision will be rejected.

- E. Installation of Embedded Items: Set and building into the Work anchorage devices and embedded items required for other Work that is attached to, or supported by cast-in-place concrete.

3.4 CONCRETE AND PLACEMENT

- A. Proportioning and Design of Mix:
 - 1. Minimum compressive strength at 28 days: 4,000 psi.
 - 2. Maximum water cement ratio by weight: 0.50.
 - 3. Minimum cement content: 560 pounds per cubic yard.
 - 4. Normal weight: 145 pounds per cubic foot.
 - 5. Use air-entraining admixture in all concrete: provide not less than four (4) percent or more than eight (8) percent entrained air for concrete exposed to freezing and thawing, and from two (2) percent to four (4) percent for other concrete.
 - 6. Calcium Chloride: Do not use calcium chloride in concrete, unless otherwise authorized in writing by ENGINEER. Do not use admixtures containing calcium chloride.
 - 7. Slump Limits: At point of placement, not less than two (2) inches and not more than five (5) inches.
- B. Job-Site Mixing: Use drum type batch machine mixer, mixing not less than one and a half (1-1/2) minutes for one (1) cubic yard or smaller capacity. Increase mixing time at least fifteen (15) seconds for each additional cubic yard or fraction thereof.
- C. Ready-Mixed Concrete: ASTM C 94.
- D. Concrete Placement: Comply with ACI 304, placing concrete in a continuous operation within planned joints or sections. Do not begin placement until work of other trades affecting concrete is completed.
- E. Consolidate placed concrete using mechanical vibrating equipment with hand rodding and tamping, so that concrete is worked around reinforcement and other embedded items and into all parts of forms.
- F. Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placement, and curing.

1. In cold weather comply with ACI 306.
2. In hot weather comply with ACI 305.

3.5 QUALITY OF CONCRETE WORK

- A. Make all concrete solid, compact and smooth, and free of laitance, cracks and cold joints.
- B. Cut out and properly replace to the extent ordered by ENGINEER, or repair to the satisfaction of ENGINEER, surfaces which contain cracks or voids, are unduly rough, or are in any way defective. Patches or plastering will not be acceptable.
- C. Repair, removal, and replacement of defective concrete as ordered by ENGINEER shall be at no additional cost to OWNER.

3.6 CURING

- A. Curing: Begin initial curing as soon as free water has disappeared from exposed surfaces. Keep continuously moist for not less than seventy-two (72) hours. Continue curing use of moisture-rating cover or membrane-forming curing compound. Cure formed surfaces by moist curing until forms are removed. Provide protections as required to prevent damage to exposed concrete surfaces.

3.7 FINISHES

- A. Exposed to View Surfaces: Provide a smooth finish for exposed. Remove fins and projections, patch defective areas with cement grout, and rub smooth.

** End of Section **

This page intentionally left blank

DIVISION 5

SECTION 05 50 00 METAL AND GRATING FABRICATIONS

This page intentionally left blank

SECTION 05 50 00

METAL AND GRATING FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following metal fabrications:
 - 1. Rough hardware
 - 2. Loose bearing and leveling plates.
 - 3. Loose steel lintels.
 - 4. Miscellaneous framing and supports not specified in other sections.
 - 5. Shelf and relieving angles.
 - 6. Miscellaneous steel trim including steel angle corner guards, steel edgings and loading area edge angles.
 - 7. Steel Ladders

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.
- C. Samples representative of materials and finished products as may be requested by Architect.
- D. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include a list of completed projects with project name, addresses, names of architects and owners, and other information specified.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this Project with a record of successful in service performance, and with sufficient production capacity to produce required units without delaying the Work.

- B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code Steel," AWS D1.2 "Structural Welding Code Aluminum," and AWS D1.3 "Structural Welding Code Sheet Steel."

1.5 PROJECT CONDITIONS

- A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating products without field measurements. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

1.6 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages and steel weld plates and angles for casting into concrete. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 FERROUS METALS

- A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Steel Tubing: Product type (manufacturing method) and as follows:
 - 1. Cold Formed Steel Tubing: ASTM A 500.
 - 2. Hot Formed Steel Tubing: ASTM A 501.
 - a. For exterior installations and where indicated, provide tubing with hot dip galvanized coating per ASTM A 53.
- D. Steel Pipe: ASTM A 53, standard weight (schedule 40), unless otherwise indicated, or another weight required by structural loads.
 - 1. Black finish, unless otherwise indicated.

- E. Cast in Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as required, hot dip galvanized per ASTM A 153.
- F. Welding Rods and Bare Electrodes: Select according to AWS specifications for the metal alloy to be welded.

2.2 PAINT

- A. Shop Primer for Ferrous Metal: Fast curing, lead and chromate free, universal modified alkyd primer complying with performance requirements of FS TT P 664, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field applied topcoats despite prolonged exposure.
- B. Galvanizing Repair Paint: High zinc dust content paint for reglazing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD P 21035 or SSPC Paint 20.
- C. Bituminous Paint: Cold applied asphalt mastic complying with SSPC Paint 12, except containing no asbestos fibers.

2.3 FASTENERS

- A. General: Provide plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating, for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon head bolts, ASTM A 307, Grade A (ASTM F 568, Property Class 4.6), with hex nuts, ASTM A 563 (ASTM A 563M), and, where indicated, flat washers.
- C. Machine Screws: ANSI B18.6.3.
- D. Lag Bolts: ANSI B18.2.1 (ANSI B18.2.3.8M).
- E. Wood Screws: Flat head, carbon steel, ANSI B18.6.1.
- F. Plain Washers: Round, carbon steel, ANSI B18.22.1 (ANSI B18.22M).
- G. Lock Washers: Helical, spring type, carbon steel, ANSI B18.21.1.
- H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed

when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Material: Carbon steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Group 1 alloy 304 or 316 stainless steel bolts and nuts complying with ASTM F 593 (ASTM F 738M) and ASTM F 594 (ASTM F 836M).

I. Toggle Bolts: FS FF B 588, tumble wing type, class and style as required.

2.4 GROUT

- A. Nonshrink, Metallic Grout: Factory packaged, ferrous aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy duty loading applications.
- B. Nonshrink, Nonmetallic Grout: Factory packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- C. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

1. Nonshrink, Metallic Grouts:

- a. Embeco 885 and 636; Master Builders Technologies, Inc.
- b. Ferrolith G Redi Mix and G NC; Sonneborn Building Products ChemRex, Inc.
- c. Hi Mod Grout; Euclid Chemical Co.
- d. Met ox; The Spray Cure Company.
- e. Supreme Plus; Cormix Construction Chemicals.

2. Nonshrink, Nonmetallic Grouts:

- a. B 6 Construction Grout; W. R. Bonsal Co.
- b. Crystex; L & M Construction Chemicals, Inc.
- c. Diamond Crete Grout; Concrete Service Materials Co.
- d. Euco N S Grout; Euclid Chemical Co.
- e. Five Star Grout; Five Star Products.
- f. Kemset; The Spray Cure Company.
- g. Masterflow 928 and 713; Master Builders Technologies, Inc.
- h. Sealtight 588 Grout; W. R. Meadows, Inc.
- i. SonogROUT 14; Sonneborn Building Products ChemRex, Inc.
- j. Supreme; Cormix Construction Chemicals.
- k. Sure grip High Performance Grout; Dayton Superior Corp.
- l. Vibropruf #11; Lambert Corp.

2.5 CONCRETE FILL

- A. Concrete Materials and Properties: Comply with requirements of Division 3 Section "Cast-in-Place Concrete" for normal weight, air entrained, ready mix concrete with a minimum 28 day compressive strength of 4,500 psi, unless higher strengths are indicated.

2.6 FABRICATION, GENERAL

- A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.
- B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Allow for thermal movement resulting from a 100 deg F change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening of joints, and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.
- E. Shear and punch metals cleanly and accurately. Remove burrs.
- F. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- G. Remove sharp or rough areas on exposed traffic surfaces.
- H. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.
- I. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat head (countersunk) screws or bolts. Locate joints where least conspicuous.

- J. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- K. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- L. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- M. Fabricate joints that will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.

2.7 ROUGH HARDWARE

- A. Furnish bent, or otherwise custom fabricated, bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures.
- B. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable iron washers for heads and nuts that bear on wood structural connections and furnish steel washers elsewhere.

2.8 STEEL LADDERS

- A. General: Fabricate ladders for the locations shown, with dimensions, spacings, details, and anchorages as indicated. Comply with requirements of ANSI A14.3.
- B. Siderails: Continuous, steel, $\frac{1}{2}$ by 2 $\frac{1}{2}$ inch flat bars, with eased edges, spaced 18 inches apart.
- C. Bar Rungs: $\frac{3}{4}$ inch diameter steel bars, spaced 12 inches o.c.
- D. Fit rungs in centerline of side rails, plug weld and grind smooth on outer rail faces.
- E. Support each ladder at top and bottom and at intermediate points spaced not more than 5 feet o.c. with welded or bolted steel brackets.
 - 1. Size brackets to support design dead and live loads indicated and to hold centerline of ladder rungs clear of the wall surface by not less than 7 inches.
 - 2. Extend side rails 42 inches above top rung, and return rails to wall or structure unless other secure handholds are provided. If the adjacent structure does not extend above the top rung, goose neck the extended rails back to the structure to provide secure ladder access.

- F. Provide nonslip surfaces on top of each rung, either by coating the rung with aluminum oxide granules set in epoxy resin adhesive, or by using a type of manufactured rung that is filled with aluminum oxide grout.
- G. Provide OSHA approved safety cages as indicated or as required by code.

2.9 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of the required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

2.10 LOOSE STEEL LINTELS

- A. Fabricate loose structural steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
- B. Weld adjoining members together to form a single unit where indicated.
- C. Size loose lintels for equal bearing of 1 inch per foot of clear span but not less than 8 inches bearing at each side of openings, unless otherwise indicated.
- D. Galvanize loose steel lintels located in exterior walls.

2.11 MISCELLANEOUS STEEL TRIM

- A. Fabricate metal protection wrap at overhead exterior doors where indicated on drawings from steel plates of .250" thick hot-rolled diamond plate steel per ASTM A786. Fabricate with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
- C. Galvanize exterior diamond plate steel.

2.12 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports for applications indicated that are not a part of structural steel framework as required to complete the Work.
- B. Fabricate units to sizes, shapes, and profiles indicated and required to receive other adjacent construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.
 - a. Except as otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1 1/4 inches wide by 1/4 inch thick by 8 inches long.

2.13 FINISHES, GENERAL

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designing finishes.
- B. Finish metal fabrications after assembly.

2.14 STEEL AND IRON FINISHES

- A. Galvanizing: For those items indicated for galvanizing, apply zinc coating by the hot dip process complying with the following requirements:
 1. ASTM A153 for galvanizing iron and steel hardware.
 2. ASTM A123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch thick or thicker.
- B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
 1. Exteriors (SSPC Zone 1B): SSPC SP 6 "Commercial Blast Cleaning."
 2. Interiors (SSPC Zone 1A): SSPC SP 3 "Power Tool Cleaning."
- C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes or to be embedded in concrete, sprayed on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC PA 1 "Paint Application Specification No. 1" for shop painting.
- D. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA a "Paint Application Specification No. 1" for shop painting. Paint embedded steel on exposed portions and initial 2" of embedded areas only.
 1. Do not paint contact surfaces which are to be welded or high-strength bolted.
 2. Apply a minimum of 2 coats of paint to surfaces which are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

- E. Application: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide a uniform minimum dry film thickness of 2.0 mils for steel prepared per SP-1 and SP-3; and 3.0 mils for steel prepared per SP-6. Use painting methods which will result in full coverage of joints, corners, edges, and all exposed surfaces.

2.15 FIBERGLASS GRATING

- A. Fiberglass grating shall be Fibergrate ® Molded Grating manufactured by Fibergrate Composite Structures Inc. or approved equal. Grating design loads shall be less than manufacturers published maximum recommended loads. Maximum recommended loads shall be determined by acoustic emission testing. Grating shall be designed for a uniform load of 100 psf or concentrated load of 300 lb. Deflection is not to exceed 0.375" or $L/D = 120$, whichever is less. The manufacturer shall certify that the stiffness of all panels manufactured are never more than 2.5% below the published load-deflection values.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.2 INSTALLATION, GENERAL

- A. Fastening to In Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors as required.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.
- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot dip galvanized after fabrication and are intended for bolted or screwed field connections.
- E. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

3.3 SETTING LOOSE PLATES

- A. Clean concrete and masonry bearing surfaces of bond reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.
- B. Set loose leveling and bearing plates on wedges or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.
 1. Use nonshrink, metallic grout in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC PA 1 requirements for touching up shop painted surfaces.
 1. Apply by brush or spray to provide a 2.0 mil minimum dry film thickness.
- B. For galvanized surfaces, clean welds, bolted connections, and abraded areas, and apply galvanizing repair paint to comply with ASTM A780.

+ + END OF SECTION + +

DIVISION 26

SECTION 26 00 00	ELECTRICAL GENERAL
SECTION 26 05 01	CONDUCTORS AND CABLES
SECTION 26 05 26	ELECTRICAL GROUNDING
SECTION 26 05 33	CONDUITS AND RACEWAY SYSTEMS
SECTION 26 05 43	UNDERGROUND DISTRIBUTION SYTEM
SECTION 26 05 53	IDENTIFICATION FOR ELECTRICAL SYSTEMS
SECTION 26 09 00	MISCELLANEOUS ELECTRICAL CONTROLS
SECTION 26 09 10	CONTROL PANELS
SECTION 26 09 16	INSTRUMENTATION
SECTION 26 09 20	HEAT TRACE
SECTION 26 21 01	INCOMING SERVICES
SECTION 26 27 16	ELECTRICAL CABINETS AND ENCLOSURES
SECTION 26 28 00	PANELBOARDS AND CIRCUIT PROTECTIVE DEVICES
SECTION 26 29 13	MOTOR CONTROLLERS
SECTION 26 32 13	ENGINE GENERATOR
SECTION 26 36 13	AUTOMATIC TRANSFER SWITCHES
SECTION 26 43 13	TRANSIENT VOLTAGE SURGE SUPPRESSION

This page intentionally left blank

SECTION 26 00 00
ELECTRICAL GENERAL

PART 1 GENERAL

1.1 SUMMARY

This Section includes general requirements for all electrical work. The Contractor shall furnish and install all materials, equipment, and appurtenances necessary for a complete and satisfactory installation of the electrical systems. The Contractor shall coordinate all electrical work required for the project. The Contractor shall provide the correct electrical feeder or branch circuit to each piece of electrical equipment whether or not shown on the drawings and check and coordinate feeder, branch circuit, and controls required with equipment provided under other specification sections.

1.2 REFERENCES

- A. Institute of Electrical and Electronics Engineers (IEEE)
- B. National Fire Protection Association (NFPA)
- C. Underwriters Laboratories, Inc. (UL)
- D. National Electrical Manufacturers Association (NEMA)
- E. American Society of Testing Materials (ASTM)
- F. Association of Illuminating companies (AEIC)
- G. Insulated Cable Engineers Association (ICEA)

1.3 SUBMITTALS

- A. Submittals shall include the following information: manufacturer's name, trade name, place of manufacture, catalog model number, complete part number, nameplate data, size, layout dimensions, capacity, project specification, and paragraph reference.
- B. Shop Drawings: Submit shop drawings in accordance with the General Conditions, the Supplementary Conditions, Section 01 33 00 Submittals, and Section 26 00 00 Electrical General. Organize similar items into a single submittal to include wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure a coordinated installation. Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices. Shop drawings shall be specific for this project. Shop drawings which provide only generic information or are of a generic nature are not sufficient. Information within the shop drawings shall be clearly marked to identify components applicable for this project. Non-applicable information shall be noted, or neatly crossed out.
- C. Manufacturer's Catalog Data: Shop drawings shall include manufacturer's published literature and catalog data for each manufactured item. Submittals for each manufactured

item shall be current manufacturer's descriptive literature of cataloged products, equipment drawings, diagrams, performance and characteristic curves, and catalog data sheets. Submittal shall include ratings, circuit diagrams, and dimensional data as a minimum.

- D. Materials List: The Contractor shall submit, along with Shop Drawings, a materials list which shall include full information, including manufacturer's complete part number, regarding all components of the equipment. Materials of construction shall be presented in the listing by ASTM reference and grade.
- E. Nameplate Information. Submit complete nameplate information for all industrial machinery. The nameplate shall include the following information:
 - 1. Supply voltage, number of phases, frequency, and full-load current.
 - 2. Maximum ampere rating of the short-circuit and ground-fault protective device
 - 3. Ampere rating of largest motor, from the motor nameplate, or load
 - 4. Short-circuit current rating of the machine industrial control panel. Short-circuit current rating shall be based on the short-circuit current rating of a listed and labeled machine control enclosure or assembly. Or the short-circuit current rating shall be as established utilizing an approved method.
 - 5. Electrical diagram number, or the number of the index to the manufacturer's electrical drawings.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Manual. Prepare operation and maintenance manuals. Submit one manual for review; then submit the remainder (quantity to be agreed between owner and contractor in advance). Include one copy of the following:
 - 1. Copy of all relevant, and previously reviewed shop drawings, with all comments addressed.
 - 2. Record (as-built) drawings, incorporating all field changes and Engineer's comments.
 - 3. Wiring diagrams incorporating all field changes and Engineer's comments.
 - 4. Manufacturer's instructions on care, operation, and maintenance of equipment.
 - 5. Narrative describing the procedures for equipment startup and operation.
 - 6. Warranty certificates.
 - 7. Spare parts list
 - 8. Complete type written operating instructions, covering all systems descriptions and operation, emergency operating instructions, and precautions.
 - 9. Copies and originals of all applicable software certificates showing proof of ownership by the owner.
 - 10. Name, address, and telephone number of supplier or representative of manufacturer for each item of equipment in Contract.

Bind all items (all unused, clean and legible) in common folder or heavy notebook covers and submit to Engineer before request for final acceptance.

- B. Affidavit of Compliance. The manufacturer shall provide an affidavit stating compliance of their equipment with all applicable provisions of this specification.
- C. Software. Submit two electronic copies of all final application software developed. Electronic copy shall be on flash drives, or other method mutually agreed upon between Engineer and Contractor. In addition to electronic copies, submit hard copy of all application software developed. For software applications of a graphical nature (such as Operator Interface Terminals or Human Machine Interfaces), hard copy submittal shall include copies of all screens.
- D. Setup Parameters. Submit printed copy of all setup parameters used for all equipment in this project. This includes, but is not limited to, all setup parameters used for the programmable controller, the operator interface terminal, the radio, the generator control panel, and any all other pertinent equipment. Include the factory default value of each parameter in this list of setup parameters.

1.5 QUALITY ASSURANCE

- A. Experience: All equipment furnished under Division 26 shall be furnished by manufacturers who have at least three years' experience in the design, production, assembly, and field service of equipment of like type and size. Products shall have been in satisfactory commercial or industrial use for two years prior to bid opening. The two-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturer's catalogs, or brochures during the two-year period. Products having less than a two-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6,000 hours, exclusive of the manufacturer's factory or laboratory tests, is furnished.
- B. Uniformity: Unless otherwise specified, equipment or material of the same type of classification, used for the same purpose shall be the product of the same manufacturer. All material shall be new and of the current design of the manufacturer providing equipment or material.
- C. Design: Equipment and accessories not specifically described or identified by manufacturer's catalog numbers shall be designed in conformity with NEMA, IEEE, or other applicable technical standards and shall have a neat and finished appearance.
- D. Installation: Erect equipment in a neat and workmanlike manner; align, level, and adjust for satisfactory operation. Install equipment so that parts are easily accessible for inspection, operation, maintenance, and repair. Minor deviations from the indicated arrangements may be made, but only after obtaining approval from the Engineer.
- E. Electrical work shall meet or exceed the latest revisions for the following standards and codes except where more stringent requirements have been specified:

1. Local Building Codes
 2. National Fire Protection Associations – NFPA
 3. National Electrical Code – NEC
 4. National Electrical Safety Code - NESC
 5. Underwriters Laboratories, Inc. – UL
 6. National Electrical Manufacturers Association – NEMA
 7. Institute of Electrical and Electronic Engineers – IEEE
 8. American Society of Testing Materials – ASTM
 9. Insulated Power Cable Engineers Association – IPCEA
 10. Association of Edison Illuminating Companies – AEIC
 11. American National Standard Institute - ANSI
- F. In general, all electrical equipment furnished shall be listed and labeled by Underwriters Laboratories, Inc. (UL), Factory Mutual (FM), Edison Testing Laboratories (ETL), or another nationally recognized testing laboratory acceptable to the County and the Engineer. Submit name of organization that will label the equipment, product, or component. Organization shall certify that the equipment meets applicable UL, ANSI, and NEMA standards.

1.6 INSPECTIONS

- A. The Contractor shall have all electrical work inspected by the following agency and this work shall pass such inspection: Independent electrical inspection agency approved by the Owner and Engineer.
- B. The Contractor shall furnish to the Engineer a certificate of compliance stating that the completed installation complies with the requirements of the National Electrical Code. This certificate shall be completed by the approved independent electrical inspection agency.

1.6 CONTRACT DRAWINGS

- A. Locations Approximate. The locations of equipment shown on the Contract Drawings are approximate only. The Contractor shall determine the exact locations of the equipment, box-outs, sleeves, and of similar items required for the coordination of electrical work with the mechanical and other work.
- B. Plan Drawings Diagrammatic. Power and Control Plans, and Lighting, Receptacle Circuit & Grounding Plans shown are diagrammatic and functional only and are not intended to show exact conduit layouts, number of fittings, or other installation details. The final determination as to routing, location, and termination shall be governed by structural conditions, obstructions, job conditions, and best industry practices. This shall not be construed to mean that the design of the system may be changed without written approval. The Contractor shall obtain shop drawings affecting all conduit locations before installation. The Contractor shall consult all drawings and specifications which may affect location of any outlet, piece of equipment, or conduit run to avoid interference with other trades. The Contractor shall furnish all labor and

materials necessary to install and place in satisfactory operation all power, control, and other electrical systems shown.

- C. Elementary Circuit Drawings and Control Panel Drawings Diagrammatic. Circuit diagrams and elementaries shown are diagrammatic and functional only and are not intended to show exact wiring, circuitry, or to be considered a substitute for wiring diagrams. Control Panel drawings, including sub-panel layout drawings, are diagrammatic and functional only and are not intended to show exact parts and locations, or to be considered a substitute for assembly drawings. The Contractor shall submit shop drawings detailing exact part selection, placement, and wiring connections.
- D. Parts lists and part numbers are included to convey design intent using actual manufactured parts. Every attempt has been made to provide a part number that may be used to order and purchase parts; but the Contractor shall be responsible for checking all part numbers to verify that all parts will perform the intended function correctly as part of an integrated system, and fit in the designated space.

1.7 CONTINUITY OF SERVICES

- A. When existing buildings are in use during construction operations, keep all existing electrical systems in operation within all rooms of buildings at all times.
- B. Provide necessary and temporary connections and relocations as required to maintain existing systems in operation.

1.8 INSTRUCTION OF OWNER'S REPRESENTATIVES

Before request for final acceptance of Work, furnish necessary skilled personnel to operate all systems. Instruct designated Owner's representative in proper operation and care of systems and equipment. Repeat instructions as required.

1.9 PROTECTED WORK

- A. Dry Locations. Dry locations are not normally subject to dampness or wetness. An area classified as dry may be temporarily subject to dampness or wetness.
- B. Wet Locations. Wet locations are areas outside, underground, in concrete slabs or masonry in direct contact with the earth, and areas subject to saturation with water or other liquids, such as a vehicle washing area and unprotected areas exposed to weather.
- C. Classified locations. In areas designated as hazardous locations and where explosion-proof equipment and work is shown or specified, all work shall meet the requirements of the National Electrical Code for Class1, Group D, Division 1 or Division 2 locations as applicable and indicated, unless otherwise noted.
- D. Corrosive Areas. Corrosive areas are areas where the potential exists for corrosive gases or liquids to come in contact and corrode equipment and materials. Corrosive Areas

shall include rooms housing chemical storage tanks or chemical feed equipment or pumps.

1.10 REMOVALS AND REPLACEMENT OF WORK

- A. All equipment and materials shown to be removed on the Contract Drawings shall become property of the Contractor and shall be removed off-site unless otherwise noted.
- B. Open conduits not used shall be capped. Spare and unused conductors shall be taped and identified at both ends.
- C. It shall be the responsibility of the Contractor to perform field verification of the existing wiring associated with the Work prior to removal of existing work and installation of new work at the existing facilities. The Contractor shall notify the Engineer prior to conducting field investigation. If discrepancies arise between the power distribution wiring connections indicated on the Contract Drawings and what is field verified, the Contractor shall immediately bring this to the attention of the Engineer.
- D. Where electrical equipment is removed or relocated, also remove all wiring back to source panelboard, MCC, switch or to last remaining device on the same circuit. Associated conduits, hangers, supports, etc. shall be removed unless otherwise noted or required to maintain the support and operation of remaining equipment.
- E. Remove all extraneous wires and exposed conduits for all mechanical, and electrical devices to be removed or abandoned.
- F. Wires shown for removal which are in underground duct banks, or embedded conduit shall be removed unless otherwise noted.
- G. Contractor shall disconnect and remove related equipment and conduit mounting hardware, equipment mounting racks, and equipment associated with materials to be removed unless otherwise required to maintain the support and operation of remaining equipment.
- H. Any conduit abandoned in concrete slabs, walls, or other inaccessible locations shall be left empty except for a nylon pull wire. Ends shall be capped with push plugs for future use.
- I. If cables cannot be removed due to a collapsed or deformed duct, or other similar reason, cut cable at duct entrance at each end and tag cable as "Abandoned Cable", "collapsed duct" or similar text. Notify the Owner of these conditions.
- J. Deliver on the premises where directed, existing material and equipment which is removed and desired by the Owner or is indicated to remain on the property of the Owner.

- K. All instrumentation equipment designated for removal shall be turned over to the Owner regardless if equipment is specifically shown or scheduled. This shall include all flow and level elements, and associated transmitters and/or electronic units.
- L. Equipment and materials not indicated for relocation, reuse, or salvage shall become the property of the Contractor and shall be removed by the Contractor from the premises and disposed of.

1.11 EQUIPMENT RELOCATIONS AND MODIFICATIONS

- A. Relocate equipment and conduits as shown on the Contract Drawings. Provide materials and hardware for patching, plugging, and refurbishing equipment intended for reuse. Provide new nameplates for reused electrical work. Perform all work and make necessary modifications to existing work as required to leave completed system in a finished and workmanlike condition.
- B. Ensure that all hardware items and replacement equipment are on hand prior to performing any demolition, modification, or remedial work.
- C. It shall be the responsibility of the Contractor to perform field verification of the existing conditions associated with the Work prior to removal of existing work and installation of new work. If discrepancies arise between the Contract Drawings and conditions verified in the field, the Contractor shall immediately bring this to the attention of the Engineer.
- D. Equipment, conduits, cables, and materials that are abandoned in place shall be provided with tags, labels, and nameplates indicating "Spare Equipment" or similar text.
- E. Contractor shall take necessary precautions to insure against damage to existing materials or equipment to remain in place, to be reused or to remain the property of the Owner. Repair or replace damaged materials and equipment at no additional cost to the Owner.
- F. Provide materials, and hardware for patching, plugging, and refurbishing equipment intended for reuse. Provide new nameplates for reused electrical work.
- G. Where the work specified herein or under other divisions necessitates relocation of existing equipment, foundations, conduits, wiring, etc., perform all work and make necessary modifications to existing work as required to leave the completed system in a finished and workmanlike condition.
- H. Rehabilitate and relocate items of equipment as required and as indicated on the Contract Drawings or specified.
- I. Fill and patch penetrations, holes, damaged surfaces, and similar area as applicable.

- J. Keep existing electrical system in operation during the progress of work. Provide temporary electrical connections to systems or equipment where necessary to maintain continuous operation until the new systems and equipment are ready for operation.
- K. Contractor shall develop a schedule power outages which are necessary to execute the work. Schedules shall be reviewed by Engineer and Owner and subject to change based on limitations required to maintain operation and to minimize the effect of the outages on operation. This may require working outside normal working hours when removing or installing equipment which will cause a partial or complete shutdown.
- L. When the work specified hereunder connects new equipment to any existing equipment, conduit, wiring, or similar object, perform necessary alterations, cuttings, fittings, etc. of the existing equipment as required to make connections between the new and existing equipment or material. The work to the existing and new equipment shall be performed in a workmanlike manner and shall be provided in a finished condition.

1.12 GROUNDING

- A. Equipment and systems shall be bonded and grounded in accordance with Article 250 of the National Electrical Code, applicable local codes, the electrical utility provider, and the manufacturer's recommendations.
- B. Ground raceways and noncurrent carrying parts of electrical equipment in accordance with NEC Article 250. Use the metallic conduit system for equipment and enclosure grounding. Grounding through the conduit system shall be in excess of any equipment grounding conductors shown on the Contract Drawings.
- C. Circuits in nonmetallic conduit shall carry one equipment grounding conductor for equipment grounding.

PART 2 PRODUCTS

2.1 CONCRETE EQUIPMENT PADS (CEP)

Provide concrete equipment pads where shown on the Contract Drawings for setting equipment enclosures, transformers, control panels, and other floor and ground mounted equipment, as well as equipment mounting racks. Concrete shall be 3000 PSI, 29 day minimum. Refer to details on electrical drawings for outdoor and indoor concrete equipment pads.

2.2 EQUIPMENT MOUNTING RACKS (EMR)

- A. Equipment mounting racks shall be provided as required to mount and support equipment and where specifically shown on the Contract Drawing details.
- B. The details shown on the Contract Drawings provide minimum requirements for the equipment mounting racks. Equipment mounting racks shall be designed to support the

required equipment. Equipment mounting racks shall be constructed to maintain a rigid installation minimizing movement and racking.

C. Materials

1. Tubing: 2" x 2" x 1/4" Aluminum Alloy (6063-T52)
2. Backplate: 1/4" thick aluminum plate (up to 24" x 24" maximum)
3/8" thick aluminum plate (for sizes larger than 24"x 24")
3. Bottom Plate: 6" x 6" x 1/2" Aluminum Alloy
4. Hardware: 3/8" stainless steel locknuts, bolts, and washers.
5. Alternatively, Thomas & Betts Kindorf channel system, with stainless steel hardware, and non-corrosive parts.

D. Assembly

1. Corners and angles shall be ground smooth and shall be free of burrs.
2. Equipment mounting racks shall be constructed as required to accommodate field conditions such as handrails, mounting against walls, or other structures.
3. Equipment mounting racks installed on unpaved surfaces or grass areas shall be provided with a concrete equipment pad. The concrete equipment pad shall extend a minimum of 6" around the perimeter of the equipment and an additional 30" (minimum) in front of the equipment to provide an area for operators to stand.
4. Equipment mounting racks shall be sized to facilitate access to the equipment controls. Controls shall be accessible in an area between 42" and 60" above finished grade.
5. Utilize 3/8" full welds as appropriate for the connection of the components.

- E. Equipment Mounting Racks installed in rooms or areas designated as "Corrosive Areas" shall be constructed of non-metallic or stainless steel components. Hardware shall also be non-metallic, stainless steel, or other material resistive to corrosion.

2.4 OUTDOOR EQUIPMENT PROTECTION (BOLLARDS)

Steel bollards shall be installed to protect outdoor transformers, emergency generators, fuel tanks, and other equipment from damage by vehicles. Bollard locations shall be as indicated on the Contract Drawings and are approximate. Placement of bollards around equipment shall be well planned so that bollards are positioned to maximize the protection to the equipment, but are not placed over ground rods, ground wires, and duct banks. Bollard locations shall also be coordinated with door swings of all enclosures. Allow all required clearances.

2.5 PADLOCKS

- A. Padlocks shall be suitable for outdoor, severe weather use and shall be provided with the following features:
1. Boron alloy-steel shackles which repel saws and bolt cutters.
 2. Dual locking shackles shall resist forcing or prying.
 3. Pick resistant spool pins.

4. Durable thermo-plastic cover to protect lock body and key cylinder from dirt, dust, and other contaminants.
 5. Special drain channels to move water through the lock body.
 6. 2-1/8 inch wide steel case and five pin W6000 removable cylinder.
 7. Changeable core
- B. Padlocks shall be “keyed alike” for similar equipment, such that all locks can be opened via the same key number. Keys shall be punched with letters as specified. Padlocks shall be provided for the following areas:
1. Each Pad Mounted Transformer (Punched: “XMFR”)
 2. Each Substation Area man-gate and vehicle gate. (Punched: “SUBST”)
 3. 10 Spare Padlocks & keys.
- C. Manufacturers
1. Master – Pro-Series 6121
 2. Or approved equal

2.6 PADLOCKS

- A. Padlocks shall be suitable for maximum security applications.
- B. Padlocks shall be provided with the following features:
1. Body - Hardened steel, fully shrouded body.
 2. Shackle - Hardened molybdenum alloy steel, nickel or chrome finish, removable shackle, which shall resist forcing or prying.
 3. Cylinder – solid brass, six pins, removable and rekeyable
 4. Cylinder Retainer Plate – Hardened steel.
 5. Pick resistant spool pins.
 6. Molded robber cover to protect keyway from the elements.
- B. Padlocks shall be “keyed alike” for similar equipment, such that all locks can be opened via the same key number. Keys shall be punched with letters as specified. Padlocks shall be provided for the following areas:
1. Each Pad Mounted Transformer (Punched: “XMFR”)
 2. Each Substation Area man-gate and vehicle gate. (Punched: “SUBST”)
 3. 10 Spare Padlocks & keys.
- C. Manufacturers
1. Stanley – S828 Professional Grade Hardened Steel Security Lock
 2. Or approved equal

2.7 PADLOCKS

- A. Padlocks shall be suitable for outdoor, severe weather use and shall be provided with the following features:
1. Body – Solid brass body.
 2. Shackle – stainless steel, removable shackle, which shall resist sawing and cutting.
 3. Cylinder Retainer Plate – Hardened steel.

4. Cylinder – solid brass, six pins, removable and rekeyable
 5. Pick resistant spool pins.
 6. Molded robber cover to protect keyway from the elements.
- B. Padlocks shall be “keyed alike” for similar equipment, such that all locks can be opened via the same key number. Keys shall be punched with letters as specified. Pad locks shall be provided for the following areas:
1. Each Pad Mounted Transformer (Punched: “XMFR”)
 2. Each Substation Area man-gate and vehicle gate. (Punched: “SUBST”)
 3. 10 Spare Padlocks & keys.
- C. Manufacturers
1. Stanley – S828 All Weather Solid Brass Security Lock
 2. Best – 21B Series
 2. Or approved equal

PART 3 EXECUTION

3.1 PAINTING OF EQUIPMENT

- A. Factory Applied. Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA ICS 6 corrosion-resistance test.
- B. Field Applied. Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria.

3.2 NAMEPLATE MOUNTING

Provide number, location, and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of two stainless steel sheet-metal screws or two stainless steel rivets.

3.3 COORDINATION

The Contractor shall coordinate all electrical work involving existing circuits and operations with the Owner for required shutdowns, conversions, and tie-ins.

**** End of Section ****

This page intentionally left blank

SECTION 26 05 01
CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 DESCRIPTION

- A. This Section includes wires, cables, and accessories as shown, specified, or required for the complete power, lighting, control, and other systems in the Contract.

1.2 REFERENCES

- A. NFPA 70 - National Electrical Code (NEC)
- B. NFPA 262 – Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces
- C. Insulated Cable Engineers Association (ICEA)
- D. Underwriters Laboratories, Inc. (UL)
- E. National Electrical Manufacturers Association (NEMA)
- F. American Society of Testing Materials (ASTM)
- G. Association of Edison Illuminating Companies (AEIC)

1.3 SYSTEM DESCRIPTION

- A. Product Requirements. Provide products as follows:
 - 1. Conductors for feeders and branch circuits 10 AWG and smaller shall be stranded.
 - 2. Control circuits shall utilize stranded conductors.
 - 3. Conductors for power and lighting circuits shall not be smaller than 12 AWG.
 - 4. Conductors for control circuits shall not be less than 18 AWG.
 - 5. Increase wire size in branch circuits to limit voltage drop to a maximum of 2.5%.
- B. Wiring Methods. Provide the following wiring methods:
 - 1. Wet or Damp Interior Locations: Use only building wire, type THHN/THWN, or XHHW insulation using raceway (PVC coated rigid metal conduit or rigid metal conduit), direct burial cable, armored cable, or metal clad cable.
 - 2. Exterior Locations: Use only building wire, type THHN/THWN, or XHHW insulation using raceway (PVC coated rigid metal conduit or rigid metal conduit), direct burial cable, service-entrance cable, armored cable, or metal clad cable.
 - 3. Underground Locations: Use only building wire, type THHN/THWN, or XHHW insulation using raceway (PVC coated rigid metal conduit or rigid metal conduit), direct burial cable, armored cable, or metal clad cable.

1.4 SUBMITTALS

- A. Prior to obtaining any material in connection with this Section, detailed shop drawings on all material shall be submitted. Submittals shall conform to the requirements of Section 01 33 00 Submittals.

- B. Submittals shall contain a material list with manufacturer data describing the material and showing its compliance with the specification, associated standards, and test requirements.
- C. Other Submittals
 - 1. Samples of any material shall be submitted upon the Engineer's request.
 - 2. A list of all test equipment shall be submitted to the Engineer for review.
 - 3. Cable testing results.
- D. For fiber optic cable, submit (in addition to the above requirements):
 - 1. Catalog data on the testing equipment.
 - 2. Complete factory test results for each cable reel stating the signal loss for each fiber in the cable.

1.5 CLOSEOUT SUBMITTALS

Provide project record documents which record actual locations of components and circuits.

1.6 QUALITY ASSURANCE

- A. Material and installation shall be in accordance with the latest revisions of the following codes, standards, and specifications, except where more stringent requirements have been specified herein:
 - 1. National Electrical Code (NEC)
 - 2. Insulated Cable Engineers Association (ICEA)
 - 3. Underwriters Laboratories, Inc. (UL)
 - 4. National Electrical Manufacturers Association (NEMA)
 - 5. American Society of Testing Materials (ASTM)
 - 6. Association of Edison Illuminating Companies (AEIC)
- B. Conductor Manufacturers. All wires and cables of like type shall be the product of one manufacturer.
- C. Manufacturer Test Requirements. Certified test reports showing compliance with applicable ICEA and UL Standards for each type of conductor shall be provided upon request.
- D. In general, all electrical equipment furnished shall be listed and labeled by Underwriters Laboratories, Inc. (UL) or another acceptable organization to the County and the Engineer. Submit name of organization that will label equipment if other than Underwriters Laboratories. Organization shall certify that the equipment meets applicable UL, ANSI, and NEMA standards.
- E. Verify that field measurements are as indicated on the drawings.

- F. Coordination. Where wire and cable destination is indicated and routing is not shown, determine routing and lengths required.

PART 2 PRODUCT

2.1 GENERAL

- A. Unless otherwise shown or specified, all conductors shall be stranded copper.
- B. Material construction of copper conductor strands shall be coated or uncoated soft drawn or annealed copper.

2.2 LOW VOLTAGE CONDUCTORS

- A. Low voltage conductors for 600 VAC service and below shall be rated a minimum of 600 volts. Conductors shall be constructed of uncoated Class B copper concentric-lay-stranded wires, rated for 90 degrees C (dry), 75 degrees C (wet), machine tool wire with thermoplastic (PVC) insulation and nylon jacket. Conductors shall be oil and gasoline resistant II. Conductors stranded in other than Class B may be used provided that all terminals, lugs, and connectors are listed and marked for use with that conductor stranding.
- B. Conductors shall be of the following type, temperature rating, insulation, and/or jacket:
 - 1. THHN/THWN/MTW: 600 Volt, 90°C (dry), 75°C (wet)
 - 2. MTW/AWM: 600 Volt, 90°C (dry) with PVC insulation
- C. Control conductors shall be type MTW/ATM, 14 or 16 AWG. Control conductors for AC circuits within MCC or control panels shall be red. Control conductors energized from a source external to the control panel source shall be yellow.
 - 1. Control conductors may be 16 AWG copper provided all of the following conditions are met:
 - a. Continuous load does not exceed 8 amperes.
 - b. Overcurrent protection is provided by one of the following:
 - i) Branch-circuit-rated circuit breakers listed and marked for use with 16 AWG copper wire
 - ii) Branch-circuit-rated fuses listed and marked for use with 16 AWG copper wire.
 - iii) Class CC, Class J, or Class T fuses.
 - 2. Control conductors may be 18 AWG copper provided all of the following conditions are met:
 - a. Continuous load does not exceed 5.6 amperes.
 - b. Overcurrent protection is provided by one of the following:
 - i) Branch-circuit-rated circuit breakers listed and marked for use with 18 AWG copper wire
 - ii) Branch-circuit-rated fuses listed and marked for use with 18 AWG copper wire.

iii) Class CC, Class J, or Class T fuses.

D. Acceptable manufacturers: Royal, Deceron, Rome, GE, General Cable, Essex, or equal.

2.3 SUBMERSIBLE CABLES

A. Submersible pump cable or submersible pump conductors shall be of the extra heavy usage type and be constructed of Class K or H tinned, copper bunch-stranded wires. Insulation shall be EPD with a single pass of CP for Size No. 8 and larger. Cable shall be suitable for use in municipal sewage.

B. Acceptable manufacturers: Royal, equal.

2.4 INSTRUMENTATION CABLES

A. Multi-conductor control cable shall consist of 600 volt, individual conductors, each constructed of a minimum of seven strands of No. 14 AWG (or as shown on the Contract Drawings) uncoated Class B copper concentric-lay-stranded wires. Each conductor shall have HMW-PE insulation and color coded PVC outer jacket. Additional overall PVC jacket shall be provided around individual conductors. Cables shall be Type 20-10 as manufactured by Anaconda, Type CT-B manufactured by Rome Cable Co. or equal.

B. Twisted Shielded Pair (TSP) Instrumentation conductors shall consist of two twisted strands of No. 16 AWG (or as shown on the Contract Drawings) tinned coated Class C copper concentric-lay-stranded wires with a braid or foil shield. Each conductor shall have polyethylene insulation and color coded (black/white) PVC outer jacket. With multi-conductor twisted pair assemblies, each pair shall include individual shield and an overall shield shall be applied over the cable assembly with an additional overall PVC jacket around the conductors.

C. Acceptable manufacturers: Rome, Deceron, Belden, or equal.

2.5 GROUNDING SYSTEM CONDUCTORS

Grounding grid system conductors shall be constructed of tin coated copper concentrically lay-stranded wires in accordance Section 26 05 26 Electrical Grounding.

2.6 NETWORKING CABLES

A. Category 5e Cables (CAT 5 enhanced)

1. The cable and patch cords shall consist of four (4) unshielded twisted pair of 24 AWG stranded or solid copper conductors and shall be FEP Teflon insulated. The conductor shall be color coded and the cable plenum jacketed.
2. The Unshielded Twisted Pair (UTP) wiring shall be able to accommodate data transmission speeds up to 1000 Mbps (gigabit Ethernet) at 100 MHz.

3. Manufacturer: Belden or equal.

B. Category 6 Cables

1. The cable and patch cords shall consist of four (4) unshielded twisted pair of 24 AWG solid bare copper conductors and shall be FEP Teflon insulated. The conductor shall be color coded and the cable plenum jacketed.
2. The Unshielded Twisted Pair (UTP) wiring shall be able to accommodate data transmission speeds up to 10 gigabits at 250 MHz.
3. Manufacturer: Belden or equal.

2.7 TELEPHONE CABLES

- A. Telephone cable shall be twisted shielded pairs, #24 AWG, and shall be solid copper. Cable shall consist of 4 pairs or 25 pairs as shown on the Contract Drawings. Cable shall be suitable for installation in cable tray, conduit, access floors, and above suspended ceilings.
- B. The cable shall be provided with a FEP Teflon insulation and shall be plenum jacketed.
- C. Manufacturer: Belden or equal.

2.8 FIBER OPTIC CABLE

- A. Fiber optic cable shall be multiple fiber cable, specifically designed for industrial applications. Cable shall be gel filled, loose tube construction suitable for installation outdoors, in duct banks, or in wet locations. Cable shall be compatible with fiber optic modems provided for the project.
- B. Cable Construction
 1. Fiber optic cable shall be provided with a double jacket with high tensile strength. Jacket shall be corrosion, oil, chemical, moisture, abrasion, and UV sunlight resistant and shall meet the requirements of the Vertical Wire Flame Test specified by IEEE-383, and UL1581 Reference Standard for Electrical Wires, Cables, and Flexible Cords. Cable shall be rated to operate in temperatures between -40°C to +80°C and a relative humidity of 0% to 100%.
 2. Cable shall be provided with an internal rip cord and kevlar strength members.
- C. Fiber Characteristics

Type:	Multimode
Core/Cladding Size:	62.5/125 microns
Maximum attenuation:	3.75 dB/km at 850 nm
Minimum bandwidth:	160 mHZ-km at 850 nm
Numerical Aperture:	0.275
Number of fibers per cable:	6

D. Cable shall be type EXP (extended performance, industrial construction) as manufactured by Phoenix Digital or equal.

E. Fiber Optic Connectors

1. Fiber optic cable shall be provided with all required connectors, couplers, and termination kits as required to provide a working system as specified herein and shown on the Contract Drawings.
2. The connectors shall be completely compatible with the fiber optic cable provided for on this project.

2.9 FLEXIBLE CORD

Flexible cord for conductors 600 VAC and below shall be rated a minimum of 600 volts. Conductors shall be constructed of Class K flexible stranded conductors for sizes 18 AWG through 10 AWG, and soft-drawn rope lay conductors for sizes 8 AWG through 2 AWG, and heat and moisture resistant thermoplastic-elastomer (TPE) insulation, type SEOW.

2.10 COLOR CODING OF CONDUCTORS

A. Power conductors on systems 600 volts and less shall be color coded in accordance with the following:

1. 480/277 VAC, three phase, 4 wire, 60 Hz.

Phase A	Brown
Phase B	Orange
Phase C	Yellow
Neutral	White
Ground	Green

2. 240/120 VAC, single phase, 3 wire, 60 Hz.

Conductor 1	Black
Conductor 2	Red
Neutral	White
Ground	Green

3. 208/120 VAC, three phase, 4 wire, 60 Hz.

Phase A	Black
Phase B	Red
Phase C	Blue

Neutral
Ground

White
Green

- B. For conductors larger than No. 6 AWG, colored tape may be used to color code the conductors at all terminations, splices or other places where they are visible.
- C. Multi-conductor Instrumentation cables shall be color-coded according to ICEA/NEMA, latest edition, Method 1.

2.11 CONNECTORS AND TERMINALS

A. Connectors (for #10 AWG and smaller)

- 1. Solderless pressure connectors (wirenuts) for pigtail splicing all power conductors and cables #10 AWG and smaller shall be "Wing-nut" type made by Ideal.

<u>Model No.</u>	<u>Wire Size</u>
451	2 #18 min.; 3 #12 max.
452	2 #14 min.; 4 #12 max.
453	1 #10, and 1 #12 min.; 2 #8 and 1 #16 max.
455	3 #12 min.; 4 #10 max.

- 2. Connectors for (straight) splicing signal and control wires #10 AWG and smaller shall be solderless and compression type. Connectors shall be Burndy Hydent, Thomas and Betts Stakon, or equal.

B. Connectors (for #8 AWG and larger)

- 1. Connections of conductors to terminal posts or other conductors shall be made with UL approved compression type connectors. Wire nuts shall not be permitted.
- 2. Connections shall insure a thorough connection without damaging the conductor.
- 3. Connections shall be suitable for the conductor size used.
- 4. Typical compression type fittings shall be as specified below:
 - a. Two way splices for large conductors size 1/0 and larger shall be uninsulated indenture type similar to Burndy "Hy-Link", Thomas and Betts Sta-kon, Burndy, or equal.
 - b. Two way splices for small conductors, size 1 AWG and smaller shall be uninsulated indenture type similar to Burndy "Hy-Dent", Thomas and Betts "Sta-Kon" or equal.

- c. Fixture connections shall be two piece indenture type similar to Thomas and Betts "Sta-Kon" Series PT-66M, Ideal - Crimp Connector Sleeve No. 410 with wire cap insulated or equal.

C. Terminals

1. Terminals shall be 600 volt, indenture type, two or one hole lugs similar to Thomas and Betts "Sta-Kon", Burndy "Hylug" or equal.
2. Spade terminals shall be locking, vinyl self insulated similar to Thomas and Betts "Sta-Kon", Burndy or equal.
3. All accessories that use special tools for proper application as recommended by the manufacturer shall be installed only with those tools and in accordance with the established practices and recommendations of the manufacturers.

D. Terminal Blocks

1. Terminal blocks shall be suitable for a continuous rating of 600 VAC shall be manufactured in accordance with UL and NEMA standards for clearance between adjacent terminals.
2. Terminal blocks shall be sectional units of molded thermoplastic polyester and suitable for channel mounting.
 - a. Sections shall have built in marking areas
 - b. Center post in each section shall prevent over insertion of wires.
 - c. Sections shall not be interlocked so that one section may be removed without disturbing the remainder of the assembly.
 - d. Terminals shall be tin plated, box lugs, having hardware recessed into the molding, or flat terminal connectors.

E. Power Distribution Terminal Blocks

1. Power distribution blocks shall be constructed of copper. Blocks shall have a minimum of two line connections and one load connection per pole with lug wire range suitable for conductor size as indicated on the Contract Drawings.
2. Power terminal blocks shall be furnished with removable clear lexan cover plates to prevent accidental contact with live parts.
3. Power distribution blocks shall be as manufactured by Allen-Bradley, Gould-Shawmut, or equal.

2.12 MISCELLANEOUS ACCESSORIES

- A. Wire pulling lubricant shall be non-toxic and contain no solvents that degrades wire insulation, plastic tape, or conduits. Lubricant shall not leave residual material in conduit, shall be rust inhibited, and be non-combustible. Lubricant shall be as manufactured by Ideal, Tomic Electric, or equal.
- B. Cable and wire supports shall be Kellem grips or cable supports wedges as manufactured by O. Z. Gedney, or equal.
- C. Cable tags for coding of individual conductors shall be in accordance with Section 26 05 53 Identification for Electrical Systems.
- D. Plastic tape shall be all weather vinyl electrical tape having a high dielectric strength and resistant to sun, water, oil, acids and corrosive chemicals. Tape shall be 3M Type 88 or similar item as manufactured by Bishop Electric, General Electric, Okonite, or equal.
- E. Electrical insulation putty shall be rubber based elastic putty in tape form. Putty shall be 3M Scotchfill, or equal.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Unless otherwise shown or specified, all power, lighting, and control circuits shall be enclosed in conduit wireways.
- B. All individual conductors shall be identified at all termination and splice points. Wire numbers or letter coding shall be by means of printed plastic tape, and shall be as scheduled on the Contract Drawings.
- C. Each conductor's insulation shall be a single color throughout its entire length.
- D. Splices and connections shall be made with solderless pressure type connectors, and shall be taped and covered to provide an insulating value of the connection equal to the adjacent wire insulation.
- E. Conductors installed in wireways shall be grouped and bundled as they exit each conduit run. In open areas, such as wireways, manholes, or other similar areas, wires and cables shall be tied every twelve (12) inches.
- F. All conductors shall be carefully handled to avoid kinks or damage to its insulation.
 - 1. Lubricant may be used to assist in pulling conductors through conduits.
 - 2. Pulling strain shall not exceed the value recommended by the cable manufacturer.
- G. Spare conductors shall be of sufficient length for future connections where spare terminals are provided; proper terminals shall be installed and connected.

- H. Conductors shall be installed in junction boxes and pull boxes that are sized to meet the requirements of the National Electrical Code for wire bending and minimum radius.

3.2 SPLICES AND JOINTING

- A. Cables and conductors installed in the underground distribution system and duct banks shall be routed continuously from termination point to termination point. No splices shall be made in underground manholes or handholes without written approval by the Engineer. Where underground or outdoor splices of 600 volt conductors are approved by the Engineer, they shall be installed utilizing an epoxy based cast splice kit. Splice kit shall be as manufactured by 3M or equal.
- B. Splices shall be made in junction boxes and shall be taped to an insulating value at least equal to the insulating value of the conductors.
- C. Application of taped joints shall be as follows:
 - 1. For 480/277 VAC power circuits, connection shall be wrapped with plastic tape.
 - 2. For lighting circuits, splice connections shall be wrapped with plastic electrical tape.
 - 3. For motor circuit terminations, splice connections shall be wrapped with 3M Scotchfill tape and finished with plastic tape.
- D. Copper to aluminum connections shall be made with UL approved aluminum-to-copper connectors and compound.
- E. Solder joints, hinged connectors, and bolted terminal lugs will not be permitted. The exception of multi-bolted directed compression connectors in large wire and cable sizes will be permitted, if compression type fittings are not available.
- F. Splices, taps, or terminations shall not be made when conductor ends have missing strands or when the ends are mutilated in any way.
- G. Pump power and control cables shall be connected to conductors using power terminal blocks which shall be mounted inside local junction boxes as shown on the Contract Drawings. Terminal blocks shall be provided with insulation barriers so that there are no exposed live parts inside the junction box.

3.3 MULTI-CONDUCTOR CONTROL CABLE

- A. Multi-conductor cable shall be provided where shown on the Contract Drawings. Multi-conductor control cable may be used where separate control circuits having a number of conductors greater than three are shown on the Contract Drawings. The Contractor shall be responsible for sizing the conduit required at no cost to the Owner.
- B. Termination of cable shall be as specified.

3.4 LOW VOLTAGE AND CONTROL CONDUCTORS

All power, control, and lighting conductors shall be type THHN-90C, THWN-75C/MTW unless otherwise noted.

3.5 CONNECTIONS TO EQUIPMENT

- A. Connections and interconnections shall be made to all equipment in accordance with the Contract Drawings, and wiring diagrams furnished by manufacturers, and as specified by the Engineer.
- B. The Contractor shall be responsible for the accuracy of the connected work made under this contract. Any damage resulting from erroneous connections shall be corrected by the Contractor at his own expense.

3.6 TESTING

A. General

- 1. When all wires and cables are in place but before the final connections have been made, they shall be tested.
- 2. Manufacturer's data on testing resistance shall be submitted with tabulated test results.
- 3. Contractor shall furnish all necessary test equipment instruments.
- 4. All tests shall be performed in the presence of the Engineer, unless waived by the Engineer.
- 5. Contractor shall notify the Engineer three (3) working days in advance of any testing.
- 6. If damage is indicated during testing or upon review of the tabulated data, Contractor shall replace defective wires and cables and retest at no cost to the Owner.

B. Direct Current High Potential Test

- 1. A direct current high potential test (Hi Pot Test) shall be performed as described below for the following conductors:
 - a. All conductors operating over 600 volts.
 - b. Any conductor, not otherwise required to be tested, but in the opinion of the Engineer has been subjected to possible damage.
- 2. The direct current high potential test shall be recorded at one minute intervals over a ten minute period for each conductor, and between each conductor and ground.

3. The ten minute period shall commence when the charging/leakage current stabilizes.
4. If leakage current stabilizes and decreases with time, the conductor being tested is acceptable.
5. Voltage levels for high potential test shall be as scheduled below.

<u>Rated cable voltage</u>	<u>D.C. high potential test voltage</u>
600	2000
Up to 5 kV	25 kV
Up to 8 kV	35 kV
Up to 15 kV	55 kV
Up to 25 kV	80 kV
Up to 28 kV	85 kV
Up to 35 kV	100 kV

6. The data recorded during high potential testing shall be tabulated by the Contractor and submitted to the Engineer in the typewritten form as indicated below:

High Potential Test Data

Circuit No.	Minute	Test Voltage		
		MF – 1/25 kV	P – 1/2 kV	P – 3/2 kV
PH A, B, C to Grd.	Init.			
	1			
	2			
	...			
	10			
PH A to B, C	Init.			
	1			
	2			
	...			
	10			
PH C to A, B	Init.			
	1			
	2			
	...			
	10			

C. Megaohm Test

1. For all wires and cable #8 AWG and larger, a 1500 volt insulation resistance (Megohm) test shall be performed.
 2. The Megohm test shall be performed on the following combination of conductors:
 - a. Between all conductors in the same enclosure
 - b. Between each conductor and ground.
 - c. The resistance test shall be recorded at the end of one minute of sustained voltage.
- D. Acceptance. After all final connections have been made, the equipment and controls shall be tested, by operation, to demonstrate performance.

**** End of Section ****

This page intentionally left blank

SECTION 26 05 26
ELECTRICAL GROUNDING

PART 1 GENERAL

1.1 SUMMARY

- A. This section includes rod electrodes, active electrodes, equipment grounding conductors, grounding well components, mechanical connectors, exothermic connections, the grounding system, and the grounding grid where shown on the Contract Drawings.
- B. Related Sections
 - 1. Section 03 20 00 – Concrete Reinforcing

1.2 REFERENCES

- A. Institute of Electrical and Electronics Engineers
 - 1. IEEE 142 – Recommended Practice for Grounding of Industrial and Commercial Power Systems
 - 2. IEEE 1100 – Recommended Practice for Powering and Grounding Electronic Equipment
- B. International Electrical Testing Association
 - 1. NETA ATS – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems
- C. National Fire Protection Association
 - 1. NFPA 70 – National Electrical Code
 - 2. NFPA 99 – Standard for Health Care Facilities

1.3 SYSTEM DESCRIPTION

- A. The Grounding systems shall use the following elements as grounding electrodes:
 - 1. Existing or new metal underground water pipe
 - 2. Metal building frame
 - 3. Concrete-encased electrode
 - 4. Ground ring
 - 5. Rod electrode
 - 6. Plate electrode

All of these metal underground systems and structures shall be bonded together to form the grounding electrode system. Piping systems and underground tanks shall be included when present.

1.4 SUBMITTALS

- A. Prior to obtaining any material in connection with this Section, detailed shop drawings on all material shall be submitted including but not limited to:
 - 1. Ground Grid Conductors
 - 2. Grid Connecting Conductors
 - 3. Grid Compression Connectors (each type)
 - 4. Compression Tools
 - 5. Grounding Electrodes
 - 6. Ground Bushings
 - 7. Water Pipe Ground Connectors
- B. Test Reports: Indicate overall resistance to ground and the resistance to ground at each electrode.
- C. Submittals shall conform to the requirements of Section 01 33 00 Submittals.
- D. Submittals shall contain a material list with manufacturer data describing the material and showing its compliance with specifications, associated standards, and test requirements.
- E. Prior to installation of any material, a detailed plan layout of the entire grounding system, including location and quantity of electrodes, connections, and cables shall be submitted to the Engineer for review.
- F. Samples of any material shall be submitted upon Engineer's request.

1.5 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of components and grounding electrodes.

1.6 QUALITY ASSURANCE

- A. Materials and installation shall be in accordance with latest revisions of the following codes, standard, and specifications, except where more stringent requirements have been specified herein:
 - 1. National Electrical Code (NEC)
 - 2. Underwriters Laboratories, Inc. (UL)
- B. These Specifications require that all grounding and grounding circuitry equal or exceed the requirements of the National Electrical Code Article 250, and in the event of a conflict or discrepancy between these Specifications, the Contract Documents, and NEC Article 250, the more stringent requirements shall apply.

1.7 COORDINATION

- A. Complete grounding and bonding of building reinforcing steel prior to concrete placement.

PART 2 PRODUCT

2.1 GROUNDING GRID SYSTEM CONDUCTORS

- A. Grid connecting conductors shall be minimum size 4/0 AWG bare stranded copper conductors in accordance with NEC Article 250.
- B. Grounding grid conductors shall be minimum size 4/0 AWG bare stranded copper conductors in accordance with NEC Article 250. The substation grounding grid conductors shall be minimum 250 kmils stranded copper conductors in accordance with NEC article 250.

2.2 GROUNDING ELECTRODES

- A. Rods shall be 5/8 inch in diameter, minimum 8 feet long unless otherwise shown, steel core with copper molten welded or electrolytically bonded to exterior. Two section ground rods are acceptable. Rods shall be manufactured by Copperweld Steel Co., Thompson Lightning Protection, Inc. or equal.
- B. Grounding plates shall be 24 inch by 24 inch, 1/4 inch thick solid copper.

2.3 GRID CONDUCTOR CONNECTORS

Connections shall be made with compression type connectors specially made for buried grounding systems as manufactured by Thomas & Betts Co., Burndy Corp. or equal.

Connections shall be made using an exothermic welding process or irreversible compression connectors.

2.4 EQUIPMENT GROUND CONDUCTORS

- A. Equipment ground conductors shall be in accordance with Section 26 05 01 Conductors and Cables for low voltage conductors.
 - 1. Ground conductor #8 and smaller shall be green in color.
 - 2. For #6 and larger ground conductors, black wire may be used and identified where exposed in all junction boxes, disconnect switches, panels, etc. with green tape wrapped over its entire exposed length.
- B. All exposed grounding conductors such as bars, straps, cables, flexible jumpers, braids, shunts, etc., shall be bare copper.

- C. All submersible pump installations shall be in accordance with NEC Article 250-112 (l and m). Submersible pumps shall include either a grounding conductor integral with the pump power cable or a separate grounding conductor sized in accordance with the National Electrical Code. A connection shall also be made between this grounding conductor and the metallic well casing (if any). This grounding conductor shall terminate at the branch circuit.

PART 3 EXECUTION

3.1 GENERAL

- A. All grounding and bonding of electrical installations shall be in accordance with, or shall exceed the requirements of Article 250 of the National Electrical Code. In the event of a conflict or a discrepancy between these Specifications, the Contract Document Drawings, and the National Electrical Code, the more stringent requirement shall apply.
- B. All metallic equipment, such as tanks, machinery, and piping where the potential exists for an ignitable mixture to be present shall be bonded and grounded.

3.2 INSTALLATION

- A. Install in accordance with IEEE 142 or IEEE 1100 as applicable.
- B. Install grounding rod electrodes at locations as indicated on the drawings. Install additional rod electrodes to achieve specified resistance to ground.
- C. Install grounding and bonding conductors concealed from view.
- D. Install grounding electrode conductor and connect to reinforcing steel in concrete pad, generator enclosure, all electrical enclosures, fence, ground rods, and ground test wells.
- E. Equipment Grounding Conductor. Install separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.
- F. Permanently ground entire light and power system in accordance with the National Electrical Code, including service equipment, distribution panels, lighting panelboards, switch and starter enclosures, motor frames, grounding type receptacles, ground terminals, and ground bus at service panel.
- G. Install branch circuits feeding isolated ground receptacles with separate insulated grounding conductor, connected only at isolated ground receptacle, ground terminals, and at ground bus of serving panel.
- H. Bare copper bars, cables, fittings, etc. shall not be installed in cinder fill nor shall be covered with soil containing cinders or other corrosive material.
- I. Cables shall be installed with enough slack to prevent breaking stresses.

- J. All grounding conductors subject to mechanical damage shall be protected by rigid steel conduit or other suitable guards and in all cases where so protected shall be permanently and effectively grounded to said enclosure at each end of its lengths with approved grounding connector and conduit fittings.
- K. All equipment ground bus, ground pads, frames, enclosures, etc., shall have all surfaces at the point of connection thoroughly cleaned and brightened, to remove paint or non-conducting material, just prior to actually making the connection. Touch-up damaged pointed surfaces to match existing conditions.
- L. Splices in wire or cable grounding conductors are prohibited.

3.3 GROUNDING GRID SYSTEM

A. Grounding Grid

1. Where shown on the Contract Drawings, a system of grounding conductors and driven electrodes, known as the grounding grid shall be installed. The grounding grid shall interconnect all the various grounding systems.
2. The grounding grid conductors shall be embedded in a minimum of 36 inches below the finished grade and 36 inches from the foundation walls or footings in the backfill material around the structure(s).
3. Earthwork including trenching, excavation and backfill shall be in accordance with Section 02 25 00 Excavation, Backfill, and Compaction.
4. All underground conductors shall be laid slack.
5. Where shown on the Contract Drawings the Contractor shall locate the existing ground grid and make connections thereto.
6. Locations shown for the existing ground grid are approximate only and the exact location shall be determined in the field.
7. Care shall be taken in locating the existing grid to avoid damage to existing power and control conduits.

B. Grounding Electrodes

1. The grounding electrodes shall be driven as located on the Contract Drawings.
2. In areas where rock is encountered or hard ground makes the driving of grounding electrodes impractical, copper plates shall be installed in lieu of the grounding electrodes. The Contractor shall notify the Engineer in writing of his intention to substitute the copper plate in lieu of the electrodes.

3. Installation shall be a minimum of 36 inches below grade and 36 inches from footings.

C. Grid Connecting Conductors

1. In addition to the grounding requirements of the National Electrical Code, a grid connecting conductor shall be provided for, but not limited to, the following equipment:
 - a. All transformer frames
 - b. Neutral transformer taps
 - c. Frames of electric motors 10 HP and larger
 - d. Exposed structural steel
 - e. Grounding of the conduit system
 - f. Service entrance disconnects
 - g. Engine generator sets
2. Where any equipment is shown or specified as “future,” sufficient lengths of the grounding conductor, connected to the ground grid, shall be installed for future connections.
3. The ground grid connecting conductors shall be connected to the grounding grid, and all shall be buried in or below the floor slab with no conduit enclosures, unless exposed to mechanical injury.

3.4 GROUNDING SYSTEM CONNECTIONS

- A. Exposed connections shall be made with pressure clamps. Connections between different metals shall be protected against corrosion and moisture with an insulating epoxy resin.
- B. Buried connections shall be made with exothermic weld type connections. Exothermic welding equipment shall be selected and used in accordance with the equipment manufacturer’s instructions. Equipment and molds shall be used to accommodate the wire size, the metallic structure’s shape, the wire position of attachment, vertical or horizontal, and other criteria that may be specified. Before a mold is used, remove and clean slag, dirt, and other foreign matter from the mold. Use cartridge and charge size based on the manufacturer’s recommendations for the specific application. Different charges are required for steel and ductile iron pipe.

1. Surface preparation

- a. Surfaces with little or no coating shall be cleaned to bare metal by grinding or filing an area approximately three inches square to produce a bright metal surface. Weld area shall be free of coating, dirt, mill scale, oxide, grease, moisture, and other foreign matter.

- b. Surfaces with a thick coating shall have a four inch square window cut through the coating and three inches square of surface cleaned to bright metal. Avoid damaging the surrounding coating.
- 2. Prior to welding, remove the wire insulation as required to fit the mold. Avoid damaging the exposed copper wire. If the wire is cut or nicked over half way through its diameter, cut off and strip a new end. If the manufacturer requires the use of a copper sleeve, the sleeve shall be crimped securely to the wire and excess wire protruding from the end of the sleeve removed.
- 3. After the charge is set, remove the mold and slag from the weld area with a welder's hammer. Strike the top and sides of the weld with the hammer to test the secureness of the connection. If the weld does not hold, remove the scrap weld material clean and begin the weld process again.
- 4. After the weld is completed and prior to coating the clean and weld area, the Engineer may test the joint bond wire for electrical continuity.
- 5. Weld Caps
 - a. After the weld passes the test for soundness, and electrical continuity, repair coating in the weld area with a cold-applied bituminous or coal-tar mastic and a weld cap placed over the weld. Mastic shall be applied to fill the weld cap and cove the exposed metal of the structure and the wire to a minimum thickness of 1/4 inch. Damage to the coating around the weld area shall be repaired according to the coating manufacturer's recommendations.
 - b. If weld cap will not fit due to physical space limitations, coat bare metal and wire in weld area with a minimum 1/4 inch thickness of bituminous mastic.
- C. In fixtures, enclosures, equipment, etc., ground terminals or lugs shall be provided.
 - 1. Ground clips may be installed within device or switchboxes where terminals are not provided or are impracticable if used with solid ground wire.
 - 2. Each panel, switchboard, or motor control center shall be provided with a ground bar of sufficient size for all ground conductors to be connected.

3.5 CONDUIT SYSTEM

A. Ground Conductor

- 1. All power and 120-volt control system conduits (feeders, branch circuits, lighting circuits, etc.) shall have an internal grounding conductor, which shall be sized in accordance with the requirements of the National Electrical Code. This grounding

conductor shall be installed although it may not be shown or scheduled on the Contract Drawings.

2. The internal grounding conductor shall be bonded to each device box, pull-box, junction box, or wiring trough it passes through.
3. All conduits one inch and larger shall be provided with grounding bushings on each end and at all cabinets and pull, junction, or outlet boxes.
4. The Contractor shall exercise care to ensure good ground continuity, in particular, between the conduit system and equipment frames and enclosures.
5. Circuits in conduit shall carry one equipment grounding conductor for bonding equipment to the grounding system.
6. Ground raceways and noncurrent carrying parts of electrical equipment in accordance with NEC Article 250. Use the metallic conduit system for equipment and enclosure grounding. Grounding through the conduit system shall be in excess of any ground conductors shown on the Contract Drawings.

3.6 SECONDARY ELECTRICAL SYSTEM

- A. The neutral conductor of all low-voltage, single and/or polyphase distribution systems shall be solidly connected at one point only. This connection shall be as follows:
 1. For Separately Derived System
 - a. Ground neutral at transformer neutral bushing. Connect to system ground and transformer enclosure in accordance with NEC Article 250. In addition, Transformer secondary neutral bushings are also to be bonded to nearest metallic water pipe, building steel, or ground rod.
 - b. Control power transformers must have their secondary (neutral) leg grounded at the transformer.
 2. For Subfed Secondary Systems: Neutral shall be grounded only at one point of origin of secondary systems. Do not ground subfed panel neutral bars. Ground connection shall be in accordance with NEC Article 250.
 3. For Service Supplied Systems
 - a. The electric service shall be grounded at an accessible point in the main service disconnect in accordance with NEC Article 250.
 - b. The grounding conductor shall be sized in accordance with NEC, Table 250-66 unless otherwise shown or specified.

3.7 TESTING

A. Acceptance

1. Unless otherwise specified, the installed grounding grid shall have a resistance to ground of 5 ohms or less.
2. The Contractor shall test all grounding conductors and grounding systems for continuity. Where continuity does not exist, jumpers shall be installed at no cost to the Owner and the system retested.
3. All testing shall be performed in the presence of the Engineer.

B. Grounding Resistance

Grounding resistance of the existing facility ground grid shall be tested using the ratio method, or other similar method that is acceptable to the Engineer. Contractor shall submit test procedure and equipment to be used in the testing. If the grounding resistance of the existing facility ground grid is in excess of 5 ohms, additional grounding shall be provided. After installation of additional grounding, ground resistance shall be retested to verify that the value does not exceed 5 ohms.

****End of Section****

This page intentionally left blank

SECTION 26 05 33
CONDUITS AND RACEWAY SYSTEMS

PART 1 GENERAL

1.1 DESCRIPTION

This Section includes the conduit system required, specified, or shown on Contract Drawings including conduits, fittings, boxes, hangers, and accessories.

1.2 REFERENCES

- A. American National Standards Institute
 - 1. ANSI C80.1 – Rigid Steel Conduit, Zinc Coated.
 - 2. ANSI C80.3 – Specification for Electrical Metallic Tubing, Zinc Coated.
 - 3. ANSI C80.5 – Aluminum Rigid Conduit – (ARC).
- B. Underwriters Laboratories
 - 1. ANSI/UL 6 – Electrical Rigid Metal Conduit – Steel
- C. National Electrical Manufacturers Association
 - 1. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum).
 - 2. NEMA FN 1 – Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
 - 3. NEMA OS 1 – Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
 - 4. NEMA OS 2- Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports.
 - 5. NEMA RN 1 – Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
 - 6. NEMA TC 2 – Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
 - 7. NEMA TC 3 – PVC fittings for Use with Rigid PVC Conduit and Tubing.

1.3 SYSTEM DESCRIPTION

- A. Raceways and boxes located as indicated on the drawings, and other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway and boxes are shown in approximate locations unless dimensioned. Provide raceway to complete wiring system.
- B. Underground More Than 5 Feet Outside Foundation Wall: PVC coated rigid metal conduit, or concrete encased PVC conduit. Provide cast metal boxes or nonmetallic handhole.
- C. Underground Within 5 Feet from Foundation Wall: PVC coated rigid metal conduit, or concrete encased PVC conduit. Provide cast metal or nonmetallic boxes.
- D. In or under slab or grade: PVC coated rigid metal conduit, or concrete encased PVC conduit. Provide cast metal or nonmetallic boxes.

- E. Outdoor Locations, Above Grade: Provide PVC coated rigid metal conduit. Provide cast metal or nonmetallic outlet, pull, and junction boxes.
- F. In Slab Above Grade: Provide PVC coated rigid metal conduit. Provide cast metal boxes.
- G. Below Grade: Provide Schedule 40 or Schedule 80 PVC conduit in concrete encased duct bank where indicated on the drawings.
- H. Wet and Damp Locations: Provide PVC coated rigid metal conduit. Provide cast metal or nonmetallic outlet, junction, and pull boxes. Provide flush mounted outlet boxes in finished areas.

1.4 SUBMITTALS

- A. Prior to obtaining any material in connection with this Section, detailed shop drawings on all material shall be submitted. Submittals shall conform to the requirements of section 01 33 00 Submittals.
- B. Submittals shall contain a material list with manufacturer's name and data describing the material and showing its compliance with specifications and associated standards.
- C. Samples of any material shall be submitted upon Engineer's request.
- D. Prior to installation of any material in a specific area, a detailed plan layout of the conduit system, including the routing of conduits, support systems, junction boxes, conduit fittings and condulets, and coordination of other work, shall be submitted to the Engineer for review. Existing conduits and enclosures to be reused shall be shown and indicated on the submittal.

1.5 CLOSEOUT SUBMITTALS

Provide project record documents which record actual locations of components and circuits.

1.6 QUALITY ASSURANCE

- A. Material and installation shall be in accordance with the latest revisions of the following codes, standards, and specifications, except where more stringent requirements have been specified herein:
 - 1. American National Standard Institute (ANSI)
 - 2. National Electrical Code (NEC)
 - 3. National Electrical Manufacturers Association (NEMA)
 - 4. Underwriters Laboratories (UL)

- B. Equipment furnished under this section shall be furnished by manufacturers who meet the industry standards for quality, workmanship, and experience.

PART 2 PRODUCT

2.1 CONDUIT

A. Rigid Metal Conduit (Type RMC)

1. Rigid metal conduit shall be galvanized steel, hot-dipped with zinc over the entire length, both exterior and interior including threads. Conduits shall have a coat of lacquer for sealing.
2. Each conduit shall have a coupling on one end and a thread protector on the other. Conduit shall be UL Listed and threaded in accordance with ANSI/ASME B.1.20.1-1983 Pipe Threads, General Purpose (inch) (3/4-inch taper per foot).
3. Conduit shall meet ANSI Standards C80.1 and C80.4 latest revisions, and ANSI/UL6. The conduit shall be manufactured by Allies Tube & Conduit Corporation, Pittsburgh Standard Conduit Company, Triangle PWC Co., or equal.

B. PVC Coated Rigid Metal Conduit

5. PVC coated rigid metal conduit and fittings shall consist of a rigid metal conduit having a PVC coating not less than 40 mils thick. Rigid metal conduit shall be as specified above. PVC coating shall be bonded to the conduit and fittings such that the bonding shall be stronger than the tensile strength of the PVC.
2. PVC coated rigid metal conduit shall be in accordance with NEMA Standard RN-1, latest revision, for Type A-40 PVC coated conduit and fittings. PVC coated conduit and fittings must comply to ASTM D870, D1151, D3359 and D1308.
3. The PVC coated conduit and general purpose fittings must be UL Listed for the PVC as supplying the primary corrosion protection.
4. Fittings and conduit bodies shall be in accordance with NEMA FB1, steel fittings with external PVC coating to match conduit.
5. The conduit threads must be hot galvanized, not hot dipped, and have an additional coat of clear Urethane.
6. PVC coated rigid steel conduit, all conduit bodies, fittings, and female threads shall include a minimum of 2 mils urethane internal coating. Product shall be Robroy Plasti-Bond Red, Perma-Cote or engineered approved equal.

C. Non-Metallic Conduits (PVC)

1. Non-Metallic conduits and fittings shall be Schedule 40 or schedule 80, polyvinyl chloride. Materials shall be corrosion and fire retardant, and sunlight resistant.
2. Conduit and fittings shall be in accordance with the NEMA Standard TC-2 and TC-3, latest revisions, and UL-651 Schedule 40 and 80 PVC Conduit.

3. The conduit and fittings shall be manufactured by Carlon Electric Conduit Co., Triangle PWC Co., or equal.

D. Flexible Conduit

1. Flexible metallic conduit (Greenfield). Shall be hot dipped galvanized flexible steel or aluminum and shall comply with UL Standard No. 1, latest revisions. Conduit shall be manufactured by Anaconda Metal Hose Company, Triangle PWC Co., or equal. Fittings shall be PVC coated at each end of the liquid-tight conduit.
2. Liquid-tight flexible metal conduit (Seal-tight). Shall be constructed of flexible corrosion resistant zinc galvanized steel conduit with an extruded plastic jacket and built-in continuous copper ground strap under the jacket. Conduit shall be type UA manufactured by Anaconda Metal Hose Company, Type LA manufactured by Electri-Flex Co., or equal. Fittings shall be PVC coated at each end of the liquid tight conduit.
3. Liquid-tight Flexible Non-metallic Conduit. Shall be constructed of corrugated flexible PVC. Fittings shall be identified for use with flexible non-metallic conduit. Flexible non- metallic conduit shall be Carflex as manufactured by Carlon, or equal.
4. Hazardous Area Flexible Metal Conduits. Flexible metal conduits installed in areas classified as Hazardous shall be Crouse-Hinds Series EC, Killark Series EK, or equal.

2.2 JUNCTION, DEVICE AND PULL BOXES

A. Junction Boxes.

1. Junction boxes and pull-boxes shall be sized as required for the quantity and size of conductors to be installed within the box. Sizes shall comply with the requirements of the National Electrical Code for wire bending space radius. Stamped Steel Junction Boxes installed in areas approved for use with EMT conduit may be constructed of code-gage galvanized steel.
2. Cast Junction Boxes. Junction boxes for use with RMC or IMC shall be constructed of hot-dipped galvanized cast iron or copper free aluminum and shall be sized per NEC requirements. Boxes shall be manufactured by Crouse-Hinds Co., Killark Co., or equal.
3. PVC coated Junction Boxes. Junction boxes used with PVC coated rigid metal conduit shall be hot-dipped galvanized cast iron or copper free aluminum with a minimum of 40 mil factory applied PVC coating and a minimum of 2 mil of factory applied urethane interior coating. Thin or non-coated areas of the interior coating will be cause for rejection. Cover screws or bolts shall be stainless steel. Junction boxes and fittings are to be of the same manufacturer as the PVC coated conduit and must be UL listed with the PVC as a primary corrosion protection. Junction boxes installed in wet locations shall be suitable for such use.

4. Hazardous Area Junction Boxes. Junction boxes in areas classified as Hazardous shall be Series EJB or GU manufactured by Crouse-Hinds Co., Series XB or GR as manufactured by Killark Co., or equal.

B. Pull Boxes:

Pull boxes shall be used in dry locations only for pulling. No splicing of conductors shall be allowed. The boxes shall be constructed of galvanized steel, 12-gauge sheet metal, angle and frame members with welded joints. The pull box cover shall be gasketed and attached with stainless steel screws. A ground lug shall be provided, sized in accordance with the National Electrical Code.

2.3 CONDUIT OUTLET BODIES, FITTINGS, COUPLINGS, EXPANSION COUPLINGS, CONDUIT SLEEVES, AND SUPPORTS

A. Conduit Outlet Bodies

1. Conduit outlet bodies shall be used where required to permit ready fishing and withdrawing of wires. Conduit bodies not located in areas classified as Hazardous shall be gasketed. Bodies shall be of cast iron or copper-free aluminum type. Bodies shall be Condulet series manufactured by Crouse-Hinds Co., Electrolet series manufactured by Killark Co., or equal.
2. Conduit bodies used with PVC coated rigid metal conduit shall be of the cast type as specified above with a factory applied 40-mil PVC coating. The conduit bodies, fittings, and couplings shall be provided with extruded PVC sleeves as required by NEMA Standards. Conduit bodies, for general service, ($\frac{1}{2}$ " – 2") shall be equipped with a V-Seal gasket. All general-purpose fittings must be UL Listed for the PVC coating as supplying the primary corrosion protection, in accordance with the National Electrical Code. All screws shall be stainless steel with the screw heads encapsulated with PVC. Product shall be Robroy "Plasti-Bond Red", Perma-Cote, or engineer approved equal.
3. Conduit outlet bodies used with rigid PVC conduit shall be of the same material and schedule as rigid PVC conduit.

B. Fittings and Couplings

1. PVC Coated Rigid Metal Conduit - All couplings and fittings for PVC coated rigid metal conduits shall have factory coating similar to above PVC coated conduit bodies.
2. PVC - All couplings and fittings for PVC rigid conduit shall be of the same material and schedule as PVC rigid conduit.
3. Hazardous Areas - Seal off fittings in areas classified as Hazardous or Corrosive shall be Series EYS manufactured by Crouse-Hinds Co., Series E manufactured by Killark Co., or equal. Sealing compound shall be Chico manufactured by Crouse-

Hinds or Series SC manufactured by Killark, or equal. Damming material shall be of the ceramic fiber type.

C. Expansion Couplings

1. Expansion couplings shall be a watertight, corrosion retardant coupling with flexible neoprene outer jacket, stainless steel jacket clamp, flexible copper ground strap, and internal hub bushing.
2. Coupling shall compensate for the following movements:
 - a. Axial expansion or contraction
 - b. Angular misalignment
 - c. Parallel misalignment
3. Coupling shall be Type XD as manufactured by Crouse-Hinds Company, Type DX as manufactured by O.Z. Gedney Co., or equal.

D. Conduit Sleeves

Where conduits pass through the walls or floors of structures, they shall be installed in suitable sleeves. Sleeves, installed in the outside walls of structures or elsewhere where watertightness is required, shall be cast iron and shall be equal to thru-wall and floor seal manufactured by O.Z. Gedney Manufacturing Company, Inc. Types No. FSK, WSK, FSC, or WSC as required, or Link-Seal as manufactured by Thunderline Corp. When Link-Seal is used, a wall sleeve, with water-stop, shall be installed. All other sleeves shall be galvanized steel pipe.

E. Conduit Hangers and Supports

1. Hangers and supports for conduits shall be adequate to support conduit systems with a minimum safety factor of 10.
2. All steel parts of the conduit support systems shall be galvanized, cadmium plated or PVC coated.
3. Perforated strap hangars shall not be used.
4. Conduit supports shall be as manufactured by Steel Coty Co. (Kindorf), Unistrut Corp., Allied Tube & Conduit Corporation (Power-Strut) or equal.
5. One hole, malleable iron pipe clamps shall be hot-dipped galvanized. Pipe spacers shall be of malleable iron and have a hot-dip galvanized finish.
6. Hanger rods shall be continuous thread and galvanized not less than 3/8" inch in diameter.
7. All fasteners shall be stainless or silicon bronze.

8. All expansion anchors shall be self-drilling type.

F. Cable Terminator Fitting

1. Cable terminating fittings shall be provided complete with gland nut and neoprene bushing properly sized to provide a tight seal.
2. Cable terminator fittings shall be CGB or CGF series as manufactured by Crouse-Hinds, or equal.

2.4 MISCELLANEOUS ACCESSORIES

A. Warning Tape

1. Tape shall be red and have imprinted a minimum of 1-inch high letters "CAUTION BURIED ELECTRIC LINE BELOW" or appropriate warning approved by the Engineer.
2. Tape shall be 6 inches wide, 4.5 mils thick, and made of low-density polyethylene.
3. Warning tape shall be as manufactured by Allen Systems (Houston, Texas), Panduit, or equal.

B. Duct-bank Conduit Spacers

1. Underground Duct-bank conduit spacers shall provide stability and consistent separation on duct-banks. Spacers shall be sized for the conduits with which they are used. They shall provide both vertical and horizontal spacing with interlocking intermediate and base spacers.
2. Duct-bank conduit spacers shall be as manufactured by Carlon, or equal

2.5 SUPPORT GRIPS

Provide a flexible wire mesh holding device to fit around an electrical cable for support of motor cable as shown on the Contract Drawings. The support grip shall support vertical runs of up to 99 feet with loads up to 600 pounds. Provide a single eye for attaching support grip to steel rod. Support grips shall be Hubbel Kellems, or equal.

PART 3 EXECUTION

3.1 INSTALLATION

A. General

1. No exterior conduits shall be run exposed on outside walls of buildings, or structures.
3. Minimum size shall be $\frac{3}{4}$ inch unless specifically shown otherwise.
4. Sufficient expansion fittings for the application shall be installed.
5. Conduit shall not be used to support enclosures except as permitted by the National Electrical Code.
6. Splices or taps shall not be made inside conduits.
7. All conductors and neutrals of the same circuit and all equipment grounding conductors shall be contained within the same conduit.
8. The conduit system shall be installed complete, including tightening of joints, from termination point to termination point, prior to installation of conductors.
9. Conduit shall be installed with a minimum number of joints. Conduits shall be continuous and shall be secured in such a manner that each system shall be electrically continuous. Terminations of conduits shall be furnished with locknuts at each fabricated panel using watertight conduit hubs. (Use PVC coated hubs in corrosive or chemical environments).
10. Terminations of metallic conduits shall be furnished with grounding bushings in accordance with Section 26 05 26 Electrical Grounding.
11. Where exposed conduit requires clamping to the building structure, clamps shall consist of galvanized iron or stainless steel one-hole pipe straps and expansion shields.
12. All conduit fittings, connectors and couplings shall be properly tightened in such a manner so as not to be easily “backed off” in order that proper ground continuity is established.
13. The use of lubricating materials to aid in the installation of conductors is allowed. Where necessary, a powdered soapstone and “Y-ER-EAS” are acceptable.
14. Where exposed conduit is permitted, install conduit parallel to or perpendicular to walls, ceilings, and lines of building, in neat and organized configurations.
15. Coordinate all conduit installations with other trades in advance of installation.
16. Ream conduit ends before installation
17. Plug conduit openings until wires are installed.

18. Where spare conduits are shown to be installed, the conduit shall be capped at each end as provided with a nylon fish-wire.
19. Expansion couplings shall be installed in conduits crossing building expansion joints.
20. Plug conduit openings until wires are installed
21. Do not install adjacent to or on hot surfaces.
22. Do not install conduit in water or in areas saturated with moisture.
23. All conduit threads shall be given a coat of zinc dust in oil or other approved compound and shall be made watertight.
24. Conduit reducers shall not be allowed unless otherwise specified, or approved by the Engineer.

B. PVC Coated Rigid Metal Conduit Requirements

1. PVC coated rigid metal conduits shall be installed using proper tools for threading and tightening conduit fittings.
2. Cutting back of coating for threading will not be allowed.
3. Minor touch up of coating shall be with manufacturer's recommended touch-up compound of applicable color.
4. Contractor must be trained and certified by the factory before installation of PVC coated products can begin.
5. Any coating and conduit considered by the Engineer damaged excessively shall be replaced at Contractor's expense.
6. Conduits shall be installed with a minimum number of joints. Conduits shall be continuous and shall be secured in such a manner that each system shall be electrically continuous. Terminations of conduits shall be furnished with locknuts at each fabricated panel or pull box using PVC coated hubs. Hubs shall be as manufactured by Myers.
7. Conduits entering enclosures shall be provided with PVC coated Myers hubs.

C. PVC Rigid Conduit Requirements

1. PVC rigid conduit shall be installed per manufacturer's recommendations.
2. Use proper tools for installing PVC conduits.

3. Fittings, boxes, and other accessories shall be PVC of the same schedule with all joints being the solvent cement type.

D. Conduit Supports and Hangers

1. Conduit supports shall be spaced at intervals of 8 feet or less as required to obtain rigid construction.
2. Single conduits shall be supported by pipe clamps with clamp backs to raise conduits at least 1 inch from the surface.
3. Supports located in corrosive areas and/or where shown shall be PVC coated.

E. Conduit Routing

1. The number of bends, offsets and crossovers shall be kept to a minimum.
2. The Contractor shall exercise the necessary precautions to prevent the lodging of dirt, plaster, or foreign matter, in conduits, boxes and fittings during installations.
3. Runs shall be parallel to walls, beams, columns and horizontal planes and shall be neatly aligned.
 - a. For bends made in the field, an approved conduit bending machine shall be used.
 - b. Field bends shall be symmetrical and carefully made so as to prevent damage or deformation of conduit.
4. Conduit runs shall be slightly pitched to facilitate draining condensation or shall be otherwise installed to prevent trapping of condensation.

F. Underground Conduits

1. Conduits shall be buried to a minimum of 24 inches unless otherwise shown or specified.
2. All buried metallic conduits shall be individually tied to plant grounding grid at each electric manhole or handhole.
3. All buried conduits or groups on conduits 2 feet in width or less shall have an identifying tape buried 12 inches under finish grade and located directly over the centerline of the conduits. Groups of conduits over 2 feet wide shall have additional identifying tape per 2 feet or less of additional width. Where shown on the Contract Drawings, additional tapes shall be provided for duct banks wider than thirty inches.
4. Underground conduit not encased in concrete shall be PVC coated rigid steel

5. Underground conduit exiting and entering structures shall have expansion couplings as specified.
4. Where conduit is buried below structures, footing, slabs, etc., the electrical Subcontractor shall excavate, install, backfill, and compact buried conduit prior to final compaction by General Contractor.
5. Any Earthwork shall be in accordance with section 02 25 00 Excavation, Backfill, and Compaction.
8. The transition from the underground conduit system to the building interior conduit system shall occur at the first junction box, device, or equipment enclosure within the building. Conduit seals shall be provided at this location. Such seals shall minimize the circulation of air between the underground conduit system and the indoor enclosures. Seals shall be composed of Duct Seal sealing compound or similar non-hardening removable sealant.
9. Conduit bends in underground conduits shall have a minimum centerline radius as follows:

<u>Conduit Size</u>	<u>Radius (inches)</u>
3 inch	36
4 inch	42
5 inch	48

10. Conduits terminating at manholes shall have endbells or insulated bushings.
11. Conduit spacers shall be used when installing two or more underground conduits. Conduit spacers shall be located at intervals of 8 ft or less.

E. Conduits in Concrete

1. All electrical conduit placed in concrete slabs shall be installed after and above the bottom reinforcing bars, but before and under the top reinforcing bars.
 - a. Where conduit crossovers are necessary, they shall be located so that the reinforcing bars are not displaced from their positions.
 - b. The minimum clearance between conduits shall be 2 times the diameter of the conduit.
 - c. No conduit greater than $t/4$ in diameter, where "t" is the thickness of the concrete slab, shall be placed in any structural slab.
 - d. If these conditions cannot be satisfied, the conduit shall be placed below the slabs.
2. Where electrical conduits in slabs cross a building expansion joint, an expansion coupling for each conduit shall be installed at the joint.

3. Conduits encased in concrete shall be type 40 heavy - wall polyvinyl chloride per NEMA standards and UL listed.
 4. Where concrete encased conduits enter manholes, #4 dowels shall be installed between the duct bank and manhole, on 8 inch centers around the perimeter of the duct bank, to minimize the potential for conduit shearing at the ductbank/manhole interface.
 5. Concrete encased conduits (underground ductbanks) where shown or scheduled shall be schedule 40 PVC. Where these conduits enter buildings or equipment, concrete encasement shall stop approximately 5 ft from the building or equipment. There shall be a transition from schedule 40 PVC to RMC or IMC approximately 10 ft. from the building or equipment, so that the transition occurs within the concrete encasement.
- F. Conduits in Chlorine Room and Corrosive Areas. Where conduits pass through Chlorine Rooms or Corrosive Area walls and/or floors, seal-off fittings as specified shall be installed to prevent gas leakage through the conduit system.
- G. Conduits in Hazardous Areas. All conduit and equipment, in or through areas classified as Hazardous and all conduit and equipment for explosion proof work, shall be installed in accordance with the provisions of Article 501 of the National Electric Code for Class I, Group D, Division 1 locations. Compound filled seal-off fittings as specified shall be installed as required.

3.2 CONDUIT TYPES

- A. Conduit types shall be in accordance with the following schedule unless specifically noted otherwise on the Contract Documents

Area/Use Description	RMC	PVC coated RMC	PVC	Reference Notes:
Underground Ductbanks		x	x	
Conduit Encased in Concrete		x		
Exposed Conduit		x		
All conduits in "Corrosive" Areas		x		

- B. Only rigid metal conduit (RMC) or Intermediate metal conduit (IMC), shall be provided, unless specifically noted otherwise on the Contract Drawings.

**** End of Section ****

SECTION 26 05 43
UNDERGROUND DISTRIBUTION SYSTEMS

PART 1 GENERAL

1.1 DESCRIPTION

This Section includes the requirements for providing the underground distribution systems of raceways, duct banks, handholes, and all necessary construction materials and appurtenances as indicated.

1.2 QUALITY ASSURANCE

- A. Material and installation shall be in accordance with the latest revisions of the following codes, standards, and specifications, except where more stringent requirements have been specified herein:
 - 1. National Electric Code (NEC)
 - 2. National Electrical Safety Code (NESC)
 - 3. American Society for Testing of Materials (ASTM)
 - 4. Underwriters Laboratories (UL)
- B. Equipment furnished under this section shall be furnished by manufacturers who meet the industry standards for quality, workmanship, and experience.

1.3 SUBMITTALS

- A. Prior to obtaining any material in connection with this Section, detailed shop drawings on all material shall be submitted. Submittals shall conform to the requirements of section 01 33 00 Submittals.
- B. Shop drawings shall show fabrication and installation details for underground ducts and utility structures. Shop drawings shall include catalog information and fabrication drawings for conduits, duct banks, handholes, manholes, and all associated accessories. Associated accessories include, but are not limited to, manhole and handhole hardware, duct bank spacers, warning tape, and miscellaneous components. Include schedules indicating type, size, number, and identification of all materials and components.
- C. Submit scaled layout drawings for the underground distribution system. Drawings shall include the following information:
 - 1. Underground Distribution Plan, showing manhole and handhole locations, and interconnecting concrete and sand encased duct banks. Scale shall be 1" = 20' maximum.
 - 2. Duct bank sections, showing scaled cross-sections and labels and sizes of ducts.

3. Duct bank profile, showing mounting elevations, duct bank penetrations to manholes, handholes, and buildings. Scale shall be 1" = 20' maximum. Other underground utilities in the affected area shall be shown.

1.4 CLOSEOUT SUBMITTALS

Provide project record documents which record actual locations of components.

PART 2 PRODUCT

2.1 GENERAL

- A. Provide all labor, materials, equipment, and services necessary for a complete installation.
- B. Fasteners, supports, and hardware shall be stainless steel.

2.2 UNDERGROUND DUCT BANKS (CONCRETE ENCASED)

- A. Underground duct banks shall be arrangements of single bore, PVC conduits (except where otherwise specified herein to be PVC coated rigid steel conduits) concrete encased with steel reinforcing bars. The number and size of conduits shall be as indicated on the Contract Drawings.
- B. PVC schedule 40 conduit shall be in accordance with the requirements of Section 26 05 33 Conduits and Raceways Systems.
- C. Concrete for duct banks shall be 3,000 psi test in 28 days (with pea gravel aggregate) and shall be in accordance with the requirements of Section 03 30 00 Cast-in-Place Concrete.
- D. Reinforcing steel (rebar) shall conform to ASTM A615 – Grade 40 or Grade 60, minimum ½" and shall be in accordance with the requirements of Section 03 30 00 Cast-in-Place Concrete.
- E. Conduit spacers shall be rigid plastic and shall maintain conduit spacing during concrete pour.
- F. Joint sealant shall be watertight as recommended by conduit manufacturer.
- G. Thruwall and Floor Seals shall be OZ type "FSK" or "WSK", or equal.

2.3 UNDERGROUND DUCT BANKS (DIRECT BURIED)

- A. Underground duct banks shall be arrangements of PVC coated rigid galvanized steel (RGS) conduits encased in sand, unless otherwise specified. Conduit shall be provided

as specified in the Section 26 05 33 Conduits and Raceways Systems. Direct buried conduits shall only be installed where specifically indicated in the Contract Documents.

2.4 HANDHOLES

- A. Precast handholes shall be reinforced concrete, monolithically poured walls and bottom, with steel frame and access door assembly as the top of handhole. Duct entrances and windows shall be located near corners to facilitate racking. Pulling-in irons and other built-in items shall be installed before pouring concrete. Cover shall have nonskid finish and legend. Unit, when buried, shall be designed to support AASHTO H10 loading in non-road or pavement areas and ASSHTO H20 loading in road or pavement areas.
- B. Cover shall be labeled to identify the handhole as "ELECTRIC" or "SIGNAL".

2.5 CONSTRUCTION MATERIALS

- A. Mortar. Mortar shall be in accordance with ASTM C 270, Type M, except for quantities less than 2 cubic feet (60 l). If quantity is less than 2 cubic feet, packaged mix complying with ASTM C 387, Type M may be used.
- B. Concrete. Concrete shall be 3000 psi (20.7 MPa) minimum, 28 day compressive strength and 3/8 inch (10mm) maximum aggregate size. Concrete and reinforcement shall be as specified in Section 03 20 00 Concrete Reinforcing.

2.6 ACCESSORIES

- A. Warning Tape
 - 2. Tape shall be red and have imprinted a minimum of 1-inch high letters "CAUTION BURIED ELECTRIC LINE BELOW" or appropriate warning approved by the Engineer.
 - 3. Tape shall be 6 inches wide, 4.5 mils thick, and made of low-density polyethylene.
 - 4. Warning tape shall be as manufactured by Allen Systems (Houston, Texas), Panduit, or equal.
- B. Duct-bank Conduit Spacers
 - 1. Underground Duct-bank conduit spacers shall provide stability and consistent separation on duct-banks. Spacers shall be sized for the conduits with which they are used. They shall provide both vertical and horizontal spacing with interlocking intermediate and base spacers.
 - 2. Duct-bank conduit spacers shall be as manufactured by Carlon, or equal

PART 3 EXECUTION

3.1 GENERAL

- A. Perform all site preparation, excavation, trenching, and backfilling necessary to install underground duct banks, manholes, handholes, transformers pads, and vaults. Excavation and backfill shall be performed in accordance with the requirements of Section 02 25 00 Excavation, Backfill, and Compaction.
- B. Grounding and bonding shall be in accordance with the requirements of the section entitled "Electrical Grounding".
- C. Cleaning
 - 1. Keep conduits, manholes, and handholes free from concrete, dirt, debris, and other substances during the construction.
 - 2. After the duct lines have been completed, pull a standard flexible mandrel not less than 12 inches long, having a diameter approximately $\frac{1}{4}$ inch less than the inside diameter of the conduit, through each conduit; then 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 conduit. This requirement shall not be applicable for PVC coated rigid steel conduit.
 - 3. Replace conduits that do not allow passage of the mandrel at no additional cost to the Owner.
 - 4. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full lengths of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.
- D. Install a 3/8" nylon or polypropylene pull line in all spare conduits. Plug and seal spare conduits after cleaning.
- E. Identify all conductors and cables within handholes and manholes with permanently indented or engraved tags. Identifying information shall include circuit origin, circuit number, and load served.

3.2 CONDUIT AND DUCT INSTALLATION

- A. Adhere to lines, grades, elevations, and dimensions as indicated. Resolve interferences with other underground conduits, piping, or equipment, either new or existing, with the Engineer. Match components suitable for proper installation.
- B. Prior to trenching, locate underground piping and conduits above and up to 12-inches below the new conduit duct banks by hand digging.
- C. Accomplish changes in direction of runs exceeding total of 10 degrees, either vertical or horizontal, by long sweep bends having a minimum radius of curvature of 12 feet, except when manufactured bends are used at or near ends of short runs of 100 feet or less. Long sweep bends shall be made up of one or more curved or straight sections. Install manufactured bends with a minimum radius of 48 inches at risers and where larger radius cannot be used.
- D. Curves and Bends. Use manufactured galvanized rigid steel elbows for stub-ups at equipment and at building entrances. Use manufactured long sweep bends with a minimum radius of 25 feet (7.5m), both horizontally and vertically, at other locations.
- E. Use solvent-cement joints in ducts and fittings and make watertight according to manufacturer's instructions. Stagger couplings so those of adjacent ducts do not lie in the same plane.
- F. Slope of conduits. Pitch duct lines with a minimum slope of four inches per 100 feet and slope towards manholes and handholes and away from buildings and structures.
- G. Duct Entrances to Handholes. Space end bells approximately 10 inches (250 mm) on center for 5 inch (125 mm) ducts and the spacing proportionately for other duct sizes. Change from regular spacing to end-bell spacing 10 feet (3 m) from the end bell without reducing duct line slope and without forming a trap in the line. Grout end bells into manhole walls from both sides to provide watertight entrances.
- H. Concrete Encased, Nonmetallic Ducts. Support ducts on duct spacers, spaced as recommended by manufacturer and coordinated with duct size, duct spacing, and outdoor temperature. Install as follows:
 - 1. Separator Installation. Space separators close enough to prevent sagging and deforming of ducts and secure separators to earth and to ducts to prevent floating during concreting. Stagger spacers approximately 6 inches (150 mm) between tiers. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
 - 2. Concreting: Spade concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Use a plank to direct concrete down sides of bank assembly to trench bottom. Allow concrete to flow to center of bank and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating

equipment unless specifically designed for duct-bank application. Pour each run of envelope between manholes or other terminations in one continuous operation. If more than one pour is necessary, terminate each pour in a vertical plane and install 19-mm (3/4-inch) reinforcing rod dowels extending 18 inches (450 mm) into concrete on both sides of joint near corners of envelope.

3. Reinforcement. Reinforce duct banks where they cross disturbed earth and where indicated.
 4. Forms. Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
 5. Minimum Clearances between Ducts. 3 inches (75 mm) between ducts and exterior envelope wall, 2 inches (50 mm) between ducts for like services, and 4 inches (100 mm) between power and signal ducts.
 6. Depth. Install top of duct bank at least 24 inches (600 mm) below finished grade in nontraffic areas and at least 30 inches (750 mm) below finished grade in vehicular traffic areas, unless otherwise indicated
- I. Direct Buried Ducts. Support ducts on duct spacers, spaced as recommended by manufacturer and coordinated with duct size, duct spacing, and outdoor temperature. Install as follows:
1. Separator Installation. Space separators close enough to prevent sagging and deforming of ducts.
 2. Install expansion fittings as shown on Shop Drawings.
 3. Trench Bottom. Continuous, firm, and uniform support for duct bank. Prepare trench bottoms as specified in 02 25 00 Excavation, Backfill, and Compaction. for pipes less than 6 inches (150 mm) in nominal diameter.
 4. Backfill: Install backfill as specified in 02 25 00 Excavation, Backfill, and Compaction. After installing first tier of ducts, backfill and compact. Repeat backfilling after placing each tier. After placing last tier, hand-place backfill to 4 inches (100 mm) over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, complete backfilling normally.
 5. Minimum Clearances between Ducts. 3 inches (75 mm) between ducts for like services and 6 inches (150 mm) between power and signal ducts.
 6. Depth. Install top of duct bank at least 36 inches (900 mm) below finished grade, unless otherwise indicated.

- J. Warning Tape. Install non-biodegradable, red plastic marker tape above every duct bank. Warning tape shall be in accordance with Section 26 00 00 Electrical General. Bury warning tape approximately 12 inches (300 mm) above all concrete encased duct banks. Align tape parallel to and within 3 inches (75 mm) of the centerline of duct bank.
- K. Stub-ups. Use rigid steel conduit for stub-ups to equipment. For equipment mounted on outdoor concrete bases, extend steel conduit a minimum of 5 feet (1.5 m) from edge of base. Install insulated grounding bushings on terminations. Couple steel conduits to ducts with adapters designed for this purpose and encase coupling with 3 inches (75 mm) of concrete.
- L. Sealing. Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15 psig (1.03-MPa) hydrostatic pressure.
- M. Pull Cord. Install 100 lbf (445 N) test nylon cord in ducts, including spares.

3.3 GROUNDING

- A. Provide grounding at each manhole and handhole as follows:
 - 1. Drive a single $\frac{3}{4}$ " diameter by 10 foot long, copper-clad steel ground rod through a hole in the bottom of each manhole and handhole. Leave 6 inches above floor and seal penetration with grout and sealant.
 - 2. Ground rods shall be properly bonded to equipment grounding conductors, metallic cable sheaths, cable racks, manhole cover frame, and ladders. Ground rods shall also be connected to grounding grids located at the nearest adjacent buildings. Ground connections shall be exothermic weld type as specified in the Section 26 05 26 Electrical Grounding. Ground cables shall be neatly and firmly attached to interior walls, and the amount of exposed bare wire held to a minimum. Bonding wires for racks and ladders shall be #4/0 stranded soft drawn bare copper.
 - 3. Terminate steel conduit entering manholes and handholes using grounding bushings. Ground all steel conduits entering manholes to the ground rod inside the manhole.'
- B. Test handhole grounding to ensure electrical continuity of grounding and bonding connections.

** End of Section **

This page intentionally left blank

SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 DESCRIPTION

This Section includes materials, procedures, practices, and requirements that shall be provided for identification of raceways, conductors, instruments, equipment, and devices.

1.2 QUALITY ASSURANCE

- A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:

1. National Electrical Code (NEC)
2. Underwriters Laboratories, Inc. (UL)

1.3 SUBMITTALS

- A. Prior to obtaining any materials in conjunction with this Section, detailed shop drawings on all material shall be submitted. Submittals shall conform to the requirements of Section 01 33 00 Submittals.
- B. Submittals include:
1. Complete list of all engraved nameplates. Failure to indicate all nameplates on this list shall not relieve the contractor of the requirement for their installation.
 2. Sample of engraved nameplate, punch type label, marking tags, laminated instrument tags.
 3. Catalog data sheets for engraved nameplates, marking tags, or other item used to identify equipment.
 4. Duplicate set of all engraved nameplates.

PART 2 PRODUCTS

2.1 NAMEPLATES

- A. Nameplates shall be engraved lamicoid.
- B. All lettering shall be uppercase (condensed block type), unless otherwise noted.
- C. Nameplate colors shall be black with white letters unless otherwise shown.

- D. Nameplate numbering system, lettering style, and letter size shall be as shown on Contract Drawings, schedules, etc.
- E. Plaques for building disconnecting means shall be provided on disconnecting means enclosures for each disconnecting means. For building with multiple power sources, each power source disconnecting means shall be provided with a plaque identifying it as a building disconnecting means, and the total quantity of building disconnecting means within the building. Plaques shall be of the same construction as the service entrance plaques specified in section entitled "Incoming Services".

2.2 MARKING TAGS (WIRE AND CABLE IDENTIFICATION)

Marking Tags shall be means of preprinted plastic tape. Manufacturer: Brady, O.Z. Gedney, equal.

2.3 INSTRUMENT TAGS

- A. Instrument tags shall be laminated vinyl tape, minimum 3 inches by 5 inches with preprinted insert and "write on" type laminate to provide calibration and servicing information. Each tag shall include a pre-punched hole for fastening to instrument with ty-raps.
- B. Tags shall be Panduit No. PST-2 or equal with a preprinted (not handwritten) insert.
- C. Each instrument tag shall include the following as appropriate:

SIDE 1

FIT – 1 (*instrument tag number*)

FLOW INDICATIONG TRANSMITTER (*instrument type*)

Manufacturer:

Model No.:

Serial No.:

Calibrated Range:

Power:

Installed by:

SIDE 2 (write-on laminate side)

FIT – 1 (*instrument tag number*)

FLOW INDICATING TRANSMITTER (*instrument type*)

Calibrated Range:

Output:

Alarms Set @ High:

Low:

Recommended Service Interval:

Last Serviced on:
Last Serviced by:

PART 3 EXECUTION

3.1 INSTALLATION

- A. Follow the numbering systems specified, scheduled and/or shown on the Contract Documents.
- B. Provide identification noted on panel schedules, one-line diagrams, etc. for all instruments, panelboards, contactors, transformers, disconnect switches, bus-ways, motor starters, devices, controllers, motor control centers, unit substation, fire alarm systems, sound systems, and all other electrical devices and enclosures. Indicate with engraved lamicoid nameplate, on cover of equipment and label with numbers and letters as shown.

3.2 FASTENING

- A. Nameplates: Clean equipment surface and securely fasten each label with silicone adhesive.
- B. Instrument Tags: Laminated instrument tags shall be fastened to instruments with cable ties.

3.3 DEVICES (RECEPTACLES AND LIGHT SWITCHES)

Label all receptacles and light switches on faceplate with 3/4-inch clear punched (Dymo) tape.

- A. Provide the following information:
 - 1. Panel Designations (per panelboard schedules)
 - 2. Branch Breaker Number

3.4 WIRE CABLES

- A. Tag all feeders, sub-feeders, special system wiring, and control wiring in each panelboard, pull-box and gutter space, denoting points of origin and termination of the wires.
- B. Provide the following information:
 - 1. Panel or source where the conductors originate
 - 2. Circuit Number
 - 3. Circuit Designation

3.5 SPECIAL PANELBOARD REQUIREMENTS

A. Nameplates: Identify in accordance with Panel Schedule

B. Directory:

1. Provide complete type written directory for each panel, with all room numbers, functions, etc., clearly identified for each individual branch circuit.
2. Handwritten directory shall be provided until all circuits are connected and balanced. Then, install permanent directory. Do not mark circuit identification on the front of enclosure of panels or on other electrical equipment.
3. Lighting panel locations shall be identified in the panel directory according to location.
4. Electrical sub-feed circuits from panels shall also be identified in the panel directories.
5. When branch circuits are relocated, the panel directory shall be updated to indicate new functions, and locations.
6. When branch circuits are removed, the panel directory shall be updated to indicate a spare.

**** End of Section ****

SECTION 26 09 00
MISCELLANEOUS ELECTRICAL CONTROLS

PART 1 GENERAL

1.1 DESCRIPTION

This Section includes miscellaneous controls, electric indicating instruments, instrument transformers, elapsed time meters, pressure and limit switches, control stations, pushbuttons, selector switches, and indicators and all appurtenances necessary for a complete installation.

1.2 SUBMITTALS

- A. Submittals shall conform to the requirements of Section 01 33 00 Submittals, and to the requirements given in Section 26 00 00 Electrical General. In addition, submittals shall include the manufacturer's name, trade name, place of manufacturer, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification, and technical paragraph reference.
- B. Submittals shall contain a material list with manufacturer's name and data describing the material and showing its compliance with specifications, associated standards and test requirements.
- C. Prior to obtaining any material in connection with this section, catalog data and detailed wiring connection diagrams shall be submitted. Submittals for each manufactured item shall be current manufacturer's descriptive literature of cataloged products, equipment drawings, diagrams, performance and characteristic curves, and catalog data sheets. Submittal shall include ratings, circuit diagrams, and dimensional data, as a minimum. Drawings shall include elementary and interconnection diagrams showing connections to internal components, and indicate field termination points for power and control interface. Should manufacturer's data require supplemental information for clarification, the supplemental information shall be submitted.
- D. Shop drawings shall present complete and accurate information relative to all working dimensions, equipment weights, assembly and section views, and all necessary details pertaining to coordinating the work of the Contract, lists of materials and finishes, parts list and the descriptions thereof, lists of spare parts and tools where such parts or tools are required, and any other information that is required to demonstrate compliance with the Contract Documents. Drawings for electrical equipment shall include elementary and interconnection diagrams showing connections to internal components, and indicating field termination points for power and control interface.
- E. Submittal shall contain manufacturer's descriptive data including ratings, circuit diagrams, and dimensional data.
- F. Samples of any material shall be submitted upon Engineer's request.

1.3 QUALITY ASSURANCE

- A. Material and installation shall be in accordance with the latest revisions of the following codes, standards, and specifications, except where more stringent requirements have been specified herein:
 - 1. National Electric Code (NEC)
 - 2. National Electrical Manufacturers Association (NEMA)
 - 3. Underwriters Laboratories, Inc. (UL)
 - 4. International Electrotechnical Commission (IEC)
- B. Uniformity: Unless otherwise specified, equipment or material of the same type of classification, used for the same purpose shall be the product of the same manufacturer. All material shall be new and of the current design of the manufacturer providing equipment or material.

PART 2 PRODUCT

2.1 CONTROL RELAYS AND CONTACTORS

- A. Plug-In Control Relays (Control Panel Applications)
 - 1. General purpose control relays shall be provided where control functions require remote indicating functions, use of interposing relays, or for other control functions where installed in control panels, annunciator panels, and display panel applications.
 - 2. Control panel relays shall be plug-in type. Provide 120 VAC coil relays with pin-type construction for AC control wiring and 24 VDC coil relays for DC control wiring. AC coil relays shall be pin type construction and DC coil relays shall be blade-type construction. Provide 8 or 11 pin-type or blade-type sockets as required for mounting relays.
 - 3. Control panel relays shall be provided with a pushbutton for testing the operation of the relay and other control functions.
 - 4. Control relays shall be provided with an integral indicating light to show the state of the relay coil (energized or de-energized) and contacts.
 - 5. Contacts for use with analog circuits shall be Silver Cadmium Oxide type rated for 10 amperes at 240 VAC. Solid State Timing Relays (TR) shall have adjustable time settings within adjustable time
 - 6. Control relays shall be as manufactured by:

- a. Square D – Class 8501 type K
- b. Idec – RR Series
- c. Potter & Brumfield
- d. equal

B. Solid State Timing Relays

1. Solid state timing relays shall have adjustable time settings within adjustable time ranges.
2. Timing ranges shall be adjustable from 0.5 seconds to 24 hours, unless noted otherwise.
3. Timing relays shall have four selectable modes: on-delay, off-delay, one-shot, and repeat cycle.
4. Solid state timing relays shall be as manufactured by Square D Class 9050 type JCK, or equal.

C. Solid State AC Current Relays

1. Solid state AC current relays shall be designed to sense AC overcurrent conditions. The relays shall be used as a means to monitor motor torque for the Sludge Holding Tank Mixers.
2. Relays shall have the following delay modes: Start Delay, Trip Delay, and Inhibit Delay
3. Relays shall operate on 120 VAC power supply and shall be wired as shown on the Contract Drawings.
4. Relays shall be Type 809S as manufactured by Allen Bradley or equal.

D. Pump Alternation Relays

1. Alternation relays shall change the sequence of the pumps after every cycle of operation.
2. The alternation relay shall plug into a standard octal pin relay socket and include position indicating lights.

E. Heavy Duty Machine Tool Relays

1. Heavy duty control relays shall be provided for operation where installed in motor control centers or individually enclosed motor starters.
2. Control relays shall be of the heavy duty, 600 VAC machine tool type, designed for

rapid cycling duty or continuous operation.

3. Relays shall be of modular construction capable of mounting adder decks to increase the number of output contacts. Contacts shall be convertible in the field from normally open to normally closed and vice-versa, without additional parts. Relay armatures shall be operable manually, without power, for testing purposes.
4. Timing relays provided for use with reduced voltage motor starter applications shall be the standard product of the motor starter manufacturer.
5. Heavy duty machine tool relays shall be as manufactured by:
 - a. Square D – Class 8501 Type C
 - b. General Electric – Type CR120B
 - c. equal

G. Intrinsically Safe Relay (Barrier Relays)

1. Intrinsically safe relays shall be provided with an energy barrier limiting the available voltage and current in the Hazardous Location. The relays shall interface with non-explosion proof field devices which are mounted in the Hazardous Locations. The circuits shall be suitable for installation in Class I, Group D, Division 1 Hazardous Locations.
2. The relay shall be constructed of plastic or glass reinforced nylon suitable for back plate mounting or din rail mounting. Terminals shall have captive screws with self-lifting clamps.
3. Intrinsically safe relays shall be six channel relay, accepting a dry contact input. The relay shall operate on 120 VAC, 1 phase power supply and shall be provided with two SPDT output relays to obtain NO and NC contact.
4. The relays shall be as manufactured by Idec – Model EB3C, Square D Company - Model NY2 A1, or equal

H. Galvanic Barrier, Loop Powered, Intrinsically Safe Signal Barrier

1. Galvanic signal barrier shall be provided to limit the energy from sensors or analog devices in the Hazardous Location. The signal barrier shall interface with non-explosion proof field devices which are mounted in the Hazardous Locations. The circuits shall be suitable for installation in Class I, Group D, Division 1 Hazardous Locations.
2. Specifications
 - a. Signal Range: 4 to 20 mA; available transmitter voltage >16V for supply voltage >21V.
 - b. Safe Area Output: 4 to 20 mA; transmitter voltage < 30 VDC.
 - c. response time < 20 usec at 0, and <600 usec 800 load

- d. maximum power dissipation: 150 mW @ 20 mA and $V < 24V$
 - e. Temperature Limits: -4° to $140^{\circ}F$ (-20° to $60^{\circ}C$)
 - f. Agency Approvals: CE, FM.
3. The intrinsically safe signal barrier shall be Dwyer Instruments KFD0-SCS-EX1.55 or equal.

I. Three Phase Power Monitor Relays

- 1. Three phase power monitor relays shall detect phase loss, voltage and phase reversal, and low voltage line conditions. The relay shall continuously monitor the three phase power lines for abnormal conditions. The monitor shall consist of a solid state voltage and phase angle sensing circuit coupled to a electromechanical relay.
- 2. The three phase power monitor shall be suitable for monitoring 480 VAC, 3 phase, 60 Hz. power systems. The output relay shall be provided with a field adjustable trip delay feature and provided with a single pole double throw form contacts rated at 5 amperes minimum.
- 3. The relay shall be provided with a red LED type failure indicator.
- 4. The relays shall be as manufactured by:
 - a. SSAC Inc.- RLM Series
 - b. Time Mark Corporation - Model 252
 - c. equal

H. Three Phase Power Monitor Relays

- 1. Three phase power monitor relays shall detect phase loss, voltage and phase reversal, and low voltage line conditions. The relay shall continuously monitor the three phase power lines for abnormal conditions. The monitor shall consist of a solid state voltage and phase angle sensing circuit coupled to a electromechanical relay.
- 2. The three phase power monitor shall be suitable for monitoring 480 VAC, 3 phase, 60 Hz. power systems, 240 VAC, 3 phase, 60 Hz power systems, or 208 VAC, 3 phase, 60 Hz systems. The output relay shall be provided with a field adjustable trip delay feature and provided with a single pole double throw form contacts rated at 5 amperes minimum.
- 3. The relay shall be provided with an LED type status indicator.
- 4. The protection relay shall meet the following requirements:
 - a. Frequency 50/60 Hz
 - b. Low voltage trip 90%, +/- 1%
Low voltage reset 93% +/- 1%
 - c. Voltage Unbalance (NEMA)

trip	6%
reset	4.5%

- d. High voltage trip 110% +/- 1%
High voltage reset 107% +/- 1%
 - e. Trip delay time High/low voltage fault 4 seconds
 unbalance and phasing faults 2 seconds
 - f. Restart time 2 seconds
 - g. Output contact ratings (SPDT) 10A at 240VAC
 - h. Temperature -20° C to 70°C (-4° F to 158° F)
 - i. Relative Humidity 10-95% non-condensing per IEC 68-2-3
 - j. Trip and reset accuracy +/- 1%
 - k. Maximum input power 5W
5. The relays shall be as manufactured by:
- a. Littlefuse – 201A series
 - b. equal

2.2 PUSHBUTTONS, SELECTOR SWITCHES, INDICATOR LIGHTS

- A. All field mounted devices shall be heavy duty, oiltight, with die cast operator bodies, and molded modular type contact blocks.
- B. Unless noted otherwise, pushbuttons, selector switches, and indicator lights mounted on the front of control panels shall be the 30mm, heavy duty, industrial style.
- C. Pushbuttons, selector switches, and indicating lights shall be configured as shown on the Contract Drawings, specified, or detailed. (e.g. momentary contacts, maintained contacts, 2-position, lockout type, spring return to center, or other control functions).
- D. Pushbuttons
 - 1. Pushbuttons shall have color button operator with guards, engraved legend plates, and contact blocks as required.
 - 2. Stop pushbuttons shall be of the mushroom head type.
 - 3. Emergency stop pushbuttons shall be of the maintained contact type, push to stop, pull to release, with the extra large mushroom style knob, legend plate, and color appropriate for an emergency stop function.
 - 4. Lockout stop pushbuttons shall be designed to accommodate a padlock in the stop position
- E. Selector Switches
 - 1. Selector switches shall have glove hand type operators, engraved legend plates, and contact blocks as required.
 - 2. Selector switches for use with analog circuits shall be provided with gold plated contacts

F. Indicating Lights

1. Indicating lights shall be wired for "push-to-test" operation when specified, shown, or required.
2. Indicating lights shall be 120 volt transformer type unless otherwise noted.
3. Indicating lights shall be provided with interchangeable color caps.
4. Indicating lights shall be provided with engraved legend plates stating the intended control function and purpose.

G. Pushbutton and Indicator Light Colors

1. Unless otherwise noted, pilot light and pushbutton colors shall be in accordance with NFPA-79 Industrial Machinery, modified below to provide additional definition.
2. Indicator Lights Colors
 - a. Red – On/Open/Danger/Alarm
 - b. Green – Off/Closed/Ready
 - c. Yellow or Amber – Caution/Attention
 - d. White – Power On/Energized
 - e. Blue – Miscellaneous
3. Pushbutton Colors
 - a. Red – Stop/Off/Emergency Stop
 - b. Green – Start/On
 - c. Yellow or Amber – Intervention/Return
 - d. Black – No specific function

H. Manufacturers

1. Square D Class 9001 Type K
2. Allen-Bradley Bulletin 800T
3. General Electric CR2940
4. equal

2.3 CONTROL STATIONS

- A. Control stations of less than sixteen units, located in non-hazardous areas and in Dry Locations shall be rated NEMA 13, oiltight, die cast, with synthetic rubber gaskets, threaded conduit openings, pre-punched gasketed pushbutton openings, and concealed hinge covers.
- B. Control stations of more than sixteen units, located in non-hazardous areas and in Dry Locations shall be rated NEMA 12, with hinged and gasketed covers, and punched pushbutton openings.

- C. Control stations located in Hazardous Areas shall be approved for Class I, Division 1, Group D atmospheres. Control stations shall be rated NEMA 7 with approved pushbutton assemblies.
- D. Control stations located in Wet Locations or Corrosive Areas shall be NEMA 4X, fiberglass reinforced thermoplastic enclosures with gasketed covers and conduit holes. Grounding bushings shall be provided on all metallic conduits entering the control stations and metallic pushbuttons.
- E. Control station manufacturers:
 - 1. Non-hazardous control stations (less than sixteen units)
 - a. Allen- Bradley Bulletin 800T Series TZ
 - b. General Electric CR2940 Series BC
 - c. Square D Class 9001 Type KYK
 - d. equal
 - 2. Non-hazardous control stations (greater than sixteen units)
 - a. Hoffman NEMA 12 or NEMA 4X enclosures
 - b. equal
 - 3. Hazardous location control stations
 - a. Crouse-Hinds NEMA 7 control station
 - b. equal
 - 4. Corrosive Area and Wet location control stations
 - a. Square D Class 9001 Type SK
 - b. Hoffman Series PBRFG
 - c. Equal

2.4 MISCELLANEOUS CONTROLS FUNCTIONS

A. Elapsed Time Meters

Elapsed time meters shall be provided where shown on the Contract Drawings. The time meters shall have synchronous clock motor movements for service at 115 VAC, single phase at 60 Hertz, and 3 inch dials with 6 digits, calibrated in hours and tenths of an hour. The elapsed time meters shall be Westinghouse Type BH-351, General Electric Type 240 or equal.

B. Alarm Horns

- 1. Alarm horns shall be provided with die cast aluminum wiring box and a black molded polycarbonate grille. Alarm horns shall be suitable for control panel or stand-alone wall mounting as shown on the Contract Drawings. Alarm horn output levels shall be field adjustable with factory setting of 88 dB at ten feet. Alarm horns shall be rated for continuous duty with an operating temperature range 0-95 degrees Fahrenheit. Alarm horns shall operate on 120 VAC, single phase power supply.

2. Alarm horns shall be weatherproof, rated NEMA 4X. The Alarm horn shall be Tork Model TA876-N5, or equal.

C. Power Conditioner

1. Power conditioners shall be furnished to provide power protection against sags, surges, swells, spikes, and electrical noise. The power protection unit shall provide noise suppression and fast microcomputer-controlled voltage regulation.
2. Power conditioners shall be rated for 10 kVA with a 208 VAC, 3 phase input power rating and a 208/120 VAC, 3 phase power output rating. Unit shall be hardwired to a 208/120 VAC, 3 phase lighting panelboard.
3. Power conditioners shall be Model 62610-Line 2 as manufactured by Square D Company, or equal.

D. Photocells

1. Photocells shall be provided to control automatic operation of the site and area lighting fixtures. The Photo-controller shall be mounted inside the Lighting Control Panel and the sensor mounted outside the building against the wall in an area where it is less likely to be illuminated by car lights.
2. Photocells shall be suitable for operation on a 120VAC, single phase power and UL listed.
3. Photocell shall include a built-in time delay to prevent false triggering and shall be able to control up to 64 circuits of lighting.
4. Photocells shall be provided where shown on the Contract Drawings. Provide two (2) spare photocell units.
5. Photocells shall be Lithonia, model Panelmax/LPC with the features specified above or equal.

E. Limit Switches

1. Mechanical limit switches shall have a heavy duty, snap action mechanism that prevents false contact opening. Limit switches shall be the lever arm with hardened roller configuration.
2. Limit switch enclosure shall be metal and rated NEMA 4. Limited switch shall use a booted shaft design to prevent penetration of foreign materials.

3. Provide 1 N.O. and 1 N.C. set of contacts, rated for 20 amperes. Wire insulation shall be rated for 600VAC and DC.
4. Limit switch shall meet the following requirements:
 - a. Temperature range: 0°F to 200°F (-17°C to 93°C)
 - b. Vibration resistance: 30G max (10-55 hz)
 - c. Repeatability: 0.03°.

PART 3 EXECUTION

3.1 INSTALLATION

A. General

1. All controls unless shown otherwise shall operate at 120 VAC.
2. All electrical control components shall be installed as shown and specified in the Contract Documents, as directed by the County and as recommended by the manufacturers.
3. The enclosures containing electrical components shall be solidly grounded with a ground conductor as specified in Section 26 27 16.
4. Where existing controls are shown to be utilized for new functions, a new, permanent tag shall be provided to identify the new control function.

B. Field Tests

1. After installation, all controls shall be checked and the required adjustments shall be made.
2. Each control function on each piece of equipment shall be field tested and certified to be functioning by the Contractor. Contractor shall notify Engineer three days in advance of this test and allow the Engineer to be present during testing. Equipment shall be field tested in the presence of the Engineer and shall be demonstrated to operate satisfactorily.
3. In the event of failure of the field test, the Contractor shall retest the equipment, at his own cost and expense, as directed by the Engineer.

****End of Section****

SECTION 26 09 10
CONTROL PANELS

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes requirements for the SCADA RTU Control Panel. This Control Panel shall provide local control and it shall function as a Remote Terminal unit in the existing Worcester County SCADA System.
- B. Equipment furnished under this Contract shall be installed in an industrial type environment and powered from an electrical source that may include harmonic distortion, surges, sags, and other electrical noise under normal operating conditions. The Contractor and his suppliers shall verify that all equipment furnished shall function correctly in this noisy electrical environment. If the equipment is found to be unable to operate in this environment, the Contractor and/or his suppliers shall furnish any replacement equipment, surge protection, power line conditioners, UPS, or other equipment required to correct this problem at no additional cost to the owner.
- C. This section also contains Power Line Surge Protectors as shown on the drawings, specified herein, and otherwise required for appropriate equipment including but not limited to control panels, instrument cabinets, instruments, processors, and other equipment susceptible to damage.

1.2 QUALITY ASSURANCE

- A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards, and specifications, except where more stringent requirements have been specified herein:
 - 1. National Electrical Code (NEC)
 - 2. Underwriters Laboratories, Inc. (UL)
 - 3. National Electrical Manufacturers Association (NEMA)
 - 4. JIC Standard EGP-1

1.3 SUBMITTALS

- A. Prior to obtaining any material in connection with this Section, detailed shop drawings on all material shall be submitted. Submittals shall conform to the requirements of Section 01 33 00, Submittals.
- B. Submittals shall include:
 - 1. Bill of materials for all components in the panel
 - 2. Catalog data sheets for all components
 - 3. Elevation/layout of panel (front view)
 - 4. Interior sub-panel layout drawings
 - 5. Elementary wiring diagrams (including wire numbers and field connection points)
 - 6. Nameplate list
 - 7. Conduit penetrations
 - 8. Installation and support details

- C. Submittal shall contain the NEMA type designation and manufacturer's data describing the enclosure and showing its compliance with specifications and associated standards.
- D. Submit diagrams detailing the type, speed, setup parameters, and purpose of all communication ports on each piece of equipment in the control panel. Include a diagram detailing the cabling connections between equipment in the control panel and their ultimate destination or source.
- E. Samples of any material shall be submitted upon Engineer's request.
- F. Submittal shall contain a narrative describing the Control Strategy that will be used as the basis of the PLC program at each control panel.
- G. Contractor shall furnish two copies of all development programming software packages that will be used to program the PLCs and OITs. One copy of the software shall be submitted within 14 days after the shop drawings are approved. The second copy shall be submitted within 60 days of project closeout.

1.4 CLOSEOUT SUBMITTALS

Provide project record documents which record actual software and equipment configuration.

PART 2 PRODUCT

2.1 GENERAL

- A. A programmable logic controller (PLC) based control system shall be provided to control equipment, generate alarms, collect and transmit data throughout the site, and provide remote monitoring and control capabilities.
- B. The Contractor shall provide a coordinated system. The Contractor shall provide hardware, software, programming, cables, connectors, line drivers, interposing relays, fuses, terminal blocks, power supplies, surge arresters, printed circuit board and graphics drivers, and special controls required to integrate and implement a functional system as specified and shown on the Contract Drawings.
- C. The Control Panel shall be furnished to house a programmable controller and all other related items to form a complete control system. The Control Panel shall include a programmable controller that shall serve as the local controller at each pumping station. The PLC shall also serve as a remote terminal unit of the SCADA system. The Control Panel shall also include any control relays, timers, power supplies, signal conditioners, surge suppressors, control operators, pilot lights, operator interface terminals, displays, or other equipment necessary to form a complete control system capable of interfacing with the instruments in the well house.
- D. Type 1 Surge Protection Device. Type 1 surge protection shall be provided for each power feed to each control panel. The device shall provide the following Surge Protection Performance Requirements:

- 1. Ambient Conditions:

Degree of protection	IP22
Ambient temperature	-40°C to 80°C (-40°F to 176°F)
Altitude	<2000 m
Permissible humidity	5% through 95%
Shock (operation)	30g (half-sine / 11 ms / 3x +/-X, +/-Y, +/-Z)

Vibration (operation)	7.5g (10 – 500 Hz / 2.5 h / X, Y, Z)		
2. General:

IEC test classification	test class II		
EN type	T2		
IEC Power Supply System	TN-S separate protective earth (PE) and neutral (N)		
Mode of protection	L-N, L-PE, N-PE		
Mounting type	DIN rail: 33 mm		
 3. Protective circuit:

Nominal voltage U_N	240/415 VAC		
Nominal frequency f_N	50 Hz / 60 Hz		
Maximum continuous operating voltage U_c (L-PE)	385 VAC		
Maximum continuous voltage U_c (N-PE)	358 VAC		
Residual current I_{PE}	< 600 μ A		
Nominal discharge current I_n (8/20) μ s	40 kA		
Maximum discharge current I_{max} (8/20) μ s	80 kA		
Short-circuit current rating I_{SCCR}	25 kA		
 4. UL specifications

SPD Type 1			
Maximum continuous operating voltage	MCOV (L-L)	750 VAC	
Maximum continuous operating voltage	MCOV (L-N)	750 VAC	
Maximum continuous operating voltage	MCOV (L-G)	385 VAC	
Maximum continuous operating voltage	MCOV (N-G)	385 VAC	
Nominal voltage	277/480 VAC		
Modes of protection	L-L, L-N, L-G, N-G		
Power distribution system	480/277 Wye		
Nominal frequency	50/60 Hz		
 5. Standards and regulations: meets IEC 61643-11
 6. Control Panel surge protection device shall be Phoenix Contact Type 1 surge protection device – VAL-US-277/80/4+-FM 2910380 (for 480VAC 4-wire and equipment protection ground).
- E. Type 3 Surge Protection Device. Type 3 surge protection shall be provided for the 120VAC power at each control panel. The device shall provide the following Surge Protection Performance Requirements:
1. Ambient Conditions:

Degree of protection	IP20
Ambient temperature	-40°C to 80°C (-40°F to 176°F)
Altitude	<2000 m
Permissible humidity	5% through 95%
Shock (operation)	30g (half-sine / 11 ms / 3x +/-X, +/-Y, +/-Z)
Vibration (operation)	5g (10 – 500 Hz / 2.5 h / X, Y, Z)
 2. General:

EN type	T2/T3
IEC Power Supply System	TN-S separate protective earth (PE) and neutral (N)
Mode of protection	L-N, L-PE, N-PE
Mounting type	DIN rail; 33 mm
Short-circuit current rating I_{SCCR}	0.25 kA DC(w/o additional backup fuse)

	5 kA DC (for 20 A gG / B backup fuse)
Maximum continuous voltage U_C	150 V DC

3. Protective circuit:

Nominal voltage U_N	120 VAC (TN-S or TT)
Nominal frequency f_N	50 Hz / 60 Hz
Maximum continuous voltage U_C (N-PE)	150 VAC
Rated load current I_L	26 A (at 30°C)
Residual current I_{PE}	< 5 uA
Nominal discharge current I_n (8/20) us	5 kA
Standby power consumption PC	<10.6 mVA (at U_{REF}), <13.5 mVA (at U_C)
Reference test voltage U_{REF}	132 VAC
Maximum discharge current I_{max} (8/20) us	10 kA
Combination Wave U_{OC} (8/20) us	6 kA
Voltage protection level U_p (L-N)	< 0.75 kV (at U_{OC}) and < 0.95 kV (at I_n)
Voltage protection level U_p (L-PE)	< 0.85
Voltage protection level U_p (N-PE)	< 0.85
TOV behavior U_T (L-N)	240 VAC (5 s / withstand mode), 240 VAC (120 min / withstand mode)
TOV behavior U_T (L-PE)	240 VAC (5 s / withstand mode), 240 VAC (120 mins / withstand mode), 1332 VAC (200 ms / safe failure mode)
TOV behavior U_T (N-PE)	1200 VAC (200 ms / safe failure mode)
Response time t_A (L-N)	<25 ns
Response time t_A (L-PE)	<100 ns
Response time t_A (N-PE)	<100 ns
Short-circuit current rating I_{SCCR}	10 kAC

4. UL specifications

SPD Type 2 (Open-Type SPD)	
Maximum continuous operating voltage	MCOV (L-L) 150 VAC, 150 VDC
Nominal voltage	150 VDC
Rated load current I_L	20 A
Modes of protection	L-N, L-G, N-G, (DC+)-(DC-), (DC+)-G, (DC-)-G
Power distribution system	single phase
Nominal frequency	50/60 Hz
Voltage protection rating VPR (L-N)	700V
Voltage protection rating VPR (L-G)	700V
Voltage protection rating VPR (N-G)	900V
Nominal discharge current I_n	5 kA
Short-circuit current rating (SCCR)	10 kA AC, 5 kA DC

5. Standards and regulations: meets IEC 61643-11

6. Surge protection device for 120 VAC shall be Phoenix Contact Type 3 surge protection device – PLT-SEC-T3-120-FM-UT 2907918.

F. Surge Protection Device for 2-wire floating signal circuit. Two wire surge protection shall be provided for sensors which utilize a 4-20 mA current loop. The device shall provide the following Surge Protection Performance Requirements:

1. Ambient Conditions:

Degree of protection	IP20
Ambient temperature	-40°C to 85°C (-40°F to 185°F)
Permissible humidity	5% through 95%
Altitude	<4000 m
Degree of protection	IP20

2. General:

Housing material	PBT
Mounting type	DIN rail: TH 35-7.5mm, two-section divisible module
Direction of action	Line-Line & Line-Signal Ground/Shield

3. Protective circuit:

IEC test classification	C1, C2, C3, D1
Nominal voltage U_N	24 VDC
Max. continuous voltage U_C	30 VDC, 21 VAC
Rated current	600mA (56°C)
Operating effective current I_c at U_c	< 5uA
Residual current I_{PE}	<1uA
Nominal discharge current I_n (8/20) us (line-line)	5kA
Nominal discharge current I_n (8/20) us (line-earth)	5kA
Pulse discharge current I_{imp} (10/350) us (line-line)	0.5kA
Pulse discharge current I_{imp} (10/350) us (line-earth)	0.5kA
Total discharge current I_{total} (8/20) us	10kA
Voltage protection level U_p (line-line)	<200V (C1 – 1 kV/500A), <320 V (C2 – 10kV / 5kA) <50 V (C3 – 25A) <55 V (C3 – 100A)

4. UL specifications

SPD Type 2 (Open-Type SPD)	
Maximum continuous operating voltage	MCOV (L-L) 150 VAC, 150 VDC
Nominal voltage	150 VDC
Rated load current I_L	20 A
Modes of protection	L-N, L-G, N-G, (DC+)-(DC-), (DC+)-G, (DC-)-G
Power distribution system	single phase
Nominal frequency	50/60 Hz
Voltage protection rating VPR (L-N)	700V
Voltage protection rating VPR (L-G)	700V
Voltage protection rating VPR (N-G)	900V
Nominal discharge current I_n	5 kA
Short-circuit current rating (SCCR)	10 kA AC, 5 kA DC

5. Standards and regulations: meets IEC 61643-21 2000

6. Surge protection device for 4-20mA devices shall be Phoenix Contact surge protection device – TTC-6P-1X2-M-24DC-PT-I 2906750.

2.2 ENCLOSURE

- A. Enclosure shall be NEMA 4X. NEMA 4X enclosures shall be water-tight and dust-tight suitable for outdoor installation, protecting enclosed equipment against splashing water, seepage of water, falling or hose-directed water, and severe external condensation. Enclosure shall also be corrosion resistant. NEMA 4X enclosures located outdoors shall be stainless steel or painted fiberglass for enhanced UV protection.
- B. Enclosure Construction
 - 1. Enclosure shall be constructed of a minimum of 14 gauge steel.
 - 2. Seams shall be continuously welded and ground smooth, with no holes or knockouts.
 - 3. Exterior hardware shall be stainless steel.
 - 4. Enclosure shall be provided with gray prime finish over phosphatized surface inside and out with a white enamel interior unless otherwise specified.
- C. Enclosure Door
 - 1. Enclosure shall be provided with front access single door, as required for the enclosure size. Door shall be provided with three point latches operated by a key locking handle. Latch rods shall have rollers to facilitate door closing.
 - 2. Door shall be mounted with continuous piano hinges. A rolled lip around minimum three sides of door shall be provided to prevent dirt and liquid from dropping into the panel when door is open.
 - 3. Door shall be fitted with a neoprene gasket applied with oil resistant adhesive and held in place with stainless steel retaining strips.
 - 4. Provide an interior door swing-out panel. Swing-out panel shall be by the same manufacturer as the enclosure and shall be specifically designed by the manufacturer for this application. Swing-out panel shall provide an area to mount devices (instead of mounting these devices on the exterior door) so that these devices will be afforded a degree of protection from outdoor weather.
- D. Interior Subpanels
 - 1. Interior subpanels shall be constructed of minimum 14 gauge steel finished in white enamel paint. Fasteners, screws, and equipment mounting racks shall be stainless steel.
- E. Enclosure Accessories
 - 1. A print pocket shall be provided on interior face of the enclosure door.
- F. Internal Wiring
 - 1. Terminal blocks for external connections shall be suitable for No. 12 AWG wire, fabricated complete with marking strip, covers, and pressure connectors. Terminal blocks shall be rated for 30A at 600 VAC unless noted otherwise. An additional 25 percent spare terminals shall be provided.

2. Terminals shall be labeled to agree with identification shown on supplier's submittal drawings. A terminal shall be provided for each conductor of external circuits, plus one ground for each shielded cable. Wires shall be numbered using wire markers. Wire numbers shall agree with terminal numbers, associated with remote equipment wiring designations, as indicated on the submittal drawings.
3. Wiring shall be grouped or cabled and firmly supported in the panel. Plastic wireway, Panduit or equal, shall be used to route wire within the panel. Wireway shall be run in continuous length with snap on covers.

G. Circuit Identification

1. Each circuit shall be identified by a typewritten directory with transparent sealed plastic cover, fastened to the inside surface of the door of the enclosure.
2. Devices mounted on or within the enclosures shall be permanently identified. The device and terminal identifications shall agree with those shown on the Contract Drawings

2.3 PROGRAMMABLE CONTROLLER

A. General

1. The PLC processor and related equipment shall be the product of one manufacturer and the components shall be completely compatible.
2. The PLC processor shall be designed and tested to operate in an industrial, high electrical noise environment. The system shall be provided with RFI protected shields and barriers to prevent interference with other electrical systems.

B. PLC Processor

1. The PLC shall be a 32 bit microprocessor-based stand-alone device. It shall be a process and logic controller designed for industrial environments. It shall be capable of a mix of logic, timing, counting, and computation functions. It shall also include a library of preprogrammed subroutines, and PID loop control capabilities.
2. The PLC shall come complete with central processors, memory, communication ports, uninterruptible power supply, interconnecting cables, and discrete and analog I/O interfaces.
3. The PLC and associated hardware shall have the following ratings (minimum):
 - Operating Temperature: -40 Deg. C to 70 Deg. C (-40 Deg. F to 158 Deg. F)
 - Humidity: 5% to 95% relative (non-condensing)
 - Shock: IEC 61131-2 ½ sine, 15 ms, 15 g
 - Vibration: IEC 61131-2, 5 – 8.4 Hz: Amplitude controlled, 7.0 mm peak to peak
8.4 – 150 Hz: Acceleration controlled, 1.0 g peak
4. The PLC shall monitor the internal operation of the PLC system for failures. If a failure is detected, the system shall shut down and freeze all inputs and outputs in their last states until the error is cleared. As a minimum, the following failures shall cause the PLC to shut down:
 - a. Memory Failure
 - b. Memory parity failure

- c. I/O cycle failure
 - d. Operating system failure
5. PLC memory shall be read/write RAM, with an EEPROM or Flash module provided. The RAM shall be battery-backed and shall retain a program for a minimum of six months if there is a loss of external power.
 6. PLC Processor shall be Schneider Electric SCADAPack 474, TBUP474U.

C. Uninterruptible Power Supply

1. The PLC system shall include an Uninterruptible Power Supply that shall provide for interrupted service by the PLC processor in the event of a power failure. The Uninterruptible Power Supply shall consist of two parts: 1) 24VDC Power Supply Unit and 2) Uninterruptible Power Supply unit containing the energy storage.
2. The 24VDC Power Supply shall have the following performance characteristics:
 - a. Enclosure degree of protection: IP20
 - b. Ambient Temperature: 13°F to 158°F (-25°C to 70°C)
 - c. Humidity: <95% (25°C non-condensing)
 - d. Nominal Input Voltage: 100-240VAC or 110-250 VDC
 - e. Input Voltage Range: 100 -240 VAC (-15% / +10%) or 110-250VDC -18%/+40%
 - f. Frequency range: 50-60 Hz +/- 10%
 - g. Power consumption: 163 VA
 - h. Inrush current: 14A
 - i. Input fuse: 6.3A
 - j. Power factor: 0.82
 - k. Nominal output voltage: 24VDC
 - l. Nominal output current: 5A
 - m. Output power: 120W
 - n. Typical response time: 300msec
 - o. Efficiency: >88%
 - p. Insulation voltage input/output: 4kVAC (type test) and 2kV AC (routine test)

The 24VDC power supply shall be Phoenix Contact QUINT4-PS/1AC/24VDC/5 2904600

3. The Uninterruptible Power Supply unit shall have the following performance characteristics:
 - a. Enclosure degree of protection: IP20
 - b. Ambient Temperature: 32°F to 104°F (0°C to 40°C)
 - c. Humidity: <95% (25°C non-condensing)
 - d. Input Voltage: 24VDC
 - e. Input Voltage Range: 18 VDC to 30 VDC
 - f. Current consumption (maximum): 9.3A (at 24 VDC)
 - g. Current consumption (idle): 9.7 mA
 - h. Current Consumption (charging process): 1.7A
 - i. Nominal output voltage: 24 VDC
 - j. Nominal output current: 5A
 - k. Power boost: 7.5A
 - l. Efficiency: >97%
 - m. Battery technology: VRLA

The Uninterruptible power supply shall be Phoenix Contact QUINT-UPS/24VDC/24VDC/5/1.3AH 2320254

D. Isolated Analog Input Module

1. Where indicated on the Contract Drawings, the PLC system shall include an Isolated Analog Input Module. The Analog Input Module shall be capable of reading 4-20mA signals for the instruments indicated.
2. The Analog Input Module shall have the following ratings:
 - a. 8 Isolated Input Points
 - b. Resolution 12 bits
 - c. Input Resistance 250 ohms for 20 mA inputs
 - d. Accuracy $\pm 0.2\%$
 - e. Normal Mode Rejection 60 dB @50/60 Hz
3. Analog Input Module shall be Control Microsystems Model 5501.

E. Analog Output Module

1. Where indicated on the Contract Drawings, the PLC system shall include an Analog Output Module. The Analog Output Module shall be capable of generating 4-20mA output signals where indicated.
2. The Analog Output Module shall have the following ratings:
 - a. Output Signal ranges: 4 Output Channels, 0-20mA or 4-20mA configurable
 - b. Output type: single ended regulation on positive side with common negative return
 - c. Maximum Load Resistance: 1k ohms w/ 24VDC loop power, 400 ohms with 12VDC
 - d. Isolation: 1500 VAC between field connections and logic circuits
 - e. Resolution: 12 bit A/D converter
 - f. Accuracy: $\pm 0.05\%$ of full scale at 25°C, $\pm 0.2\%$ of full scale over entire temp.range
 - g. Noise and Ripple: 0.04% maximum
 - h. Transient Protection: 2.5kV surge withstand capability per ANSI/IEEE C37.90.1-1989
 - i. Response Time: 250msec typical for 10% to 90% signal change
 - j. Power Requirements: 5V @ 45mA, 9-30V @ 15mA quiescent plus 80mA max
 - k. Environment: 5% relative humidity – 95% relative humidity non- condensing, -40°C (-40°F) to 60°C (140°F)
3. Analog Output Module shall be Control Microsystems Model 5302.

F. Digital Input Module

1. Where indicated on the Contract Drawings, the PLC system shall include a Digital Input Module. The Digital Input Module shall be capable of reading 8 discrete 120 VAC input points.
2. The Digital Input Module shall have the following ratings:
 - a. Number of digital inputs: 8
 - b. Input Logic-HI Level: Off to On transition threshold 50% pf full scale signal range
 - c. Input Current: 5mA typical
 - d. Response Time: Off to On 7msec, On to Off 24msec typical
 - e. Isolation: 1500VAC
 - f. Power Requirements: 5V @ 45mA

- g. Environment: 5% relative humidity – 95% relative humidity non-condensing, -40°C (-40°F) to 60°C (140°F)

3. Digital Input Module shall be Control Microsystems Model 5403.

K. Ethernet Switch

1. There shall be a five port Industrial Ethernet Switch to provide communications and Ethernet Connectivity between the various devices.
2. The Industrial Ethernet Switch shall have the following characteristics and ratings:
 - a. Degree of protection: IP20
 - b. Ambient Temperature: 32°F to 140°F (0°C to 60°C)
 - c. Humidity: 5% to 95% (non-condensing)
 - d. Interface: Ethernet (RJ45)
 - e. Number of ports: 5 (RJ45 ports)
 - f. Note on the connection method: Auto negotiation and autocrossing
 - g. Transmission physics: Ethernet in RJ45 twisted pair
 - h. Transmission speed: 10/100 Mbps
 - i. Basic functions: Unmanaged switch / auto negotiation, complies with IEEE 802.3, store and forward switching mode.
 - j. Cascading Depth: Network, linear, and star structure
 - k. Maximum conductor length (twisted pair): 100m
 - l. Supply voltage: 24VDC
 - m. MTTF: 192 years
 - n. Conforms to EMC Directive 2004/108/EC
3. Industrial Ethernet Switch shall be Phoenix Contact FL SWITCH SFN 5TX 2891152 or equal.

L. Operator Interface

1. Contractor shall provide an Operator Interface Terminal (OIT) to display status and fault messages, and to receive inputs from the operator.
2. The OIT display shall be a touch screen interface for programmable controllers to display pictorial information, data, and messages that are preloaded into it. The touch screen area shall be programmed to perform various functions to receive inputs from the operator. The OIT display shall receive messages from the PLC processor via Ethernet or an RS-232 communications link.
3. The display shall have a display area of 200mm(W) by 140mm(H) with a pixel resolution of 800(W) x 480(H).
4. The Operator Interface display shall have the following ratings:

Input Power	350mA at 24VDC (+/- 20%)
CE	Complies with EN50081-2 and EN50082-2
EMI	Complies with FCC Class A
Vibration endurance	10 to 25 Hz (X Y Z direction 2G 30 minutes)
Environmental	NEMA 4 / IP65 front panel
Operating Environment:	0°C to 45°C (32°F to 113°F)
Operation Humidity	10 to 90% relative humidity, non-condensing
LCD Display	5.7" STN 16.7M colors

Contrast Ratio	800:1
Brightness	400 cd/m ²

5. Operator Interface shall be Weintek/KEP MT8070iE.

- O. The Contractor shall provide all discrete input modules, discrete output modules, analog input modules, and analog output modules required for interfacing to the instruments located at each pumping station.
- P. The Contractor shall provide any modem, communications module, antenna, telephone interface, cables, or other equipment to establish communications with a programmable controller and central computer located at the Ocean Pines Wastewater Treatment Plant. The programmable controller shall be programmed to accept commands from the central computer and transmit the status of any device or the measured value of any instrument in the pumping station.
- Q. The programmable controller shall be programmed to provide a seamless and coordinated operation of all devices in the Pumping Station.

2.4 POWER SUPPLIES

- A. DC power supplies shall be of sufficient size to power all connected equipment with an additional 20% reserve.
- B. Performance Requirements
 - 1. Enclosure degree of protection: IP20
 - 2. Humidity: <95% (at 25°C non-condensing)
 - 3. Nominal Input Voltage: 100-240VAC (wide range input)
 - 4. Input Voltage Range: 85-264 VAC
 - 5. Frequency range: 50 – 60 Hz+/- 10%
 - 6. Power consumption: 163 VA
 - 7. Inrush current limiting: < 20A
 - 8. Input fuse: 6.3 A
 - 9. Power Factor: 0.82
 - 10. Nominal Output Voltage: 24VDC +/- 1%
 - 11. Nominal Output Current: 5A
 - 12. Output Power: 120W
 - 13. Output Voltage Range Setting: 24 - 29.5 VDC
 - 14. Derating: > 60°C (140°F), 2.5% per Kelvin
 - 15. Connection in parallel to increase redundancy and power
- C. General Requirements
 - 1. Isolation Voltage (input/output): 4kV/2kV
 - 2. Enclosure Package Degree of Protection: IP 20
 - 3. MTBF: greater than 1,532,000 hours (25°C), > 930,000 hours (40°C), >431,000 hours (60°C)
 - 4. Ambient Temperature (Operation): -25°C to +70°C (-13°F to +158°F)
 - 5. Storage Temperature: -40°C to +85°C (-40°F to +185°F)
 - 6. Humidity: up to 95% at 25°C (77°F), no condensation
 - 7. Conformance to EMC Directive 2014/30/EU
 - 8. Conformance to Low Voltage Directive 2014/35/EC
 - 9. Conformance to the EMC requirements for conducted noise emission EN 55016, and EN 61000-6-3 (Class B)
 - 10. Conformance to the EMC requirements for noise emission EN 55016, and EN 61000-6-3 (Class B)

11. U/C-UL listed UL 508

- D. DC Power Supplies shall be one of the following: Phoenix Contact QUINT4-PS/1AC/24DC/5 2904600, or equal

2.5 ELECTRIC HEATERS

- A. Provide electric heaters for outdoor control panels. Electric heaters shall be sized to protect sensitive mechanical, electrical, and electronic equipment from the harmful effects of condensation, corrosion, and low temperatures.
- B. Electric heaters shall be thermostatically controlled, fan driven units that can maintain a stable temperature within the control panel. Thermostat shall be adjustable from 0°F to 100°F (-18°C to 38°C).
- C. Electric heaters shall be Hoffman model DAH or equal.

PART 3 EXECUTION

3.1 GENERAL

- A. Enclosures shall be provided with wiring, schematic, layout, connection, and control diagrams.

1.2 INSTALLATION

- A. Enclosure wiring shall be installed by the manufacturer and shall be brought out to identified terminal blocks. Interwiring between sections shall be from terminal blocks to terminal blocks. Terminal blocks for wiring shall be correlated with those for the electrical equipment by the enclosure manufacturer. Each terminal block shall contain no more than two wires on each side. Additional terminal blocks shall be provided when connection of more than two wires are required.
- B. Wiring for panel enclosures shall be neatly arranged in bunches taped or tied together at six inch intervals and shall be securely attached to the interior of the panel unless continued within plastic wireways. Identification of panel component and wiring shall be as shown on the submittals. Wiring to door mounted components shall be bundled and enclosed in flexible spiral wrap to provide protection to the wiring.
- C. Panels shall be grounded, and equipment and circuits included in the panels, as shown or required to be grounded, shall be connected to the grounding conductors.
- D. Equipment shown or specified to be furnished with the panels shall be mounted by the panel manufacturer. Panel mounted controls and components shall be mounted a minimum of 30" above finished floor and a maximum of 72" above finished floor. The panels shall be furnished as completely assembled units, requiring only field connections of power and control wiring.
- E. Pole or wall mounted panels shall be provided with brackets designed for pole or wall mounting.
- F. Where multiple power sources enter a single enclosure, a nameplate shall be provided indicating: "CAUTION: MULTIPLE POWER SOURCES" or similar warning.
- G. Not less than eight inches of clearance shall be provided between the terminal strips and the base of vertical panels for conduit and wiring space.

- H. AC and DC wiring shall be run in separate plastic wireways.
- I. Where different voltages are present within the enclosure, provide nameplates indicating the voltage levels applicable to terminals. Terminals for 480 VAC and 120 VAC shall be separated a minimum of six inches. If the enclosure contains low voltage instrumentation wiring and terminals, the wiring and terminal blocks shall be separated from the 120 VAC and 480 VAC wiring by a minimum of six inches. The terminal blocks for low voltage instrumentation wiring shall be enclosed in a separate steel enclosure inside the terminal cabinet for shielding.
- J. Power terminal blocks shall be provided with clear Lexan shields removable without removing the power terminal blocks.

1.3 FIELD TESTS

- A. The panel shall be checked and necessary adjustments shall be made in the field after installation, by representatives of the manufacturers of the equipment included in the panel.
- B. The panel shall be functionally tested by simulating the inputs. Tests shall be in the presence of the Engineer.

** End of Section **

This page intentionally left blank

SECTION 26 09 16 INSTRUMENTATION

PART 1 GENERAL

1.1 SUMMARY

This Section includes requirements for the complete instrumentation system for this project as shown, specified and as scheduled. Detailed specifications for instrumentation equipment are included herein, on the Contract Drawings, and where specifically referenced elsewhere in the specifications. Unless otherwise noted, this section shall apply to all instrumentation furnished under this project, regardless of whether it is specifically identified in this section.

1.2 QUALITY ASSURANCE

- A. Material and installation shall be in accordance with the latest revision of the following codes, standards, and specifications, except where more stringent requirements have been specified herein:
 - 1. National Electrical Code (NEC)
 - 2. National Electrical Manufacturers Association (NEMA)
 - 3. Underwriters Laboratories (UL)
 - 4. American National Standards Institute (ANSI)
 - 5. The American Society of Mechanical Engineers (ASME)
 - 6. The American Society for Testing Materials (ASTM)
 - 7. Instrument Society of America (ISA)
- B. Qualifications of manufacturer. Provide materials and equipment that are the products of manufacturers regularly engaged in the production of such products which are of equal material, design, and workmanship. Products shall have been in satisfactory commercial or industrial use for two (2) years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturer's catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer.
- C. Uniformity: Unless otherwise specified, equipment or material of the same type of classification, used for the same purpose shall be the product of the same manufacturer. All material shall be new and of the current design of the manufacturer providing equipment or material.
- D. Design: Equipment and accessories not specifically described or identified by manufacturer's catalog numbers shall be designed in conformity with ISA, ANSI, ASME, ASTM, and other applicable technical standards and shall have neat and finished appearance.

1.3 SUBMITTALS

- A. Submittals shall conform to the requirements of Section 01 33 00 Submittals, and to the requirements given in Section 26 00 00 Electrical General. In addition, submittals shall include the manufacturer's name, trade name, place of manufacturer, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification, and technical paragraph reference.
- B. Submittals shall contain a material list with manufacturer's name and data describing the material and showing its compliance with specifications, associated standards and test requirements.
- C. Submittals for individual pieces of equipment such as indicators, flow meters, level meters, etc. shall include manufacturer's data describing the equipment and showing its compliance with their associated specification.
- D. The Contractor, his supplier, system builder, or subcontractor shall prepare and submit a set of system coordination drawings which shall show all instrument connections and interconnections as well as the functional and connection relationship of the instrumentation equipment to the related equipment and devices.
- E. Prior to obtaining any material in connection with this section, catalog data and detailed wiring connection diagrams shall be submitted. Submittals for each manufactured item shall be current manufacturer's descriptive literature of cataloged products, equipment drawings, diagrams, performance and characteristic curves, and catalog data sheets. Submittal shall include ratings, circuit diagrams, and dimensional data, as a minimum. Drawings shall include elementary and interconnection diagrams showing connections to internal components, and indicate field termination points for power and control interface. Should manufacturer's data require supplemental information for clarification, the supplemental information shall be submitted.
- F. Shop drawings shall present complete and accurate information relative to all working dimensions, equipment weights, assembly and section views, and all necessary details pertaining to coordinating the work of the Contract, lists of materials and finishes, parts list and the descriptions thereof, lists of spare parts and tools where such parts or tools are required, and any other information that is required to demonstrate compliance with the Contract Documents. Drawings for electrical equipment shall include elementary and interconnection diagrams showing connections to internal components, and indicating field termination points for power and control interface.
- G. Submit factory calibration sheets for all instrumentation, and field calibration sheets for calibration under actual use conditions.
- H. Manufacturer's standard wiring diagrams and specific modifications to the wiring of the equipment shall be submitted. All terminal points for field, and interconnecting wiring shall be identified.

- I. Samples of any material shall be submitted upon Engineer's request.

1.4 CLOSEOUT SUBMITTALS

- A. Prepare four instruction and maintenance portfolios as specified hereinafter. Each shall include:
 - 1. Index and tabbed section dividers
 - 2. Reviewed submittals
 - 3. Wiring diagrams
 - 4. System coordination drawings
 - 5. Field adjustable settings (e.g. setpoints, ranges, spans current alarm trips)
 - 6. Manufacturer's instructions on care and operation of equipment.
 - 7. Spare parts list
 - 8. Complete typewritten operating instructions, covering all systems descriptions and operation, emergency operating instructions and precautions.
 - 9. Name, address and telephone number of supplier and representative of manufacturer for each item of equipment in Contract.
- B. Bind above items (all unused, clean, and legible) in three ring binders and submit to Engineer for review. Provide before request for final acceptance.
- C. Provide project record documents which record actual locations of components and circuits.
- D. Provide project record documents which record actual setup and calibration of each instrument.

PART 2 PRODUCT

2.1 GENERAL

- A. Unless otherwise specified, each measurement system shall be accurate within one percent of full-scale reading over the specified range. This accuracy requirement shall apply to each overall system including any transmitters, retransmitters, receivers, etc. that are shown or required.
- B. All instrumentation equipment and components shall be supplied by one contractor, subcontractor, supplier or other single entity who shall coordinate the equipment and its arrangements in the shop drawing, installation and start up stages of the work.

2.2 SIGNAL CARRIERS

- A. Signal Carriers for instrumentation shall include the electric wires, cables and conduits as shown, specified and required for a complete transmission of signals between transmitters and receivers.

- B. Electronic instrument signals (4-20mA) shall be carried over shielded twisted pairs of wires in accordance with Section 26 05 01 Conductors and Cables. All electric interconnections and terminations shall be in accordance with the requirements for control wiring specified in Section 26 05 01. Signal conductors shall be separated from power and control conductors and routed in separate conduits, regardless of whether they are specifically scheduled or shown.
- C. Shielded, coaxial, or special cables, where specified or required by the manufacturer, shall be supplied by the contractor regardless of whether they are specifically scheduled or shown.
- D. Current isolators shall be provided and installed where required for proper operation of the equipment.
- E. All instruments which utilize a 4-20 mA analog signal shall include surge/lightning transient protectors at the transmitter's power source. Transient surge protection device shall be Phoenix Contact PLT-SEC-T3-24-FM-UT 2907916.
- F. All 4-20 mA analog control loops containing field mounted (i.e. remote from control panel) transmitters shall include surge/lightning transient protectors at the transmitter. Transient protectors shall be Phoenix Contact TTC-6P-1X2-24DC-PT-I 2906815, or equal.
- G. All 4-20 mA analog control loops containing field mounted (i.e. remote from control panel) transmitters shall include surge/lightning transient protectors at the transmitter. Transient protectors shall be Phoenix Contact TTC-6P-1X2-M-24DC-PT-I 2906750, or equal

2.3 MISCELLANEOUS EQUIPMENT

- A. Enclosures for instruments shall be suitable for the location where mounted and or specified in Section 26 27 16 Electrical Cabinets and Enclosures.
- B. Isolators. Current to Current (I/I) or Voltage to Voltage (E/I) isolators shall be one of the following:
 - 1. Current to current multi-channel 2-wire isolator; 4-20 mA input, 4-20 mA output – Acromag 600T Series
 - 2. Input Loop Powered, current to current; 4-20mA input, 4-20mA output- Acromag 270i Isolator or equal
- C. Signal Splitters. Current to current (I/I) or Voltage to current (E/I) signal splitters shall be one of the following:

1. 2 wire type, current to current; single 4-20 mA input, dual 4-20 mA outputs – Acromag 653T, or equal
 2. 2 wire type, process voltage to current; +/- 1VDC, +/- 5VDC, or +/- 10 VDC input, dual 4-20 mA outputs – Acromag SP237, or equal.
 3. 2 wire type, thermocouple to current; thermocouple/millivolt input, dual 4-20 mA control signal outputs – Acromag SP233 or equal.
 4. 2 wire type, high voltage to current; +/-15 VDC, +/- 75 VDC, or +/- 150 VDC input, dual 4-20 mA outputs – Acromag SP230 or equal.
 5. 4 wire type, current to current, single 4-20 mA input, dual 4-20 mA output, AC/DC powered – Acromag 633T, or equal.
- D. Power Supplies. DC power supplies shall be of sufficient size to power all connected equipment with an additional 50% reserve. DC power supplies shall be: Phoenix Contact UNO-PS/1AC/24DC/30W- 2902991, or equal.
- E. Power Disconnection and Overcurrent Protection. Panel mounted instruments shall have integral or external fuse protection. Field instruments shall utilize terminal block mounted fuses.
- F. Signal Conditioner
1. Provide a measurement, control, and regulation device which is capable of receiving a 4-20mA input signal and generating two 4-20mA output signals. Each output signal shall be identical to the input signal and isolated to the input signal and the other output signal.
 2. Performance
 - Number of inputs: 1
 - Current input signal: 4 - 20 mA
 - Input burden: less than 3.0 V (150 ohms) at full scale
 - Input overvoltage protection: bipolar transient voltage suppressors
 - Input excitation: 24VDC +/- 10%, 22mA maximum each. Full isolated. Independent current limiting
 - Output range: 4-20 mA (each channel)
 - Output trim range: zero to full scale adjustment to +/- 4%
 - Output limiting: limited to 27 mA
 - Output load: 0 to 950 ohms
 - Output load resistance effect: less than +/-0.01% of output span effect for a +/-100 ohm change in load resistance
 - Output response time (input step change): 25 mSec typical to achieve 98% of final value
 - Accuracy: +/-0.05% of output span
 - Temperature drift: > +/-50ppm/ °C over the ambient temperature range

Bandwidth: -3dB at 50Hz
Common Mode Noise Rejection:
Input resistance (current input): 50 ohms

3. Signal output data:
Number of outputs: 2
Voltage output signal: 0 (each identical to the input signal). .

G. Digital Line Powered Meter

1. Provide a Digital Line Powered Meter for any and all instruments that require power from a 24 VDC source. The purpose of the digital Line Powered Meter is to provide a locally mounted power supply for the Level Indicating Transmitter, Pressure Indicating Transmitter, or temperature sensor.
2. Features
 - a. NEMA 4X enclosure / Explosionproof
 - b. Powered using 115/230 VAC (Universal 85-265 VAC input power)
 - c. 4-20mA retransmitted signal from instrument
 - d. 2 (or 4) programmable relay outputs
 - e. User configurable display
 - f. Display: 6 digits 1"
 - g. Provide mounting kit for Digital Line Powered Meter
3. Manufacturer/Model
 - a. Helios PD2-6001-6H7
 - b. Precision Digital Model PD650, 655, or 656 (655-45)
 - c. Precision Digital Model PD6000
 - d. Magnetrol Model 009
 - e. equal

2.4 FLOAT LEVEL SWITCH

- A. Float level switches shall be designed for applications requiring accurate liquid level control, including wastewater environments. Float switch shall be capable of accurately signifying specific water levels, or for direct alarm actuation.
- B. Float switches shall consist of a polypropylene or polyethylene body housing a mechanical type limit switch. Float switch shall be leak proof, shock proof, and impact resistant. Float switch shall also be suitable for use in wastewater applications and for use with intrinsically safe circuits.
- C. Ratings.
Liquid temperature: minimum 0°C (32°F), maximum 76°C (170°F)
Liquid density: minimum 0.65 g/cm³, maximum 1.5g/cm³
Degree of Protection: IP68, 20m (65ft)
Contact ratings: AC resistive load, 250 volts 10 amperes

AC inductive load, 250 volts 3 amperes
DC load, 30 volts 5 amperes

D. Switch Variations

1. Normally Open (N/O). Contacts are open in the hanging position. As the float rises (1" or 5") above the horizontal position, the contacts shall close.
2. Normally Closed (N/C). Contacts are closed in the hanging position. As the float rises (1" or 5") above the horizontal position, the contacts shall open.
3. Single Pole, double Throw (SPDT). Both normally open and normally closed contact (but not necessarily both) available.

E. Provide cord weight to facilitate proper operation of float switch.

2.5 DISPLACER TYPE LIQUID LEVEL SWITCHES

A. Displacer type liquid level switches shall consist suspension cable and displacer elements. Displacer elements and cable shall be 316 stainless steel.

B. Displacer elements shall operate based on buoyancy, whereby a spring is loaded with weighted displacers which are heavier than the liquid. Immersion of the displacers in the liquid shall result in buoyancy force change which shall move the spring upward.

C. All elements of the displacer switch shall be compatible with the liquid being monitored.

D. Displacer elements shall be adjustable along the cable.

E. Displacer elements shall be suitable for operation that indicates liquid levels indicated on the contract drawings.

1. Level switches for Tank T-2R shall be capable of indicating Low, High, and High-High.
2. Level switches for Tank T-6R shall be capable of indicating Low-Low, Low, High, and High-High.

F. Other Ratings

1. Temperature 32°F (0°C) through 300°F (149°C)
2. Switch contacts shall be rated for 120 VAC, 10 amperes minimum.
3. Switch assembly shall be rated for installation in a Class I Division 1 or Class I Division 2 hazardous location.

G. Displacer Type Liquid Level Switches shall be as manufactured by Magnetrol.

2.6 LEVEL INDICATING TRANSMITTER

- A. The level probe shall sense the liquid level as a function of the level of submersion. Level probe shall be a twin rod probe, Guided Wave Radar type, and operate based on the technology of TDR (Time Domain Reflectometry).
- B. Level probe shall be capable of measuring the level of Sodium Hypochlorite and Caustic in the tanks indicated on the drawings. Wetted parts shall be compatible with the Sodium Hypochlorite and Caustic.
- C. The level sensor shall consist of stainless steel, twin rod probe, and a solid state electronic unit (transmitter) housed in a NEMA 4X enclosure. Probe will operate in conjunction with a remotely mounted level transmitter (but within 3 feet of the tank) to provide level information, through a 4-20 mA analog signal, to a remote control panel. Probe shall provide a 4-20mA signal proportional to the liquid level in the tank.
- D. Transmitter
- | | |
|------------------|----------------------------------|
| 1. Signal output | 4-20 mA |
| 2. Span | 6 to 240 inches |
| 3. Resolution | Analog 0.01 mA, display 0.1 inch |
| 4. Power | 11-28 VDC |
- (provide locally mounted Digital Line Powered Meter so unit may be powered using 115 VAC)
- E. Performance Requirements
- | | |
|--------------------------------|--|
| 1. Linearity | <0.1% of probe length |
| 2. Measured error | +/-0.1% probe length or 0.1 inch (3mm) |
| 3. Resolution | +/-0.1 inch (3mm) |
| 4. Repeatability | <0.1 inch (3mm) |
| 5. Response time | <1 second |
| 6. Operating temperature range | -40° to +175° F (-40° to +80° C) |
| 7. Process dielectric effect | <0.3 inch (8mm) of selected range |
| 8. Humidity | 0-99%, non-condensing |
- F. Manufacturer/Model
- | |
|--|
| 1. Magnetrol Model 705 Transmitter and Magnetrol Model 7EB probe |
| 2. equal |
- G. Schedule
- | <u>Tag Number</u> | <u>Service</u> | <u>Notes</u> |
|-------------------|--------------------------------|--------------|
| 1) LIT-2 | Sodium Hypochlorite Tank Level | 1,2 |
| 2) LIT-3 | Caustic Tank Level | 1,2 |
- Application Notes:
1. Calibration range shall be equal to tank maximum usable depth
 2. Provide surge protection

2.6 ELECTROMAGNETIC FLOW METER

- A. The magnetic flow meter shall operate on the principle of electromagnetic induction, and shall produce a 4-20mA output signal that is directly proportional and linear to the volumetric flow rate of the liquid flowing through the metering tube.
- B. The metering system shall consist of a metering sensor tube, signal amplifier, the interconnecting wiring, and all necessary appurtenances for a complete monitoring system. Interconnecting wiring and appurtenances shall be as recommended by the manufacturer.

C. Metering Tube

1. The metering tube shall be constructed of 316 Stainless Steel, and rated for a standard working pressure of 150 PSI.
2. The end connections shall be Carbon Steel flanged, in accordance with ANSI B16.5 Class 150 standards.
3. The insulating liner material shall be made of a hard rubber elastomer suitable for wastewater flow in conformance with manufacturer's recommendation for the intended service.
4. The detector head metering tube shall include two self-cleaning measuring electrodes.
5. The detector head shall include a third electrode located in the upper portion of the inside diameter of the flow tube. This electrode shall be used to detect an empty pipe condition when the fluid flow in the flow tube is running partially empty. Empty pipe detection that is not activated until 50% of the pipe is empty is not acceptable.
6. The electrodes material shall be corrosion resistance Alloy C.
7. The detector head housing shall be constructed of carbon steel, welded at all joints, and rated to meet NEMA 4.
8. In its submersible option, with remote electronics, the detector head housing shall meet NEMA 6P standards including the junction box for remote electrical connections.
9. When installed in non-metallic or internally lined piping, the detector head shall be provided with a pair of stainless steel corrosion resistance grounding rings.

D. Signal Amplifier

1. The signal amplifier shall be microprocessor based, and shall energize the detector coils with a digitally controlled pulsed DC, low excitation frequency.

2. The signal amplifier shall feature a precise signal management software to ensure the capture of up to 60 flow measurement sample points per minute, thus providing an accurate averaging of the process generated signal.
3. The amplifier shall include a non-volatile memory chip capable of storing all programmable data and accumulated Totalizer values in the event of a power interruption.
4. Automatic zero stability, low flow cut-off, empty pipe detection and bi-directional flow measurement shall be provided by the signal amplifier.
5. The amplifier shall include a 4 line, 16 characters, backlit LCD display to display simultaneously the following:
 - a. Flow Rate in selected unit of measure
 - b. Total forward flow in selected unit of measure
 - c. Total reverse flow in selected unit of measure
 - d. Current software revision number
 - e. Error or alarm messages
6. All outputs shall be isolated to 500 volts.
7. The input power supply for the Electromagnetic Flow Meter Amplifier shall be 115 VAC.
8. The signal amplifier housing shall be NEMA 4X.
9. The electromagnetic flow meter amplifier shall be capable of being mounted up to 300 feet from the amplifier.
10. The amplifier shall provide:
 - a. 4-20 mA analog output signal, capable of driving an 800 ohm load
 - b. output relay contact for high and low flow alarms
 - c. output relay contact for an alarm condition

E. System Performance and Calibration

1. The metering system shall achieve an accuracy of $\pm 0.25\%$ of rate over a flow velocity range from 1.0 to 39.4 feet per seconds. The accuracy performance shall be $\pm 0.5\%$ of rate for flow velocities between 0.1 and 1.0 feet per second.
2. The metering system shall be capable of measuring the volumetric flow rate of liquids having an electrical conductivity as low as 5 micromhos/centimeter.
3. The system measuring repeatability shall be 0.1% of full scale.

4. Each meter shall be hydraulically calibrated in a certified testing facility, which utilizes a computerized gravimetric testing method with a measuring uncertainty of 0.1%.
5. Each meter shall be provided with a calibration certificate indicating the measured error (percent deviation) at three different flows, respectively equivalent to 25%, 50% and 75% of the nominal flow for each size.

F. Manufacturers

1. Badger Meter Inc. Magnetoflowmag meter
2. equal

2.7 ULTRASONIC LIQUID LEVEL SWITCH

- A. Liquid level switch shall utilize ultrasonic signals for liquid level detection and shall be utilized for high or low levels, or leak detection.
- B. Liquid level switch shall be CSA approved for use in hazardous locations.

2.8 SUBMERSIBLE LEVEL TRANSDUCER (PRESSURE TRANSDUCER TYPE)

- A. The submersible pressure transducer shall utilize a piezoresistive pressure cell to measure liquid level.
- B. The submersible pressure transducer shall be capable of translating water level in the water tower to a 4-20 mA signal, proportional to water level.
- C. The level sensor shall consist of the pressure transducer to measure the liquid level and an aneroid bellows to compensate for the affects of atmospheric pressure.
- D. Performance Requirements
 1. pressure range 2.3 through 700 ft water; specifically calibrate instrument to measure from elevation -4.0 ft to elevation 0 ft.
 2. proof pressure 1.5 full scale
 3. burst pressure 2.0 full scale
 4. Static accuracy +/- 1.00% full scale output
 5. Resolution +0.0001% F.S.
 6. Wetted materials 316 Stainless Steel
 7. Compensated Temp Range 0 to 50°C
 8. Thermal Error +/-0.05% (max), +/-0.1% from BFSL
 6. Output signal 4-20 mA
 7. Output impedance <10 ohms
 8. Power Supply 9-30 VDC, loop poweered
 9. lightning protection

(provide locally mounted Digital Line Powered Meter or power supply so unit may be powered using 115VAC)

F. Specific requirements

1. Material – Stainless Steel
2. Reference Format – vented gage
3. Output – 4 - 20mA
4. Electrical Connection – molded cable seal
5. Lightning Protection – full lightning protection
6. Level Range - 0 ft – 4 ft water column (0 psi – 1.734 psi)
7. Moisture Protection – aneroid bellows
8. Cable Type – polyurethane
9. Cable length – adequate to route from control panel to level sensor, as shown on the drawings
10. Label - ft H₂O

G. Manufacturers

1. KPSI Series 700 (KPSI 700S14A0B001.734000.000C10050B)
2. equal

2.9 PRESSURE TRANSDUCER

A. The pressure transducer shall utilize a piezoresistive pressure cell to measure pressure.

B. The pressure transducer shall be submersible and shall be capable of measuring pressure at the effluent of the pumps and converting it to a 4-20 mA signal, proportional to pressure.

C. Performance Requirements

1. pressure range	0.5 to 400 bar (7.5 to 6000 psi) Gauge and Absolute.
2. proof pressure	2.0 full scale
3. burst pressure	>35 full scale (< 100psi); >20 full scale (<1000 psi); >5 full scale (<6000 psi)
4. fatigue life	>100 million full scale cycles
5. Output signal	4-20 mA
6. supply voltage	9.5 to 40 VDC
7. accuracy	0.15% full scale
8. operating temperature	-4°F to 122°F (-20°C to 50°C)
9. max loop resistance	(V _s – 9.5) x 50 ohms
10. vibration	35g peak sinusoidal, 5 to 2000 Hz

D. Specific requirements

1. Output Response	- 4-20mA undamped
2. Pressure Datum -	gauge and compound
3. Pressure range -	0 to 60 psi
4. Pressure Port -	¼-NPT external
5. Electrical Connection -	IP68 immersible cable
6. Approvals -	CE

7. Cable Length -adequate to route from control panel to level sensor, as shown on the drawings
8. Static/Thermal performance – 0.15% / .5%

E. Manufacturers

1. GEMS Sensors and Controls 6710 Series (6710BGF60B0M350B)
2. Equal

2.10 SUBMERSIBLE LEVEL TRANSDUCER (PRESSURE TRANSDUCER TYPE)

- A. The submersible level transducer shall be specifically designed to meet the adverse environments encountered in wastewater applications. It shall utilize a PTFE coated elastomeric diaphragm and piezoresistive pressure cell to measure liquid level.
- B. The submersible pressure transducer shall be capable of translating water level in the water tower to a 4-20 mA signal, proportional to water level.
- C. The level sensor shall consist of the pressure transducer to measure the liquid level and an aneroid bellows to compensate for the affects of atmospheric pressure.
- D. Performance Requirements
 1. pressure range 0-6 through 0-115 feet H₂O (0-2.60 psi through 0-49.85 psi)
 2. proof pressure 1.5 full scale
 3. burst pressure 2.0 full scale
 4. Static accuracy method +/- 0.25% full scale output BFSL (best fit straight line)
 5. Wetted materials 316 Stainless Steel or titanium; FKM; PTFE; Polyurethane or ETFE
 6. Output signal 4-20 mA
 7. Ouput impedance <10 ohms
 8. Power Supply 9-30 VDC
 9. lightning protection

(provide locally mounted Digital Line Powered Meter so unit may be powered using 115VAC)

E. Manufacturers

1. KPSI Series 700
2. equal

2.11 SUBMERSIBLE LEVEL TRANSDUCER (PRESSURE TRANSDUCER TYPE)

- A. Provide a submersible level transmitter to sense the liquid level of the two wet wells located at Pump Station No. 773 and Pump Station No. 677.

- B. The transducer housing shall be fabricated of PVC with a 2.5" diameter Teflon diaphragm. Silicone oil shall be used as a hydraulic fill. The sensor shall be mounted using its signal cable and have a 3/4" NPT pipe threading for pipe mounting.
- C. The internal air pressure of the sensor assembly shall be relieved to atmospheric pressure through a sealed breather system.
- D. The transmitter shall be a 4-20mA, 2 wire, 10-30 VDC loop powered device, and its output signal shall be directly proportional to the measured wet well level. The sensor shall be UL 913 approved intrinsically safe
- E. Manufacturer
 - 1. Contegra Model SLX 130-MIS
 - 2. equal

2.12 PRESSURE INDICATING TRANSMITTER

- A. The pressure indicating transmitter shall be capable of translating pressure to a 4-20mA signal, proportional to pressure.
- B. Pressure sensor shall be capable of measuring the water pressure of the water tank indicated on the drawings.
- C. Performance Requirements
 - 1. Measurement Range 0-200psi
 - 2. Accuracy +/-0.2% of calibrated span (up to 10:1 turndown)
 - 3. Turn down (minimum span) 10:1
 - 4. Elevation/Suppression -100% to +100%
 - 5. Sensor temperature limit -40° to +212° F (-40° to +100° C)
 - 6. Electronics temperature limit -40° to +185° F (-40° to +85° C)
 - 7. Wetted parts 316 stainless steel
 - 8. Output signal 4-20mA
 - 9. Enclosure NEMA 6/6P or 4X
 - 10. Power supply 11-45VDC
(provide locally mounted Digital Line Powered Meter so unit may be powered using 115VAC)
- D. Manufacturer/model
 - 1. Barton Model FCX
 - 2. Endress & Hauser PMC41
 - 3. equal

2.13 PRESSURE INDICATING TRANSMITTER

- A. The pressure indicating transmitter shall be capable of translating pressure to a 4-20mA signal, proportional to pressure.

- B. Pressure sensor shall be capable of measuring the water pressure at the pump discharge as indicated on the drawings.
- C. Performance Requirements
1. Measurement Range 0-60psi gauge
 2. Accuracy +/-0.1% of calibrated span (up to 100:1 turndown)
 3. Turn down (minimum span) 100:1
 4. Elevation/Suppression -100% to +100%
 5. Process Temperature Range -40° to +260° F (-40° to +130° C)
 6. Electronics temperature limit -4° to +158° F (-20° to +70° C)
 7. Wetted parts 316 stainless steel
 8. Output signal 4-20mA HART
 9. Enclosure NEMA 6/6P or 4X
 10. Power supply 11.5 -45VDC
(provide locally mounted Digital Line Powered Meter so unit may be powered using 115VAC)
 11. Class I Division 2 Groups A-D
- F. Process connection: ½” NPT. Coordinate with the site conditions and verify that the sensor will be compatible with the existing equipment.
- E. Manufacturer/model
1. Endress & Hauser PMP51-FD21JD1MGFRKJA1
 2. equal

2.14 TEMPERATURE SENSOR

- A. The temperature sensor shall sense ambient temperature and transmit a 4-20 mA analog signal proportional to measured temperature.
- B. Temperature probe shall consist of a 100 ohm RTD temperature sensor housed in a 0.25” diameter, 4” long stainless steel housing.
- C. Enclosure shall be NEMA 4X.
- D. Performance Requirements
1. Analog output 4-20 mA proportional to temperature
 2. Temperature measurement range -50°F to 450°F (-45°C to 232°C)
 3. Power Source 120 VAC
- E. Manufacturer/Model
1. United Electric D1D2L1A
 2. Equal
- F. Schedule
- | | |
|----------------------------------|--------------|
| <u>Tag Number</u> <u>Service</u> | <u>Notes</u> |
|----------------------------------|--------------|

1. TT-1 ambient temperature 1

Application Notes:

1. Provide surge protection

2.13 VACUUM SENSOR

- A. The vacuum sensor shall be capable of measuring the vacuum level within the vacuum collection tank and transmitter shall be capable of translating vacuum to a 4-20mA signal, proportional to vacuum.

- B. Ratings.

Rated pressure range: 0.0 – 101.0 kPa vacuum pressure

Set pressure range: 10.0 – 111.0 kPa

Withstand pressure: 500 kPa

Wetted parts material: pressure sensor stainless steel 304 and fitting stainless steel 304

Applicable fluids: wastewater

Port size: R 1/4, NPT 1/4

Power Supply voltage: 12-24 VDC

Current consumption: < 45mA

Enclosure: IP65

Operating Temperature Range: 0 – 50°C

Storage Temperature Range: -10°C to 60°C

Liquid density: minimum 0.65 g/cm³, maximum 1.5g/cm³

Degree of Protection: IP68, 20m (65ft)

Contact ratings: AC resistive load, 250 volts 10 amperes

AC inductive load, 250 volts 3 amperes

DC load, 30 volts 5 amperes

- C. Manufacturers

1. SMC ZSE80

2. equal

PART 3 EXECUTION

2.2 INSTALLATION

- A. All electronic instruments and systems shall operate on the universal 4-20mA signal system unless otherwise noted and shall be installed in the instrument loop so that the failure or removal of any instrument from the loop, other than primary element or power supply, will not affect the remaining instruments on the loop or the overall integrity of the loop. This shall be accomplished through the use of bias resistors at each receiver.
- B. All instruments shall be installed as shown, specified, directed and recommended by the manufacturers.

- C. The instrument enclosures shall be solidly grounded with a ground conductor as specified in Section 26 05 26 Electrical Grounding.
- D. Instruments shall be factory calibrated to minimize field adjustments and insure proper operation.
- E. Installation: Erect equipment in neat and workmanlike manner; align, level and adjust for satisfactory operation; install so that parts are easily accessible for inspection, operation, maintenance and repair. Minor deviations from indicated arrangements may be made, but only after obtaining approval from Engineer. All power and signal (4-20 mA / 1-5 VDC / other) cables shall be kept isolated and installed in separate conduit systems.

2.3 MISCELLANEOUS INSTRUMENTATION

- A. The following items of materials and installation shall also be provided under this Section.
 - 4. Instrument panels complete with all accessories and appurtenances as shown, specified and scheduled.
 - 5. Furnish and install all mounting stands, supports structures, brackets and accessories as required or detailed for the installation of the instruments furnished. Unless otherwise specified or required, supports shall be galvanized steel. All mounting hardware shall be stainless steel. Equipment mounted on walls in contact with ground or water shall be mounted offset from the wall a minimum of ¼-inch.
 - 6. Temporary storage of all instrumentation equipment shall be in a humidity-controlled environment heated to a minimum of 55°F, maximum of 85°F.
 - 7. Isolation of each device on 4-20 mA loops as required to prevent ground loops, with current-to-current isolators.
 - 8. Current to current isolators as required to provide rated outputs into total impedance of each loop.
 - 9. Identification of instrumentation equipment by means of metal tags or durable printed symbols with information regarding manufacturer, serial number, catalog number and model number.
 - 10. Cutting and drilling of existing panels for new instrumentation as shown, specified, or required, including repair and touch up painting of panel after installation.

3.3 STARTUP

- A. The services of competent factory trained representatives of the manufacturer who shall supervise the installation, startup, and operation of the equipment; and conduct the field tests.

B. Field Tests

1. After installation, instrumentation equipment shall be checked and the required adjustments shall be made by the representatives of the manufacturers.
2. Equipment shall be field tested in the presence of the Engineer and shall be demonstrated to operate satisfactorily over the specified ranges.
3. The Contractor shall provide the necessary test equipment and qualified test personnel.
4. In the event of failure of the field test, the Contractor shall perform the necessary corrections and retest, at his own cost and expense, the equipment as directed by the Engineer.

** End of Section **

SECTION 26 09 20
ELECTRICAL HEAT TRACE SYSTEM

PART 1 GENERAL

1.1 SUMMARY

This Section includes a complete electric heat trace system including a self-regulating heat trace cable, and all interconnection components, controls, and fittings required for a complete installation .

1.2 SUBMITTALS

- A. Prior to obtaining any material in connection with this section, detailed shop drawings on all materials shall be submitted. Submittals shall conform to the requirements of Section 01 33 00 Submittals, and to the requirements given in Section 26 00 00 Electrical General.
- B. Submittals shall contain a material list with manufacturer's name and data describing the material and showing its compliance with specifications, associated standards and test requirements. Submittal shall include as a minimum:
 - 1. Self-regulating heat trace cable
 - 2. All interconnection components
 - 3. All controls and fittings
 - 4. Warning tape.

In addition, the material list shall include the manufacturer's catalog or part number for each item.

- C. Catalog data and detailed wiring connection diagrams shall be submitted. Submittals for each manufactured item shall be current manufacturer's descriptive literature.
- D. Submittal shall include design calculations prepared by the Contractor, supplier, or system manufacturer based on the following information:
 - 1. Input Data (provided by the Engineer)
 - Maintenance temperature: 40°F
 - Ambient design temperature: 0°F
 - Area classification: Wet-Outdoor, non-classified
 - Pipe type and size (refer to Contract Drawings).
 - Insulation type and thickness (refer to Contract Drawings)
 - Heater Voltage (refer to Contract Drawings)
 - 2. Calculated Data (to be provided by Contractor, supplier, or manufacturer)
 - Heater type and output

Trace ratio
Heater length per circuit
Startup current
T-rating (classified areas)

- E. A heat trace installation drawing for use by the installing contractor shall be submitted. This drawing shall include a piping drawing (in plan or isometric format; piping schematics will not be acceptable). The drawing shall indicate the location and installation details of each of the following as applicable.
 - 1. Power connection – locate as shown on the Contract Drawings
 - 2. Tee connections
 - 3. End seals or splices
 - 4. Thermostats – locate at power connections or as indicated on the Contract Drawings
 - 5. Contactors
- F. Samples of any material shall be submitted upon Engineer's request .
- G. Submit list of heat trace installations by area, denoting the piping system to be heat traced, and the rating of the heat trace (ordinary or Hazardous Location).

1.3 CLOSEOUT SUBMITTALS

Provide project record documents which record actual layout of heat trace configuration.

1.4 QUALITY ASSURANCE

- A. Material and installation shall be in accordance with the latest revision of the following codes, standards, and specifications, except where more stringent requirements have been specified herein:
 - 1. National Electrical Code (NEC)
 - 2. National Electrical Manufacturers Association (NEMA)
 - 3. Underwriters Laboratories (UL)
 - 4. American Society of Testing Materials (ASTM)
- B. All heat trace cables, connectors, controls, and fittings of like type shall be the product of one manufacturer.
- C. Uniformity: Unless otherwise specified, all heat trace cables, connectors, and fittings of like type shall be the product of one manufacturer. All material shall be new and of the current design of the manufacturer providing equipment or material.
- D. Certificates of Compliance or certified test reports showing compliance with applicable UL Standards for each type of component shall be provided upon request.

PART 2 PRODUCT

2.1 GENERAL

- A. The heat trace element shall be self-regulating type cable consisting of two bus wires linked by a conductive polymer core. The heat trace cable shall vary its output power all along its length to respond to temperature.
- B. The heat trace cable shall be approved and listed. Appropriate “T-ratings” shall be met.
- C. The cable shall be capable of being crossed over or cut in the field.
- D. The cable shall include a tinned copper shield and overall Fluoropolymer outer jacket for resistance to organic chemicals and corrosives.
- E. Where installed on nonmetallic pipe, the heater shall be installed using an aluminum tape.
- F. Manufacturers: Raychem XL-Trace, Chromalox Type SRL-XX-CT, Thermon PSX-BC-FOJ, or equal.

2.2 CONNECTIONS

All power connectors, fittings, junction boxes, terminations, etc., shall be of nonmetallic construction and provided by the heat trace cable manufacturer.

2.3 CONTROLS

- A. The thermostat shall be ambient type set to 40°F and shall be connected directly to the heat trace cable (less than 15A full load).
- B. All controls and disconnecting means shall be provided with enclosures suitable for the area in which they are to be installed (Wet Location, or Hazardous Location).

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install the heater and all fittings in accordance with manufacturer’s recommendations. The heat trace shall be sized for a maintain temperature of 40°F with an ambient temperature of 0°F.
- B. Apply the heat trace cable on the pipe after the piping has been successfully pressure tested. Secure the heater to piping with cable ties or fiberglass tape.

- C. Apply the heat trace cable to a depth of three feet below grade, and throughout the exposed section of pipe.
- D. All piping, fittings, valves, instruments, taps, sample lines, and other components in the piping system, subject to freezing, shall be heat traced. Heat tracing at valves, instruments, or other components which are subject to removal for servicing shall be installed in a manner to permit removal of the valve or instrument.
- E. The heater shall be served by a 30 mA ground fault protection branch circuit breaker properly sized for the inrush currents.
- F. Heater shall be installed, connected, and tested prior to installation of insulation system.
- G. Install insulation (2" thick minimum) and metal jacket over heat traced lines.
- H. Provide and install labels indicating "CAUTION – ELECTRICAL HEAT TRACING" or similar at minimum 10 ft intervals on all heat traced pipelines. Labels shall be provided on insulation or metal jacket.

3.2 FIELD TESTS

- A. The heat trace system shall be checked and adjustments shall be made in the field after installation.
- B. Repair or replace malfunctioning units. Retest after repairs or replacements are made.

** End of Section **

SECTION 26 21 01
INCOMING SERVICES

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes all material required, shown or specified for the incoming electrical and telephone services for the Lewis Road Pump Station located on Lewis Road in Worcester County, Maryland 21811, and requirements for providing underground distribution systems of raceway and necessary appurtenances as indicated.
- B. The Contractor shall be responsible for making arrangements with Choptank Electric and Verizon relative to a timely installation of the incoming electric and telephone services and for coordination of his work with the power and telephone companies.

1.2 QUALITY ASSURANCE

- A. The incoming electrical service shall be inspected and approved by Choptank Electric and the local electrical inspection agency responsible for such inspections. A certificate of inspection from that agency shall be provided before the incoming service is energized.
- B. Material and installation shall be in accordance with the latest revision of the following codes, standards, and specifications, except where more stringent requirements have been specified herein:
 - 1. National Electrical Code (NEC)
- C. Qualifications of manufacturer. Provide materials and equipment that are the products of manufacturers regularly engaged in the production of such products which are of equal material, design, and workmanship. Products shall have been in satisfactory commercial or industrial use for two (2) years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturer's catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer.
- D. Uniformity: Unless otherwise specified, equipment or material of the same type of classification, used for the same purpose shall be the product of the same manufacturer. All material shall be new and of the current design of the manufacturer providing equipment or material.

1.3 SUBMITTALS

- A. Submittals shall conform to the requirements of Section 01 33 00 Submittals, and to the requirements given in Section 26 00 00 Electrical General.
- B. A copy of the inspection certificate from the local electrical inspection agency for the incoming electrical service shall be submitted to the Engineer.
- C. Any and all utility company permits, electric service orders (ESO), etc., shall be submitted.
- D. Submit details of service entrance plaques.

1.4 CLOSEOUT SUBMITTALS

Provide project record documents which record actual locations of components and circuits.

PART 2 PRODUCT

2.1 ELECTRICAL SERVICE

- A. All material shown on the Contract Drawings, specified below, or required by the utilities shall be in accordance with the applicable sections of the specifications.
- B. The incoming electrical service shall be either 240/120, or 208VAC 3 phase. Provide equipment to accommodate the actual incoming service.
- C. The incoming electrical service at the Lewis Road Pump Station shall be 480VAC 3 phase, and sized to operate all of the equipment at the pump station.

2.2 DETAILED MATERIAL REQUIREMENTS

- A. Provide all labor, materials, equipment and services necessary for and incidental to the complete installation and operation of electrical work as indicated on the Contract Drawings and specifications.
- B. Grounding shall be in accordance with the requirements of Section 26 05 26.

2.3 UNDERGROUND DUCT BANKS (DIRECT BURIAL)

- A. Underground duct banks shall be PVC coated rigid galvanized steel conduits direct buried, unless otherwise noted. Conduit shall be as specified in Section 26 05 33.
- B. Duct banks shall conform to installation details indicated on Contract Drawings

PART 3 EXECUTION

3.1 COORDINATION WITH THE ELECTRICAL UTILITY

- A. The Contractor shall make arrangement and coordinate with the Owner and with Xcel Energy to obtain the electrical services at this site. The Owner will be responsible for the cost of the new services, but the Contractor shall coordinate with Xcel Energy to obtain the most economical installation.
- B. The Contractor shall be responsible for scheduling installation of the electrical service. The Contractor shall coordinate the installation with the following:

Mr. Mark Deao
Choptank Electric Cooperative
MarkD@choptankelectric.com
C: (410) 443-9036

3.2 INSTALLATION

- A. The Contractor shall perform all manual excavating and backfilling and site preparation necessary to install the underground conduit included in this section of the work.
- B. The Contractor shall install the underground conduit minimum of 24" below grade.
- C. Penetrations shall be sealed to a watertight condition.
- D. Keep conduit free from concrete, dirt, and other substances during the construction. After conduit have been installed, pull standard flexible mandrel not less than 12 inches long, having a diameter approximately 1/4" inch less than the inside diameter of the conduit, after which pull a brush with stiff bristles through the conduit to make certain that no particles of earth, sand, or gravel have been left in the conduit. Replace conduit that do not allow the passage of the mandrel at no additional cost to the Owner.
- E. Contractor shall backfill and regrade to original condition after installation of the conduit.
- F. Install detectable, non-biodegradable 3" wide yellow metallic marker tape 12" below grade above every ductbank. The word "ELECTRIC" shall appear continuously along its length.

** End of Section **

This page intentionally left blank

SECTION 26 27 16
ENCLOSURES

PART 1 GENERAL

1.1 DESCRIPTION

This Section includes enclosures of the type suitable for their locations to protect all electrical equipment and controls.

1.2 QUALITY ASSURANCE

A. Material and installation shall be in accordance with the latest revisions of the following:

1. National Electrical Code (NEC)
2. Underwriters Laboratories, Inc. (UL)
3. National Electrical Manufacturers Association (NEMA)
4. International Electrotechnical Commission (IEC)

B. Qualifications of manufacturer: All equipment furnished under this Section shall be furnished by manufacturers who meet the industry standards for quality, workmanship, and experience.

C. In general, all electrical equipment furnished shall be listed and labeled by Underwriters Laboratories, Inc. (UL) or another acceptable organization to the Engineer and owner. Submit name of organization that will label equipment if other than Underwriters Laboratories. Organization shall certify that the equipment meets applicable UL, ANSI, and NEMA standards.

D. Control panels shall be constructed and UL Labeled by a UL certified panel shop.

1.3 SUBMITTALS

A. Prior to obtaining any material in connection with this Section, detailed shop drawings on all material shall be submitted. Submittals shall conform to the requirements of Section 01 33 00 Submittals.

B. Enclosures shall be submitted with each piece of equipment they are protecting.

C. Submittals shall contain the NEMA or IEC type designation and manufacturer data describing the enclosure and showing its compliance with specifications and associated standards.

D. A list of nameplate titles shall be submitted for each annunciator panel or enclosure as part of the shop drawing submittals.

E. Samples of any material shall be submitted upon Engineer's request.

1.4 CLOSEOUT SUBMITTALS

Provide project record documents which record actual locations of components and circuits.

PART 2 PRODUCT

2.1 GENERAL

A. Enclosures for Protected Work

1. The enclosures for electrical equipment shall be NEMA Type 1 – Gasketed or IEC-IP42 except as modified below.
2. In areas designated as Hazardous Locations, all work shall meet the requirements of the National Electrical Code for Class I Division 1 locations. All electrical equipment and enclosures shall be NEMA Type 7, approved for Class 1, Division I, Group D atmosphere.
3. In Outdoor areas, or areas designated as a Wet Location, all work shall meet the requirements of the National Electrical Code for Wet Locations. All electrical equipment and enclosures shall be NEMA Type 4 (or Type 4X), or IEC-IP66.
4. In areas designated as a Corrosive Location, all electrical equipment and enclosures shall be NEMA Type 4X, or IEC-IP66.

B. Where electrical equipment is installed in motor control centers, panels, panelboards, or other control assemblies, no additional enclosures are required except where specifically specified or shown.

C. Device, junction, pull-boxes, and other conduit system accessories shall be as specified in Section 26 05 33 Conduits and Raceway Systems.

2.2 ENCLOSURES

A. NEMA 12 Enclosures

NEMA 12 enclosures shall be dust-tight, drip-tight, and suitable for protecting enclosed equipment and components from fibers, flyings, lint, dust and dirt. NEMA 12 enclosures shall provide a degree of protection against light splashing, seepage, dripping and external condensation of non-corrosive liquids.

B. NEMA 3R Enclosures

NEMA 3R enclosures shall provide protection from falling rain, formation of ice, windblown dust, and other weather hazards. NEMA 3R enclosures shall be suitable for outdoor installation.

C. NEMA 4 Enclosures

NEMA 4 Enclosures shall be water-tight and dust-tight suitable for outdoor installation, protecting enclosed equipment against splashing water, seepage of water, falling or hose-directed water, severe external condensation. NEMA 4X enclosures, in addition to the requirements for NEMA 4, shall be corrosion resistant. NEMA 4X enclosures located outdoors shall be stainless steel.

D. Enclosure Construction

1. Enclosures shall be constructed of a minimum of 14 gauge steel.
2. Seams shall be continuously welded and ground smooth, with no holes or knockouts.
3. Exterior hardware shall be stainless steel.
4. Enclosures shall be provided with gray prime finish over phosphatized surface inside and out with a white enamel interior unless otherwise specified.
5. Dimensions of enclosures shown on the Contract Drawings are approximate and represent the minimum size required. Contractor shall size each enclosure as required to house the electrical equipment shown or specified and coordinate space availability.

2.3 ENCLOSURE IDENTIFICATION

- A. All enclosures shall have nameplates on the exterior of each enclosure identifying the application function of the equipment enclosed such as "SLUDGE PUMP NO. 1."
- B. For Control Stations, a factory installed legend plate shall be provided to indicate the function each station performs, such as "ON" or "OFF."

C. Identification Tags

1. Identification nameplates shall be engraved ¼ -inch high letters on a 1/8-inch thick plastic black nameplate mechanically attached to the enclosure.
2. Legend plates shall be metal with black lettering mechanically attached to control station.
3. Nameplates and circuit identification shall be as specified in Section 26 05 53 Identification for Electrical Systems.

- D. Devices mounted on or within the enclosures shall be permanently identified. All control functions shall be identified. The device and terminal identifications shall agree with those shown on the Contract Drawings.

- E. Each circuit shall be identified by a typewritten directory with transparent sealed plastic cover, fastened to the inside surface of the door of the enclosure.

2.4 ENCLOSURE DOORS

- A. Enclosures shall be provided with front access single door or double doors as required for the enclosure size. For large enclosures requiring double doors, doors shall be provided with three point latches operated by a key locking handle. Latch rods shall have rollers to facilitate door closing.
- B. Doors shall be mounted with continuous piano hinges. A rolled lip around minimum three sides of door shall be provided to prevent dirt and liquid from dropping into the panel when door is open.
- C. Doors shall be fitted with a neoprene gasket applied with oil resistant adhesive and held in place with stainless steel retaining strips.
- D. Enclosure doors shall be provided with stainless steel door strips to hold the doors in the open position. The open position shall be field adjustable. The doors shall be capable of being opened at a minimum of 90° angle from their closed positions.
- E. Provide interior door swing-out panel for outdoor mounted control panels. Swing-out panel shall be by the same manufacturer as the enclosure and shall be specifically designed by the manufacturer for this application. Swing-out panel shall provide an area to mount devices (instead of mounting these devices on the exterior door) so that these devices will be afforded a degree of protection from outdoor weather elements.

2.5 INTERIOR SUBPANELS

Interior subpanels shall be constructed of minimum 14 gauge steel finished in white enamel paint. Fasteners, screws, and equipment mounting racks shall be stainless steel.

2.6 INTERNAL WIRING

- A. Terminal blocks for external connections shall be suitable for No. 12 AWG wire, fabricated complete with marking strip, covers, and pressure connectors. Terminal blocks shall be rated for 30A at 600 VAC unless noted otherwise. Not less than 25 percent spare terminals shall be provided.
- B. Terminals shall be labeled to agree with identification shown on supplier's submittal drawings. A terminal shall be provided for each conductor of external circuits, plus one ground for each shielded cable. Wires shall be numbered using wire markers. Wire numbers shall agree with terminal numbers, associated with remote equipment wiring designations, as indicated on the submittal drawings.
- C. Wiring shall be grouped or cabled and firmly supported in the panel. Plastic wireway, Panduit, or equal, shall be used to route wire within the panel. Wireway shall be run in continuous length with snap on covers.

2.7 CONTROL PANEL ENCLOSURE AND CONDUIT SYSTEM ACCESSORIES

- A. Conduit system accessories shall be as specified in Section 26 05 33 Conduits and Raceway Systems.
- B. A large print pocket shall be provided on the interior face of the enclosure door.
- C. For enclosures housing a programmable controller, provide a folding shelf or equivalent accessory to accommodate a laptop computer or other programming tools for servicing and programming the programmable controller. Provide a 115 VAC, 15 A utility receptacle for use with laptop computer or other programming tools.
- D. Provide a fluorescent light in floor mounted, or freestanding enclosures.
- E. For floor mounted, or freestanding enclosures housing a programmable controller, provide a window on the enclosure door so the status of the programmable controller processor and input/output modules may be monitored without opening the enclosure door.

2.8 ABOVE GROUND ENCLOSURES

Above ground enclosures shall be weatherproof, clamshell design, and provide drip-proof edges which assure the flow of rain water away from the enclosure. Material of construction shall be fiberglass suitable for outdoor installation. Provide corrosion resistant hardware, including hinges, restraining line (to limit the opening of the cover), handle, and locking hasp. Above ground enclosure shall permit access to the interior contents. Above ground enclosure to be as manufactured by Diffused Gas Technologies, Inc., or equal.

PART 3 EXECUTION

3.1 GENERAL

Enclosures shall be provided with wiring, schematic, layout, connection, and control diagrams. These diagrams shall be placed in the print pocket contained on the inside of the enclosure door.

3.2 INSTALLATION

- A. Enclosure wiring shall be brought out to identifying terminal blocks. Interwiring between units or sections shall be from terminal block to terminal block. Terminal blocks for wiring shall be correlated with those for the electrical equipment by the Systems Integrator. Each terminal block shall contain no more than two wires on each side. Additional terminal blocks shall be provided when a connection of more than two wires are required. Use the full complement of wiring accessories available to provide a neat and organized appearance.
- B. Wiring for panel enclosures shall be neatly arranged in bunches taped or tied together at six inch intervals and shall be securely attached to the interior of the panel unless contained within plastic wireways. Identification of panel component and wiring shall be

as shown on the Contract Drawings. Wiring to door mounted components shall be bundled and enclosed in flexible spiral wrap to provide protection to the wiring.

- C. Panels shall be grounded, and equipment and circuits included in the panels, as shown or required to be grounded, shall be connected to the equipment grounding conductors.
- D. The panel manufacturer shall mount equipment shown or specified to be furnished with the panels. Panel mounted controls and components shall be mounted a minimum of 30" above finished floor and a maximum of 72" above finished floor. The panels shall be furnished as completely assembled units, requiring only field connections of power and control wiring.
- E. Where multiple power sources enter a single enclosure, a nameplate shall be provided indicating: "CAUTION: MULTIPLE POWER SOURCES" or similar warning.
- F. Not less than eight inches of clearance shall be provided between the terminal strips and the base of vertical panels for conduit and wiring space.
- G. AC and DC wiring shall be routed in separate plastic wireways.
- H. Where different voltages are present within the enclosure, provide nameplates indicating the voltage levels applicable to terminals. Terminals for 480 VAC and 120 VAC shall be separated a minimum of six inches. If the enclosure contains low voltage instrumentation wiring and terminals, the wiring and terminal blocks shall be separated from the 120 VAC and the 480 VAC wiring by a minimum of six inches. The terminal blocks for low voltage instrumentation wiring shall be enclosed in a separate steel enclosure inside the solid state motor controller cabinet for shielding.
- I. Component mounting and panel layout shall meet the requirements of NEMA and U.L. for location, type of mounting, separation of components for proper ventilation and air circulation to prevent heat build-up and accessibility for maintenance.

3.3 FIELD TESTS

- A. The panel shall be checked and necessary adjustments shall be made in the field after installation, by representatives of the manufacturers of the equipment included in the panel.
- B. The panel shall be functionally tested by simulating the inputs. Tests shall be in the presence of the Engineer.
- C. In the event of failure of the field test, the Contractor shall retest, at his own cost and expense, the equipment as directed by the Engineer.

**** End of Section ****

SECTION 26 28 00
PANELBOARDS AND CIRCUIT PROTECTIVE DEVICES

PART 1 GENERAL

1.1 DESCRIPTION

This section includes low voltage panelboards, circuit breakers, disconnect switches, fuses, and other circuit protective devices for service at 600 VAC or less.

1.2 QUALITY ASSURANCE

- A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards, and specifications, except where more stringent requirements have been specified herein:
 - 1. National Electrical Code (NEC)
 - 2. National Electrical Manufacturers Association (NEMA)
 - 3. Underwriters Laboratories, Inc. (UL) 1449
 - 4. American National Standards Institute (ANSI)
- B. Qualifications of manufacturer. Provide materials and equipment that are the products of manufacturers regularly engaged in the production of such products which are of equal material, design, and workmanship. Products shall have been in satisfactory commercial or industrial use for two (2) years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturer's catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer.
- C. Uniformity. Unless otherwise specified, equipment or material of the same type of classification, used for the same purpose shall be the product of the same manufacturer. All material shall be new and of the current design of the manufacturer providing equipment or material.

1.3 SUBMITTALS

- A. Submittals shall conform to the requirements of Section 01 33 00 Submittals, and to the requirements given in Section 26 00 00 Electrical General. In addition, submittals shall include the manufacturer's name, trade name, place of manufacturer, catalog model, layout dimensions, project specification, and technical paragraph reference.
- B. Submittals shall contain a material list with manufacturer's name and data describing the material and showing its compliance with specifications, associated standards and test requirements.

- C. Prior to obtaining any material in connection with this section, detailed shop drawings on all material shall be submitted. Submittals for each manufactured item shall be current manufacturer's descriptive literature of cataloged products, equipment drawings, diagrams, performance and characteristic curves, and catalog data sheets. Submittal shall include ratings, circuit diagrams, and dimensional data, as a minimum. Drawings shall include elementary and interconnection diagrams showing connections to internal components, and indicate field termination points for power and control interface. Should manufacturer's data require supplemental information for clarification, the supplemental information shall be submitted.
- D. Submittals shall contain complete part numbers for all materials, including the panelboard enclosure, the neutral bar, the ground bar, the lugs, and the circuit breakers. And the submittal shall include an explanation of each part number, and the options and alternatives available
- E. Submittals shall also contain descriptive data and time-current characteristic trip curves for each type of circuit breaker or fuse. These curves shall be submitted on full size manufacturer's drawings.
- F. Samples of any material shall be submitted upon Engineer's request.

1.4 CLOSEOUT SUBMITTALS

Provide project record documents which record actual circuit directories, as well as actual locations of components and circuits.

PART 2 PRODUCT

2.1 PANELBOARDS

A. Panelboards

1. Panelboards shall meet Federal Specification W-P-115B, Type 1, Class 1, and shall conform to UL50 UL67, and NEMA PB-1.
2. Loadcenters (Federal Specification W-P115C Type 1 Class 2) shall not be substituted for panelboards unless specifically indicated.
3. Panelboards shall be circuit breaker type as shown on the drawings with neutral bar, ground bar, and main and branch circuit breakers as scheduled.
 - a. Unless otherwise shown, scheduled or specified, bus bars, ground bar, and neutral bar shall be copper or tin plated aluminum.
 - b. Panelboards shall be furnished and installed in accordance with the panelboard schedules as shown.
 - c. Subject to Engineer's review, such schedules may be revised to obtain more convenient grouping and better balance of the actual connected load.

4. Panelboards shall be provided with ample wiring gutters and shall have a single door with spring door hinges, lock, keys, and cardholder on the side of the door. Circuit identification cards shall be typewritten with circuits identified as actually installed.
5. Panelboards shall have single, double, or triple pole bolt-on branch circuit breakers as scheduled.
 - a. Branch circuit breakers shall be in accordance with subsection headed "Molded Case Circuit Breakers".
 - b. Unless otherwise shown, circuit breakers shall be rated at 20 amperes.
 - c. Circuit breakers shall be provided for all spares shown on the schedule.
6. Short circuit current requirements shall be obtained only from the schedules, specifications, or the Contract Drawings.
 - a. If this information is not shown, the Engineer shall be consulted.
 - b. Under no circumstances shall any short circuit requirements be assumed by the Contractor.
 - c. Integrally rated panelboards utilizing branch breakers with reduced short circuit ratings are acceptable.
7. Panelboards with main circuit breakers serving as building disconnecting means shall be service entrance rated, and shall be provided with a plaque designating the circuit breaker as a building disconnecting means.
8. Provide surge suppression for panelboards in accordance with Section 26 43 13 Transient Voltage Surge Suppression. Devices for surge suppression may be an integral part of the panelboard.
9. Panelboard enclosures shall be provided with key-locked doors. Provide a minimum of two keys for each lock.
10. Manufacturers
 - a. 120/208 VAC and 120/240 VAC, 3 Phase Panelboards. Unless otherwise indicated, four wire 120/208 VAC and 120/240 VAC panelboards shall be: bolt-on AQ Series manufactured by General Electric Co., Type NQOD manufactured by Square D Company, or equal.
 - b. 277/480 VAC, 3 Phase Panelboards. Unless otherwise indicated, four wire 277/480 VAC panelboards shall be: bolt-on AE Series manufactured by General Electric Co., Type NF as manufactured by Square D Company, or equal.

B. Panelboard Circuit Breakers

1. Circuit breakers, where included as part of panelboards, shall be mechanically and electrically similar to molded case circuit breakers.
2. Single pole breakers shall have a minimum interrupting rating of 10,000 amperes RMS symmetrical at 240 VAC or 14,000 amperes at 480 VAC unless otherwise shown or specified.

3. Except where otherwise shown, trip ratings shall be 20 amperes.
4. 120/208 VAC circuit breakers shall be Q Line manufactured by General Electric Co., Type QOB manufactured by Square D Company, or equal.
5. 277/480 VAC circuit breakers shall be TEY Line manufactured by General Electric Company, Type ED/EG/EJ manufactured by Square D Company or equal.
6. GFCI circuit breakers shall be provided where scheduled on the Contract

2.2 CIRCUIT BREAKERS

A. Molded Case Circuit Breakers

1. Except as modified below, the material and construction of molded case circuit breakers shall be in accordance with NEMA AB-1 and UL 489 standards for breakers.
2. Circuit breakers shall be of the air-break type.
3. Circuit breaker mechanisms shall be so designed that an overload or a fault on any one pole shall trip all poles simultaneously.
4. All poles shall be effectively barriered from one another.
5. Circuit breaker handles shall be trip-free. Circuit breakers in motor control centers or individual enclosures shall be interlocked with the door latching mechanism so that the door of the circuit breaker enclosure or motor control center compartment cannot be opened unless the circuit breaker contained is in the open position.
6. Number of poles and trip ratings of circuit breakers shall be as shown, specified, or required.
7. Motor control center main and tie circuit breakers shall be provided with auxiliary contacts for remote monitoring of the circuit breaker status.

B. Individual Circuit Breakers

1. Circuit breakers shall have a minimum of 14,000 amperes RMS symmetrical interrupting rating at 480 VAC or 10,000 amperes at 240 VAC except where different ratings are shown on the Contract Drawings, or unless otherwise specified.
2. Circuit breakers, 225 ampere frame and above, shall have interchangeable thermal and adjustable magnetic tripping elements.
3. Circuit breaker enclosures of the type shown on the drawings shall be provided.

C. Motor Circuit Protectors

1. Motor Circuit Protectors (MCP) shall have a quick make, quick break, switching mechanism, mechanically trip free from the handle, enclosed in a molded case.
2. The Contractor shall field verify actual motor starting and running currents in sizing the MCPs. Any replacement of MCPs due to this verification not being performed shall be done at no additional cost to the Contract.
3. MCPs shall have provisions for adjusting the instantaneous magnetic trip element.
4. Each pole shall provide instantaneous short circuit protection and all poles shall be constructed to open, close, and trip simultaneously.
5. Where higher short circuit protection is required, MCPs shall be provided with current limiters with trip indicators that are fully coordinated with the motor circuit protector so all three phases open if the current limiter is operated. Current limiters shall be constructed so replacement can only be made with an identical limiter having the same interrupting capacity. The minimum interrupting short circuit ratings of the MCP shall be known as shown on the Contract Drawings (integral rating).
6. MCPs shall be Type MCP manufactured by Cutler-Hammer Co., type Mag-Break manufactured by General Electric Co., or equal.

D. Service Entrance Circuit Breakers

1. Where shown or required, a service entrance breaker shall be provided to disconnect all conductors in a building or structure from the service-entrance conductors.
2. The service entrance breaker shall be UL listed, service entrance rated.
3. Where a 480 Volt System 1,000 ampere breaker or larger is shown or required, ground fault protection shall be provided in accordance with NEC 230-95.
4. The service entrance breaker shall be provided with an appropriate enclosure labeled as "Service Disconnect," and the enclosure shall be connected to the grounding grid in accordance with Section 26 05 26 Electrical Grounding and the National Electrical Code.

2.3 SWITCHES

A. Disconnect Switches

1. Disconnect switches as indicated on the plans and specifications shall be NEMA Heavy Duty Type HD, Underwriter's Laboratories listed. The switches shall be fusible type unless otherwise indicated on the Contract Drawings.

2. Switch Interior. All switches shall have switchblades that are fully visible in the OFF position when the door is open. Switches shall have removable arc suppressors, where necessary, to permit easy access to line-side lugs. Lugs shall be UL listed for aluminum and/or copper cables and front removable. All current carrying parts shall be plated.
3. Switch Mechanism. Switches shall have a quick-make, quick-break, operating handle and mechanism, which shall be an integral part of the box, not the cover. Switches shall have interlock to prevent unauthorized opening of the switch door in the ON position or closing of switch mechanism with the door open. Handle position shall indicate if switch is ON or OFF. Switch shall be lockable in the OFF position.
4. Enclosures. Switches shall be furnished in NEMA 1 general-purpose enclosures unless specified as NEMA 3R (rainproof), NEMA 4 (stainless steel), or NEMA 7 (Class 1, Div 1) on the Contract Drawings. Covers on NEMA 1 enclosures shall be attached with pin type hinges.
5. Ratings. Switches shall be rated as indicated on the Contract Drawings. The switch must have a UL listed rejection feature to reject all fuses except Class R. UL listed short circuit ratings, when equipped with Class J or Class R fuses, shall be 200,000 amperes RMS symmetrical.

B. Molded Case Switches

1. Molded case switches shall be provided where shown on the Contract Drawings. Molded case switches shall be automatic type designed to open instantaneously at a factory preset magnetic trip point. Molded case switches shall be designed for 600 VAC, 3 pole, with a minimum withstand rating of 25,000 amperes.
2. Molded case switches shall be as manufactured by Square D, or equal.

2.4 FUSES

- A. Low Voltage (less than 600 volts) cartridge fuses shall be of the voltage and amperage rating listed on the drawings. Fuses shall be selected to provide overcurrent, short circuit, and blackout protection. They shall be of the type listed below unless otherwise indicated.
 1. Main service and feeder protection (above 600 amps) – Current limiting UL Class L above 600 amperes (current UL standards do not rate Class L fuses at 600 amperes or below).
 2. Main service and feeder protection at 600 amps and below – Current limiting UL Class J.
 3. Motor branch circuit, transformer, inductive loads protection (such as MCCs, starters, etc.) – UL Class J current limiting, time delay for motor inrush and short circuit protection.

- B. Refrigeration or air-conditioning equipment. Where refrigeration or air conditioning equipment includes requirements for a particular overcurrent device type (i.e., fuse) and maximum size, this requirement shall be adhered to. If a particular type of equipment is listed for “Maximum fuse size”, a fuse must be used to protect this equipment. Refrigeration equipment will be protected with UL Class J time delay fuses.
- C. Manufacturers
 - 1. Bussman
 - 2. Littlefuse
 - 3. Eagle
 - 4. equal.
- D. Spare Fuse Cabinet. Provide Spare Fuse Cabinet Enclosure. Spare Fuse Cabinet shall be wall mounted enclosure with piano-hinge door for spare. Size adequate for storage of spare fuses with 25% spare capacity. Enclosure shall have painted finish with “SPARE FUSES” stenciled on front door. Spare Fuse Cabinet shall be Bussman, SFC, or equal.

2.5 ENCLOSURES

Enclosures for Circuit Protective Devices shall be of the type appropriate for each location as specified under Section 26 27 16 Electrical Cabinets and Enclosures.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Electrical Contractor shall refer to all pertinent Sections of these Specifications for installation details of other equipment associated with panelboards and individual circuit breakers.
- B. Provide all miscellaneous bolts, washers, nuts, clips, Belleville washers, lockwashers, small hardware, etc., of corrosion resistant material to make installation complete.
- C. Provide minimum working clearance, as described in the National Electrical Code Article 110.26, for all electrical equipment.
- D. Verify the location of each piece of equipment at the site before installing enclosures or conduits.
- E. Mount all cabinets level and plumb, flush or surface as scheduled.
- F. Install recessed cabinet flush with finished wall.
- G. Be sure wall thickness will accept panel enclosures before ordering equipment.
- H. Paint all scratches, marring, and other imperfections in the finish, resulting from installation. Use matching paint.

- I. Provide complete and professional installation for all items of equipment included in this Section, and in accordance with the National Electrical Code.

3.2 INSTALLATION OF PANELBOARDS

- A. Mount panelboards 6'-6" minimum to centerline to top circuit breakers; 3'-0" to bottom of cabinet where possible, unless noted otherwise.
- B. Properly align panel in cabinet.
- C. Provide for empty 1-inch conduits from panel to ceiling space for all flush mounted panels. Arrange for future continuation of work.

3.3 FUSES

- A. Install fuses in fusible devices as shown. Arrange fuses such that fuse ratings may be read without removing the fuse.
- B. Install spare fuse cabinet with spare fuses in location shown (or adjacent to distribution switchgear).
- C. Spare Fuses. Furnish quantity equal to 20 percent of each type and six installed, but not less than one set of three of each of type and size.

** End of Section **

SECTION 26 29 13 MOTOR CONTROLLERS

PART 1 GENERAL

1.1 SUMMARY

This Section includes motor controllers for the three-phase and single-phase motors operating at voltages not in excess of 600 VAC.

1.2 QUALITY ASSURANCE

- A. Material and installation shall be in accordance with the latest revision of the following codes, standards, and specifications, except where more stringent requirements have been specified herein:
 - 1. National Electrical Code (NEC)
 - 2. National Electrical Manufacturers Association (NEMA)
 - 3. Underwriters Laboratories (UL)
 - 4. International Electrotechnical Commission (IEC)
- B. Qualifications of manufacturer. Provide materials and equipment that are the products of manufacturers regularly engaged in the production of such products which are of equal material, design, and workmanship. Products shall have been in satisfactory commercial or industrial use for two (2) years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturer's catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer.
- C. Uniformity: Unless otherwise specified, equipment or material of the same type of classification, used for the same purpose shall be the product of the same manufacturer. All material shall be new and of the current design of the manufacturer providing equipment or material. Solid state motor controllers, AC magnetic contactors, NEMA rated overloads, and molded case circuit breakers for motor circuit shall be of the same manufacturer.

1.3 SUBMITTALS

- A. Submittals shall conform to the requirements of Section 01 33 00 Submittals, and to the requirements given in Section 26 00 00 Electrical General. In addition, submittals shall include the manufacturer's name, trade name, place of manufacturer, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification, and technical paragraph reference.

- B. Submittals shall contain a material list with manufacturer's name and data describing the material and showing its compliance with specifications, associated standards and test requirements.
- C. Prior to obtaining any material in connection with this section, catalog data and detailed wiring connection diagrams shall be submitted. Submittals for each manufactured item shall be current manufacturer's descriptive literature of cataloged products, equipment drawings, diagrams, performance and characteristic curves, and catalog data sheets. Submittal shall include ratings, circuit diagrams, and dimensional data, as a minimum. Drawings shall include elementary and interconnection diagrams showing connections to internal components, and indicate field termination points for power and control interface. Should manufacturer's data require supplemental information for clarification, the supplemental information shall be submitted.
- D. Shop drawings shall present complete and accurate information relative to all working dimensions, equipment weights, assembly and section views, and all necessary details pertaining to coordinating the work of the Contract, lists of materials and finishes, parts list and the descriptions thereof, lists of spare parts and tools where such parts or tools are required, and any other information that is required to demonstrate compliance with the Contract Documents. Drawings for electrical equipment shall include elementary and interconnection diagrams showing connections to internal components, and indicating field termination points for power and control interface. Solid State Motor Controller Equipment supplier shall submit manufacturer's catalog data and diagrams, output cable lug sizes and ratings, and elevation view of Solid State Motor Controller with the door removed. Project specific wiring diagrams shall be provided.
- E. Submittal shall contain manufacturer's descriptive data including ratings, circuit diagrams, dimensional data, conduit entry restrictions, and heat dissipation to ambient. Submittals shall also contain manufacturer's part number for the equipment.
- F. Manufacturer's standard wiring diagrams and specific modifications to the wiring of the equipment shall be submitted. All terminal points for field, and interconnecting wiring shall be identified.
- G. Submittals shall include a list of the setup parameters for the solid state motor controller.
- H. Samples of any material shall be submitted upon Engineer's request.

1.4 CLOSEOUT SUBMITTALS

Provide project record documents which record actual circuit directories, as well as actual locations of components and circuits.

PART 2 PRODUCT

2.1 NEMA MAGNETIC MOTOR CONTROLLERS

A. NEMA Magnetic Motor Starters

1. Magnetic motor starters shall be 3-pole, 60 cycle magnetic starters, and shall be of the NEMA size appropriate for the motor horsepower and voltage shown but not be less than NEMA Size 1.
2. Unless otherwise specifically shown or specified, all magnetic motor starters shall be provided with:
 - a. Vertical lift operation.
 - b. A replaceable type, encapsulated operating coil rated at 120 VAC.
 - c. Overload relays.
 - d. Starter coils and contacts shall be easily replaceable without removing contactor from the enclosure.
3. Magnetic motor starters shall be rated to meet minimum number of load/life operations (contact electrical life under load) when motor starter is used for starting of squirrel cage motors and switching motor off only after the motor is up to speed, as follows:

<u>NEMA Size</u>	<u># of Operations</u>	<u>Operational Current</u>
1	2 million	27 amperes
2	2 million	45 amperes
3	1.5 million	90 amperes
4	1.5 million	135 amperes
5	2 million	270 amperes

4. Individual magnetic motor starters shall be provided with the required accessories to perform the control circuit as shown on Contract Drawings or specified. These accessories shall include but shall not be limited to the following:
 - a. Single-phase control transformers of rating suitable for the load of the control circuit as actually installed, with fused secondary rated for 120 VAC.
 - b. Pushbutton stations or selector switches with legend plates or engraved nameplates as specified in Section 26 09 00 Miscellaneous Electrical Controls.
 - c. Hand-Off-Auto selector switch, unless otherwise noted.
 - d. Push-to-test indicating lights with interchangeable covers as specified in Section 26 09 00 Miscellaneous Electrical Controls.
 - e. Control circuit fuse where a separate control circuit is shown.
 - f. Two electrically convertible contact interlocks.
5. Each magnetic motor starter shall be of a type suitable to perform the control function shown and be in accordance with one of the following:

- a. Constant Speed, Full Voltage, Non-Reversing Starters (FVNR) shall provide basic contactors for forward control.
 - b. Constant Speed, Full Voltage Reversing Starters (FVR) shall provide basic contactors for the forward and reverse speed. Mechanical and electrical interlocks shall be provided to preclude the possibility of both contactors being closed at the same time.
 - c. Constant Speed, Reduced Voltage Starters (RV) shall be of the closed transition, auto-transformer type and shall include the required 3 pole and 5 pole contactors, auto-transformers, timing relays and appurtenances.
 - d. Multi-Speed Motor Starters shall provide the basic contactors for each speed, suitable interlocked. Where shown, sequence-compelling relays shall be provided.
 - 6. Magnetic motor starter manufacturers:
 - a. Allen-Bradley Bulletin 500, 505 Series
 - b. General Electric CR-306, CR-309 Series
 - c. Sq D Class 8536, 8702 Series
 - d. Cutler-Hammer A-200 Series, A-210 Series
 - e. equal (Samples of equal products shall be submitted in accordance with Part I)
- B. NEMA Combination Motor Starter with Circuit Breaker (MCP) Disconnect
- 1. Combination magnetic motor starters shall be the combination type consisting of a motor circuit protector (MCP) and NEMA magnetic motor starter assembled and wired into a self-contained unit.
 - 2. The magnetic motor starter shall be designed to coordinate with the circuit protective device to withstand a minimum short circuit current of 22,000 AIC or as shown on the Contract Drawings.
 - 3. MCP and magnetic motor starter shall be packaged by one manufacturer. Combination motor starters shall be:
 - a. Allen-Bradley Bulletin 513, 507 Series
 - b. General Electric Type CR387, CR390 Series
 - c. Sq D Class 8539, 8739 Series
 - d. Cutler-Hammer Class A206, A216 Series
 - e. equal (Samples of equal products shall be submitted in accordance with Part I)
 - 4. Disconnect switch shall be capable of being locked in the open position.
- C. NEMA Combination Magnetic Motor Starter with Fused Switch Disconnect
- 1. Combination magnetic motor starters shall be the combination type consisting of a fused switch and NEMA magnetic motor starter assembled and wired into a self-contained unit.

2. The magnetic motor starter shall be designed to coordinate with the fused switch to withstand a minimum short circuit current of 100,000 AIC or as shown on the Contract drawings.
3. Fused switches shall be provided with Class R fuse clips.
4. Fused type combination starter shall be provided certified Type 2 coordination in accordance with IEC 947-4-1.
5. Fused switch and magnetic motor starter shall be packaged by one manufacturer. Combination motor starters shall be:
 - a. Allen-Bradley Bulletin 512, 506 Series
 - b. General Electric Type CR308, CR311 Series
 - c. Sq D Class 8538, 8738 Series
 - d. Cutler-Hammer Class A204, A214 Series
 - e. equal (Samples of equal products shall be submitted in accordance with Part I)

D. NEMA Manual Motor Starting Switches

1. Manual motor starting switches shall be provided for the control and protection of all single-phase motors which do not require control from a remote location.
2. Manual motor starting switches shall provide thermal overload protection, including trip-free operation, and a manual reset overload.
3. Integral start-stop pushbuttons or on-off toggle switches shall be provided as shown on the Contract Drawings.
4. Manual motor starting switch manufacturers:
 - a. Allen-Bradley Bulletin 600 Series
 - b. General Electric CR101, CR1062
 - c. Sq D Class 2510, 2511, 2512
 - d. equal (Samples of equal products shall be submitted in accordance with part I)

E. NEMA Overloads

1. The Contractor shall verify the ratings of overloads and install overloads suitable for the actual motors installed, and based on the actual nameplate information and other supplemental information furnished with the installed motors. Any replacement of motor overloads due to this verification not being performed shall be done at no additional cost to Owner.
2. Overload relays shall be class 20, manual reset, eutectic alloy, thermal type overload device with visual trip indication, unless shown or specified otherwise. Overload relays shall be current transformer operated if required for coordination.

3. Three spare overload relay thermal elements shall be provided for each type of element installed.
5. Overload relay manufacturers:
 - a. Allen-Bradley Bulletin 592
 - b. General Electric CR324
 - c. Square D Class 9065
 - d. equal (Samples of equal products shall be submitted in accordance with part I)

2.2 IEC MAGNETIC MOTOR CONTROLLERS

A. IEC Magnetic Motor Starters

1. Magnetic motor starters shall be 3 pole, 60 cycle magnetic starters rated for IEC utilization category AC3 and be of the IEC size appropriate for the motor horsepower and voltage shown but not rated less than AC3 - 18 amperes, 2 million operations.
2. Magnetic motor starters shall be rated to meet minimum mechanical endurance (number of no load operating cycles) per IEC 947-4:

<u>Mechanical Operations</u>	<u>Electrical Size</u>
20 million operations	18 amperes
20 million operations	24 amperes
15 million operations	30 amperes
15 million operations	38 amperes
15 million operations	45 amperes
15 million operations	60 amperes
15 million operations	75 amperes
10 million operations	110 amperes
10 million operations	180 amperes

3. Magnetic motor starters shall be provided with interchangeable contacts that may be easily inspected, for applications greater than 25 HP.
4. Magnetic motor starters shall be provided with an operating coil rated at 120 VAC, common through 20 HP, slide out type for above 20 HP.

5. Individual magnetic motor starters shall be provided with the required accessories to perform the control requirements specified or as shown on Contract Drawings. These accessories shall include, but not be limited to the following:
 - a. Single-phase control transformers of ratings suitable for the load of the control circuit as actually installed with fused secondary rated at 120 VAC.
 - b. Pushbutton stations or selector switches with legend plates or engraved nameplates as specified in the Section 26 09 00 Miscellaneous Electrical Controls.
 - c. Hand-Off-Auto selector switch, unless otherwise noted.
 - d. Push-to-test indicating lights with interchangeable covers as specified in the Section 26 09 00 Miscellaneous Electrical Controls.
 - e. Control circuit fuse where a separate control circuit is shown.
 - f. Two extra electrical convertible contact interlocks.
 6. Each magnetic motor shall be a type suitable to perform the control function shown and in accordance with the following:
 - a. Constant Speed, Full Voltage, Non-Reversing (FVNR) Starters shall provide basic contactors for forward control.
 - b. Constant Speed, Full Voltage, Reversing (FVR) Starters shall provide basic contactors for forward and reverse control. Mechanical and electrical interlocks shall be provided to preclude the possibility of both contactors being closed at the same time.
 7. Each IEC combination type magnetic motor starter with fused switch disconnect shall provide verified Type 2 coordination in accordance with IEC 947-4-1.
 8. Magnetic motor starters shall be suitable for group installation in accordance with the NEC 430-53.
 9. Magnetic motor starter manufacturers:
 - a. Allen-Bradley Bulletin 100, 104 Series
 - b. Klockner Moeller DIL-M, DIUL-M Series
 - c. Square D Telemecanique Type D and F
 - d. equal (Samples of equal products shall be submitted in accordance with Part I)
- B. IEC Combination Magnetic Motor Starter with Circuit Breaker (MCP) Disconnect
1. Combination magnetic motor starters shall consist of a motor circuit protector (MCP) and IEC motor starter assembled and wired into a self-contained unit.
 2. The magnetic motor starter shall be designed to coordinate with the circuit protective device to withstand a minimum short circuit current of 22,000 AIC or as shown on the Contract Drawings.
 3. Circuit protective devices shall be motor circuit protectors or as shown on the Contract Drawings and shall be in accordance with Section 26 28 00 Panelboards and Circuit Protective Devices.

4. MCP and magnetic motor starter shall be packaged by one manufacturer. Combination starters shall be:
 - a. Allen-Bradley Bulletin 113
 - b. Klockner Moeller type NZM
 - c. Square D Telemecanique Type LE1
 - d. equal (Samples of equal products shall be submitted in accordance with Part 1.)

C. IEC Combination Magnetic Motor Starter with Fuse Switch Disconnect.

1. Combination type starters shall consist of a fused switch and motor starter assembled and wired into a self-contained unit.
2. The magnetic motor starter shall be designed to coordinate with the fused switch to withstand a minimum short circuit current of 100,000 AIC or as shown on the Contract Drawing.
3. Fused switches shall be provided with fuse clips to accommodate UL Class J and CSA HRC1-J fuses or as shown on the Contract Drawings. The switch shall be rated for IEC utilization category AC23 and be of the IEC size appropriate for the motor horsepower and voltage shown but not rated less than AC23-30 amperes.
4. Fused type combination starter shall provide verified Type 2 coordination in accordance with IEC 947-4-1.
5. Fused switch and starter shall be packaged by one manufacturer. Combination starters shall be:
 - a. Allen-Bradley Bulletin 512
 - b. Klockner Moeller Type P2
 - c. Square D Telemecanique Type LE1
 - d. equal (Samples of equal products shall be submitted in accordance with Part 1)

D. IEC Manual Motor Starting Switch

1. Manual motor starting switches shall be provided for control and protection of all single-phase motors which do not require control from a remote location.
2. Manual starting switches shall provide thermal overload protection, including trip free operation and manual reset on overload.
3. The overload mechanism shall be class 10 ambient compensated bimetal type and shall include a differential mechanism for sensitivity to single phase conditions.
4. Integral start-stop pushbuttons or on-off toggle switches shall be provided.
5. IEC manual motor starting switch manufacturers:
 - a. Allen-Bradley Bulletin 140 Series
 - b. General Electric CR72 Series

- c. Square D GV1, GV3 series

E. IEC Overload Relays

1. The contractor shall verify the ratings of the overload relay units in accordance with actual motor nameplates or other information furnished with the installed motors. Any replacement of overload relays due to this verification not being performed shall be done at no additional cost to the Contract.
2. Overload relay shall be class 10 ambient compensated bimetal type with integral heater elements and shall include a differential mechanism for sensitivity to single phase conditions.
3. Overload relays shall be provided with external hand reset mechanism and visible trip indication.
4. Three spare overload relay thermal elements shall be provided for each type element installed.

PART 3 EXECUTION

3.1 MARKING ON MOTOR CONTROLLERS

- A. A motor controller shall be marked with the manufacturer's name or identification, the voltage, the current or horsepower rating, the short-circuit current rating, and other necessary data to properly indicate the applications for which it is suitable.

3.2 INSTALLATION

- A. Overload relays shall be installed in each leg of the starter.
 1. Overload relay characteristics shall be closely parallel the motor thermal characteristics.
 2. Ambient compensated overload relay thermal elements shall be installed where motor and overload are in different locations.
- B. Enclosures for motor controllers shall be of the type appropriate for each location, as specified in Section 26 27 16 Electrical Cabinet and Enclosures.

3.3 FIELD QUALITY CONTROL

- A. Adjust the motor overloads to match the nameplate currents of the motors that they are protecting.
- B. Inspection and Field Calibration (includes setting of the motor overloads)

1. The services of a qualified manufacturer's engineer, or their appointed representative from the Contractor, shall be provided to inspect and calibrate the motor overloads. The representative shall perform the following services:
 - a. Visually inspect delivered units and accessories for conformance with the specifications and Contract Drawings.
 - b. Examine equipment locations for satisfactory preparation. Check conduits and raceway installations, and all wiring and cable terminations.
 - c. Manufacturer's representative set the motor overloads.

** End of Section **

SECTION 26 32 13
ENGINE GENERATOR

PART 1 GENERAL

1.1 DESCRIPTION

- A. Section includes a complete emergency generator system consisting of a pad mounted enclosed generator-engine set, main circuit breaker, starting batteries, battery charger, exhaust system, automatic transfer switch, automatic starting system, control panel, fuel system, sub-base fuel tank, cooling system, exhaust system, and all other accessories required for a complete system as shown and specified.
- B. The emergency generator system shall be suitable for continuous standby applications.
- C. The emergency generator system shall have the capacity, under load, to start and accelerate each pump motor with all other loads on line.
- D. The equipment shall be rated as scheduled and as shown.

1.2 QUALITY ASSURANCE

- A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards, and specifications, except where more stringent requirements have been specified herein:
 - 1. ANSI/NEMA MG1 Standard for Motors and Generators
 - 2. ANSI/NEMA 112 Standard for Test Procedures for Polyphase Induction Motors and Generators
 - 3. NFPA-110 Standards for Emergency and Standby Power Systems
 - 4. IEEE-126 Standard for Speed Governing of Internal Combustion Engine Generator Units
 - 5. IEEE-446 Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
 - 6. NFPA-30 Flammable and Combustible Liquids Code
 - 7. NFPA-37 Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines
 - 8. NFPA-70 National Electric Code (with special attention to Articles 700, 701, and 702)
 - 9. Underwriters Laboratory, Inc. – UL 142 Standard for Steel Aboveground Tanks for Flammable and Combustible Liquids
 - 10. Underwriters Laboratory, Inc. – UL 2200 Standard for Stationary Engine Generator Assemblies
 - 11. National Electrical Manufacturers Association – NEMA
 - 12. Environmental Protection Agency – EPA
 - 13. BOCA – Building Code

- B. **Manufacturer's Qualifications.** The emergency generator set shall be manufactured by a single manufacturer who has been regularly engaged in the production of engine-generator sets for a minimum of ten years. The emergency generator system described herein, including their accessory components, shall be factory built, factory tested, and shipped by this single manufacturer, so there is one source of supply and responsibilities for warranty, parts, and service. This manufacturer shall have a local representative (within 300 miles) who can provide factory-trained servicemen, required stock of replacement parts, and technical assistance.
- C. The performance of the emergency generator system including generator, engine, and transfer switch shall be in accordance with procedures certified by an independent testing laboratory. The manufacturer shall have successfully tested a prototype of the proposed unit.

1.3 SUBMITTALS

- A. Submittals shall conform to the requirements of Section 01 33 00 Submittals, and to the requirements given in Section 26 00 00 Electrical General. In addition, submittals shall include the manufacturer's name, trade name, place of manufacturer, catalog model or number, complete part number, nameplate data, size, layout dimensions, capacity, project specification, and technical paragraph reference.
- B. Submittals shall contain a material list with manufacturer's name and data describing the material and showing its compliance with the specifications, EPA required third party certification, associated standards, and testing requirements.
- C. Prior to obtaining any material in connection with this Section, detailed shop drawings of all material shall be submitted. Submittals shall contain a material list with manufacturer data describing the material and showing its compliance with the specifications, associated standards and testing requirements.
- D. Shop drawings shall include manufacturer's catalog data. Submittals for each manufactured item shall be current manufacturer's descriptive literature of cataloged products, equipment drawings, diagrams, performance and characteristic curves, and catalog data sheets. Submittal shall include ratings, circuit diagrams, and dimensional data as a minimum.
- E. Shop drawings shall present complete and accurate information relative to all working dimensions, equipment weights, assembly and section views, and all necessary details pertaining to coordinating the work of the Contract, lists of materials and finishes, parts list and the descriptions thereof, lists of spare parts and tools where such parts or tools are required, and any other information that is required to demonstrate compliance with the Contract Documents. Shop drawings submitted shall include:
 - 1. Current applicable literature and detailed specifications that completely describe the engine generator set and all accessories. Provide data showing dimensions, weights, ratings, interconnection points, and internal wiring diagrams for engine, generator, control panel, battery, battery rack, battery charger, exhaust silencer, vibration isolators, and elevation and details of the weatherproof enclosure.

2. Electrical characteristics and connection requirements. Include plan and elevation views that indicate overall interconnection point dimensions.
 3. Provide fuel consumption rate curves at various loads, as well as ventilation and combustion air requirements.
 4. Schematics and wiring diagrams.
 5. Drawings that detail the dimensions of the weatherproof enclosure and sub-base fuel tank.
 6. Overall outline of engine/generator set showing dimensions, base details, and weights.
 7. Front view of generator control panel.
 8. Detailed piping and equipment layouts for the emergency generator system including details of hangers, wall and roof penetrations, fittings, and appurtenances.
 9. Procedure for the startup and testing of the ATS and generator under no-load and full load conditions.
 10. Engine manufacturer, number of engine cylinders, bore and stroke speed of piston at rated rpm, displacement (in cubic inches), Brake Mean Effective Pressure (BMEP) at rated capacity.
 11. Generator capacity in kW, kVA, and power factor.
 12. NEMA MG1-22.40 temperature rise rating of insulation of generator.
 13. Type of generator exciter.
 14. Certified engine horsepower at the ambient temperature and elevation specified.
- F. Operations and Maintenance Manual. Submit six copies of the complete operations and maintenance manual for each generator set. The O&M Manual shall include, as a minimum:
1. Generator Set Installation Manual
 2. Generator Set Operator's Manual
 3. Generator Set Parts Manual
 4. Generator Set Control System Manual
 5. Automatic Transfer Switch Installation Manual
 6. Automatic Transfer Switch Operations Manual
 7. Automatic Transfer Switch Parts Manual

8. Interconnection diagrams for Generator, Automatic Transfer Switch, and Battery Charger
- G. Record Drawings. Submit eight copies of record drawings from the actual field installation for the Owner's record.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. The following manufacturers are named to establish a standard of quality necessary for the Project:
 1. Katolight Corporation
 2. Cummins/Onan
 3. Kholer
 4. Caterpillar
 5. equal

2.2 GENERAL

- A. Provide power metering equipment as indicated on the Drawings. Power metering equipment shall measure three phase voltages and currents at the incoming electrical service and the three pump motors for each pumping station.
- B. Power metering equipment shall provide true rms metered values. Information provided shall include frequency, temperature, current, demand current, voltage, real power, reactive power, apparent power, demand power, power factor, accumulated energy, total harmonic distortion of each current and voltage, and K-factor of each current.
- C. Power metering equipment shall be rated for an operating temperature range of -25°C to 70°C and have an overcurrent withstand rating of 500 amperes for 1 second.
- D. All setup parameters shall be stored in nonvolatile memory.
- E. Power metering equipment shall accept metering inputs of up to 600 VAC direct connection and from industry standard instrument transformers (120 VAC secondary potential transformers and 5 ampere secondary current transformers). Connect to 480/277 VAC circuits shall be possible without the use of potential transformers.
- F. Power metering equipment shall communicate via RS-232, RS-485 simultaneously. Power metering equipment shall be capable of communicating to 3 additional Modbus devices using RS-485 daisy chains. Power metering equipment shall report the three line-line voltages and three line currents to the existing SCADA controller using the Modbus communications network.

2.3 RATING

- A. Power. This system shall include one engine-generator set(s). Each set shall be rated for 40kW, 50kVA, at 0.8 PF, 60 Hz, 3 phase, 4 wire, 277/480 volts on a continuous standby basis. Upon a utility power outage, the standby engine generator set shall immediately start and accelerate to rated speed. The engine generator set shall deliver its rated power continuously for the duration of the power outage.
- B. Environment. The engine generator set shall be capable of producing and delivering rated kilowatts and kilovolt-amperes when operating at the following altitude and ambient temperature:

Altitude:	500 feet / 52.4 meters
Minimum Temperature:	0° F / -17.78° C
Maximum Temperature:	100° F / 37.78° F

2.4 ENGINE

- A. Engines shall be stationary, liquid-cooled, diesel for use with No. 2 diesel fuel. Design shall be two or four cycle. Engine shall be certified by the engine manufacturer as capable of driving a generator yielding a kW rating as specified herein. Engine shall be capable of driving the generator of this rating on a continuous standby basis for the duration of normal utility source interruptions per SAE J1349 conditions.
- B. Engine equipment shall include the following:
 - 1. Governing System. The engine generator set shall be provided with a precision electronic governor of the constant speed type. The governor shall be capable of maintaining a steady state bandwidth of not more than +/-0.25%, at any constant load, from no load to full load. The governor shall maintain governed speed at 60Hz at any load, from no load to full load.
 - 2. Cooling System. The engine shall be cooled by a mounted closed loop radiator system rated for full load operation at 122°F (50°C) ambient as measured at the generator air inlet. Radiators shall be provided with a duct adaptor flange. The cooling system shall be filled with 50/50 ethylene glycol/water mixture by the equipment supplier. Rotating parts shall be guarded against accidental contact.
 - 3. Starting System. An electric DC starting motor, of sufficient capacity to crank the engine at starting speed for one minute without overheating. The electric starter shall be capable of three complete cranking cycles without overheating, before overcrank shutdown.
 - 4. Lubrication System. Provide gear type lubrication pump that will furnish oil under pressure to moving engine parts. Also provide full flow lube oil filters, dipstick oil level indicator, and a bypass valve that will allow lube oil circulation in the event of failure of the filtering system.

5. Fuel Pump. An engine driven, mechanical positive displacement fuel pump. Fuel pump fuel filter shall be a replaceable spin-on canister element. Fuel pump shall have replaceable dry element air cleaner with restriction indicator, and flexible supply and return fuel lines.
6. Block Heater. A jacket water heater shall be provided to maintain the engine block at a suitable temperature to assure rapid starting at the lowest specified ambient temperature. Heater shall be rated 120 volts, single phase, 60 Hz. If an alternate voltage heater is provided, contractor shall arrange for correct branch circuit at no additional cost to the Owner.
7. Provide a thermostatically controlled heating jacket for the starting batteries. Heating jacket shall be suitable for providing a minimum 40°F temperature maintenance for the starting batteries. Heating jacket shall be rated 120 volts, single phase, 60 Hz.

C. Base

1. Each engine-generator set shall be mounted on a heavy-duty steel base to maintain proper alignment between components, and each set shall incorporate vibration isolators of the type and quantity as specified and recommended by the generator engine set manufacturer.
2. Vibration isolators between the engine-generator and base and shall provide a minimum vibration attenuation of 95%.
3. Anchor bolts, for anchoring to a concrete base, shall be the size and quantity per generator manufacturer's recommendations.
4. The base shall incorporate a battery tray with holddown clamps within the rails.

2.5 GENERATOR

- A. The generator shall be capable of delivering rated output (kVA) at rated frequency and power factor, at any voltage not more than 5 percent above or below rated voltage. The alternator shall have a motor starting capability rated for 120 kVA. The generator shall be salient-pole, brushless, 12-lead reconnectable, self-ventilated and drip-proof construction with amortisseur rotor windings and skewed stator for smooth voltage waveform. The insulation shall meet the requirements of NEMA MG1-22.40 and 16.40 for Class H and be insulated with epoxy varnish that is fungus resistant per MIL 1-24092. Temperature rise shall not exceed 105°C at 40°C ambient.
- B. PMG Excitation System. A permanent magnet generator (PMG) shall provide excitation power for immunity from voltage distortion caused by non-linear loads. The PMG shall sustain excitation power for optimum motor starting and to sustain short circuit current at approximately 300% of rated current for 10 seconds. The rotating exciter shall use a three phase full wave rectifier assembly with hermetically sealed silicon diodes protected against abnormal transient conditions by a multi-plate selenium

surge protector. The diodes shall be designed for safety factors of five times voltage and three times current.

- C. Voltage Regulator. The automatic voltage regulator shall be a digital, microprocessor design with solid state voltage build-up. The voltage regulator shall be equipped with three-phase RMS sensing. The regulator shall control buildup of AC generator voltage to provide a linear rise and limit overshoot. The regulator shall include a torque-matching characteristic, which shall reduce output voltage in proportion to frequency below a threshold of 58 Hz. The torque-matching characteristic shall use differential rate of frequency change compensation to use the maximum available engine torque and provide optimal transient load response. Regulators which use a straight-line fixed volts per hertz characteristic are not acceptable.
- D. The voltage regulation shall be ¼% from no load to full load and 5% frequency variation. Regulator drift shall be less than ½% per 72°F/40°C ambient temperature change. The voltage regulator shall be a static-type using non-aging silicon controlled rectifiers, with electromagnetic interference suppression that meets MIL-STD-461 C, part 9, when mounted in the generator conduit box. The waveform harmonic distortion shall not exceed 5% total RMS measured line to line at full-rated load. The TIF factor shall not exceed 50.

2.6 CONTROL PANEL

- A. The control panel shall be microprocessor based with a liquid crystal display for monitoring the engine, generator, and fault parameters. The control panel shall be mounted on the generator set for easy viewing by the operator. The control panel shall be suitable for the environment where the generator is installed.
- B. The control panel shall coordinate the control of the engine generator set, the transfer switch, and provide information for monitoring of the engine generator set and transfer switch by the Pump Control Panel.
- C. The control panel shall include the following features:
 - 1. Generator metering (including, but not limited to all single phase and three phase output voltages, all single phase and three phase output currents, output frequency, system power factor, total instantaneous kilowatt loading)
 - 2. Engine monitoring (including, but not limited to engine oil pressure, coolant temperature, run time)
 - 3. Engine generator set control
 - 4. Engine protection
 - 5. Automatic Transfer Switch control
 - 6. 15 programmable outputs
 - 7. IP 54 front panel rating
 - 8. Modbus Communications with RS-485
- D. The control panel shall be capable of detecting the following alarm or pre-alarm conditions, and indicate if the condition will shutdown the generator or provide a warning, and annunciate the situation, using words and phrases, on the digital display:

1. Low oil pressure
2. Overspeed
3. Overcrank
4. High coolant temperature
5. Low coolant temperature
6. Low coolant level
7. Low fuel level
8. Low battery voltage
9. High battery voltage
10. Weak battery
11. Battery charge failure
12. Fuel leak
13. Low fuel

2.7 EXHAUST SYSTEM

- A. The exhaust system shall include a silencer, piping, wall or ceiling penetrations, and all required fittings and supports.
- B. Silencers. Silencers shall be of the residential type, with an attenuation of 20 dB or more at frequencies above 500 hertz, and 15 dB or more at frequencies 500 hertz and below. Silencers shall be sized per the requirements of the engine manufacturer and the proposed layout of the exhaust system.
- C. Exhaust Piping. Exhaust piping shall be schedule 40, ASTM A-53 steel. Flexible, bellows type, stainless steel fittings, at least 24 inches long, shall be furnished for each exhaust outlet. Penetrations through walls or ceiling shall have an exhaust thimble with bird screen. A rain cap shall be provided at the exterior end of the exhaust system. The exhaust system shall be designed so that any condensation will drain into a condensation trap, rather than the engine. The trap shall be piped to a convenient and readily accessible location, and valved to facilitate draining of condensation.
- D. Insulation. Exhaust piping and silencer shall be insulated with calcium silicate insulation. Prior to insulating, exhaust piping and silencer shall be painted with a high temperature resistant paint.

2.8 ABOVEGROUND FUEL SYSTEM

- A. The fuel system shall include a sub-base mounted fuel storage tank, fuel pump, piping, and tank level indicator. The fuel tank capacity shall be 200 gallons.
- B. Main Fuel Tank. The sub-base skid mounted fuel tank shall be suitable for holding No. 2 diesel fuel. The tank shall be constructed in accordance with Underwriters Laboratories Standard UL-142, NFPA 30, NFPA 37, and NFPA 110. The tank shall be rectangular in shape, and include a reinforced steel box channel to support the engine generator set. The tank shall be approved by Underwriters Laboratories and shall include the following:

1. Tank Level Gauge. The sub-base fuel tank shall include a direct reading fuel level gauge, as well as a fuel gauge that can be monitored by the generator control panel and the Pump Control Panel.
 2. 600 Gallon Capacity. Contractor is responsible for supplying fuel during testing.
 3. Fuel Containment Basin. The sub-base fuel tank shall include a steel containment basin, sized at a minimum of 110% of the tank capacity to prevent the escape of fuel into the environment in the event of a tank rupture. A leak detector switch shall be provided in the containment basin.
- C. Sub-base Tank Fittings. The sub-base fuel tank shall include the following fittings:
1. appropriately sized NPT fuel supply
 2. fuel return fitting
 3. 1-1/4 inch NPT for normal vent
 4. NPT for emergency vent, sized as appropriate
 5. 2 inch NPT for manual fill
 6. NPT for level gauge, sized as appropriate
 7. 3/8 inch NPT basin drain
 8. 2 inch NPT for level alarm
 9. NPT fitting for leak detection alarm
- D. Sub-base Tank Testing. The tank shall be pressurized at 3-5 psi and leak-checked to ensure integrity of sub-base weld seams per UL-142. The containment basin shall be leak-checked using weld penetrant and ultraviolet light.

2.9 TRANSFER SWITCH

- A. The Automatic Transfer Switch shall be supplied with UL No. 1008 approval. The switch shall be double throw design mechanically and electrically interlocked, mechanically held and mounted in a NEMA 3R enclosure. The automatic transfer switch shall be capable of transferring the load to the emergency sources when any phase of the normal power supply fails. The switch shall automatically retransfer the load circuit to the normal source when all phases of normal A.C. power supply have been re-established. The transfer switch and its control panel shall be the product of the same manufacturer.
- B. The transfer switch shall be electrically operated and mechanically held. Transfer switches shall be over center operation, double-throw construction, positively electrically and mechanically interlocked by a simple mechanical beam to prevent simultaneous closing, and mechanically held in both normal and emergency positions. The electrical operator shall be a single-solenoid mechanism, momentarily energized.
- C. The switch shall be positively locked and unaffected by momentary outages so that pressure is maintained at a constant value and temperature rise at the contacts is minimized for maximum reliability and operating life.
- D. All main contacts shall be silver composition. Transfer switches shall have three (3) S.P.D.T. (Single Pole Double Throw) auxiliary switches, with solid neutral, on both the normal and emergency-sides, operated by the transfer switch. These auxiliary switches

shall be factory wired to an easy access terminal block and may be used to monitor transfer switch position for controlling remote indicator lamps or other peripheral equipment.

- E. Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. A manual operating handle shall be provided for maintenance purposes. The handle shall permit the operator to manually stop the contacts at any point throughout their entire travel to inspect and service the contacts.
- F. Designs utilizing components of molded-case circuit breakers, contactors, or parts which are not intended for continuous duty, repetitive switching, or transfer between two active power sources are not acceptable.
- G. Where neutral conductors must be switched, the ATS shall be provided with fully-rated neutral transfer contacts.
- H. Where neutral conductors are to be solidly connected, a neutral terminal plate with fully rated AL-CU pressure connectors shall be provided.
- I. The automatic transfer switches shall include all lights, switches, relays, and devices required to provide performance and protection as specified.
- J. The ATS shall be rated to close on and withstand the available RMS symmetrical short circuit current at the ATS terminals with the type of overcurrent protection shown on the plans. The withstand and closing rating shall be 22kAIC.
- K. The automatic transfer switch shall be ASCO Series 300, Zenith ZTG, or Katolight KATG and meet the requirements of the standards listed in paragraph Part 1, Paragraph B.1.

2.10 TRANSFER SWITCH ACCESSORIES

A. Controls

- 1. Control accessories shall be mounted in a separate smaller cabinet mounted on the inside of the main cabinet door. This is to allow for ease of service when the main cabinet lockable door is opened, but to prevent access by unauthorized personnel.
- 2. The control system shall be electronically based and include under voltage and time delay modules. The solid-state under voltage sensors shall simultaneously monitor all phases of the normal and emergency power sources to provide field adjustable range sensors for specific applications. Voltage sensors shall allow for adjustment to sense partial loss of voltage on any phase of the normal or emergency power source, even where motor feedback voltages exist.

3. Controls shall signal the emergency power system to start upon signal from normal source voltage sensors. Solid-state time delay start shall be provided to avoid nuisance engine-generator set start-ups on momentary voltage dips or interruptions.
4. The transfer switch shall transfer the load to the emergency power system after the engine-generator set reaches proper voltage and frequency and has stabilized.
5. The transfer switch shall control the engine-generator set to allow the set to start and transfer the load within 10 seconds after a normal source power failure. It shall be the responsibility of the transfer switch supplier to meet this requirement.
6. The transfer switch shall retransfer the load to the normal source after normal source power is restored, allowing normal source to stabilize before retransfer and shall allow staggered retransfer of loads in multiple transfer switch systems.
7. The controls shall signal the engine-generator set(s) to stop after load retransfer to the normal source, but shall maintain the availability of the emergency source in the event that the normal source fails shortly after retransfer. The controls shall allow the engine-generator set(s) to run unloaded for a cool down period prior to shutdown.
8. The controls shall provide an automatic retransfer of the load from the emergency source to the normal source if the emergency source fails when the normal source is available.
9. The transfer switch operating power for transfer and retransfer shall be obtained from the source to which the load is being transferred.
10. Main cabinet front door mounted controls and indicator lamps shall consist of oil-tight, neon position indicator lamps (NORMAL - White and emergency - Amber) and key-operated Test and Selector switches to provide the following

B. Test Switch

1. TEST - Simulated normal source power loss to control unit for testing engine-generator set capability, including transfer of load if so equipped. Control system shall provide for system test without load transfer when specified.
2. NORMAL - Normal operating position and also restores the system to standby operation; and if load was transferred, retransfers load from emergency to normal source after test and time delays.
3. RETRANSFER - Spring-loaded momentary position of switch, that overrides retransfer time delay to cause the immediate return to the normal source after a test or actual power outage.

C. Accessory Items. Transfer switches shall be equipped with the following items:

1. Exerciser clock to set day-of-week (one week dial minimum), time-of-day, and duration-of-time of engine-generator set(s) exercise.
2. Provide Manual-Automatic retransfer selector switch. After normal source is restored, this switch provides either manual or automatic retransfer after the retransfer time delay has expired in the automatic position, or manual retransfer at a time selected by an operator.
3. Transfer switches shall be equipped with a "Programmed Transition" feature with an adjustable time range of 0.5 to 5 seconds. This feature shall provide a field adjustable time delay during switching in either normal or emergency switching directions.
4. During this time delay, the load is isolated from either power source to allow residual voltage components of motors or other inductive loads (such as transformers) to decay prior to completing the switching cycle. Transfer methods that use the phase relationships between the two (2) power sources to control the transfer initiation time are not acceptable.
5. Provide thermostatically controlled space heater of appropriate size in the ATS to reduce condensation when ATS is installed outside.

2.11 REMOTE ANNUNCIATOR

The remote annunciator shall provide all the indications and audible alarms called for by NFPA Standard 110 as provided on the engine-generator set control panel; and in addition shall provide indications for high battery voltage, low battery voltage, normal battery voltage, battery charger malfunction. Alarm silence and lamp test switches shall be provided.

2.12 BATTERY CHARGER

An integrally mounted float charger shall maintain battery charge while the engine is not running. The charger shall be a full wave silicon bridge rectifier compatible with the starting battery. The charger shall have the following features and characteristics:

- Voltage regulation: 2% for 10% variation in line voltage.
- Output: 6 amps for 24-volt dc system (or 12 volt dc system), isolated from AC line.
- Float Voltage: adjustable
- Equalize Voltage: adjustable, with 12 hour timer
- DC Voltmeter: 3% accuracy
- DC Ammeter: 5% accuracy
- Protection: output current limited and self-protecting

2.13 SOUND ATTENUATING ENCLOSURE

- A. The engine-generator set shall be equipped standard with a sound attenuated enclosure to provide a sound level no greater than 75 dB(A). This sound level will represent the average measurement taken at eight points set equidistant, 23 feet from the set, operating at full load.
- B. The enclosure shall be weather-protective with an internal critical grade silencer with rain cap. Housing shall have hinged side-access doors and a rear access door. All access doors shall be pad-lockable. The entire enclosure and skid assembly shall be treated with an electro-deposition primer process prior to finish painting for maximum durability.

PART 3 EXECUTION

3.1 INSTALLATION

- A. The engine-generator set shall be installed on a concrete pad and shall be cushioned on vibration isolators mounted on a welded steel frame.
- B. The emergency generating equipment shall be installed as shown specified, directed, and recommended by the manufacturer. The equipment shall be grounded to the ground conductor as shown on the Contract Drawings.
- C. Piping. Pipes shall be supported as shown or required.
 - 1. Fuel Piping
 - a. Fuel filters shall be installed as recommended by the manufacturer.
 - b. Connections to engine shall be made with flexible seamless bronze hose.
 - 2. Engine Coolant System. Engine coolant system shall be provided with an easily accessible valve to facilitate draining of coolant, cleansing and re-filling of radiators.
 - 3. Exhaust Plenum. Exhaust plenum shall be constructed of 22 gauge galvanized steel. Plenum shall be furnished with an access door. Locate plenum access door so as to provide easy access. Plenum shall be sized as shown on the Contract Drawings.

3.2 TESTING

- A. The intent of this specification is to provide equipment of proven reliability and compatibility. Three separate series of tests shall be performed: Factory Prototype Model Tests, Factory Production Model Tests, and Field Tests.
- B. Factory Prototype Model Tests. The electric generating system consisting of prime mover, generator, governor, coupling and all controls must have been tested as complete unit on representative engineering prototype model as required by NFPA 110.

The tests, being potentially damaging to the equipment tested, must not be performed on equipment to be sold, but on separate prototype models as specified by NFPA 110 and their accomplishment certified by means of documentation of the tests accompanying submittal data. These tests shall have included:

1. Maximum power level (maximum kW).
 2. Maximum motor starting capacity (maximum KVA) and voltage dip recovery within seven cycles of applied load.
 3. Structural soundness (Short-Circuit and Endurance Tests).
 4. Torsiograph Analysis: The manufacturer of the engine-generator set shall verify that the engine- generator combination, as configured, is free from harmful torsional stresses. The analysis shall include correlation of empirical data from tests on a representative prototype unit. The empirical data must include spectrum analysis of the torsional transducer output within the critical speed range of the engine-generator set. Results of this analysis shall be made available to the specifier on request. Calculations based on engine and generator separately are not acceptable.
 5. Engine-generator cooling.
 6. Transient response and steady-state speed control and voltage regulations.
 7. Generator temperature rise per NEMA MG1-22.40.
 8. Harmonic analysis and voltage waveform deviation per MIL-STD-705B, method 601.4.
 9. Three-phase short-circuit test for mechanical and electrical strength with system operating at rated volts, amps, power factor, and speed, the generator terminals must be short circuited ten times on all three phases for a duration of thirty seconds. Engine-generator set must build up and perform normally without manual interventions of any kind such as resetting of circuit breakers or other tripping devices when the short circuit is removed.
 10. Failure mode test for voltage regulator. With engine-generator set operating at no load, rated speed and voltage, the AC sensing circuit to the regulator must be disconnected for a period of at least one hour. The engine-generator set must be fully operative after the test, and without evidence of damage.
 11. Endurance testing is required to detect and correct potential electrical and mechanical problems associated with typical operation
- C. Factory Production Model Tests. Before shipment of the equipment, the engine-generator set shall be tested under rated load and power factor for performance and proper functioning of control and interfacing circuits. Testing at unity power factor only (resistance banks only) is not acceptable. Tests shall include:
1. Single step load pickup per NFPA 110.
 2. Transient and voltage dip responses and steady state voltage and speed (frequency) checks.
 3. The Engineer shall have the option of witnessing these tests. A summary of these test results shall be available upon request.

D. Field Tests After Installation

1. The complete installation shall be initially started and checked out for operational compliance by a factory-trained representative of the engine-generator set manufacturer.
2. Upon completing the initial start-up and system checkout, the supplier of the system shall perform a field test, with the Engineer notified in advance, to demonstrate load carrying capability and voltage and frequency stability.
3. With the emergency load at normal operating level, a power failure is initiated by opening all switches or breakers supplying the normal power to the building or facility. Records shall be maintained at 5-minute intervals for first 15 minutes and every 15 minutes thereafter. Test data shall include time-of-day, coolant temperature, cranking time until prime mover starts and runs, time required to come up to operating speed, voltage and frequency overshoot, time required to achieve steady-state condition with all switches transferred to the emergency position, voltage, frequency, current, oil pressure, ambient air temperature, kilowatts, and power factor. Continue this load test for 5 hours observing and recording load changes and the resultant effect on voltage and frequency. Return normal power, record the time delay or retransfer for each switch (set for 15 minutes minimum) and the time delay on prime mover cool down period and shutdown.
4. Upon completion of the above test, allow the prime mover to cool for 5 minutes. Then apply full rated load for four hours (nameplate kW) consisting of building load supplemented by a load bank if required. Unity power factor is suitable for on-site testing, provided that rated load tests at power factor have been performed by the manufacturer prior to shipment.

3.3 START-UP INSTRUCTION

- A. The manufacturer shall provide a service representative to inspect the installation, supervise field tests and start up, to instruct all personnel involved in the generator set operation and advise personnel on the recommended maintenance procedures.
- B. Training shall be a minimum of 8 hours and shall be coordinated with the Owner so as not to cause schedule conflicts with the normal work assignments of the trainees.
- C. Upon completion of start-up and testing, the manufacturer shall submit a signed detailed report of all testing procedures and results to the Owner.

3.4 FIELD QUALITY CONTROL

The services of the manufacturer's representative shall be provided to perform on-site inspection of the installation of the emergency generator system and power wiring connections. The Contractor shall provide a manufacturer's Certificate of Installation to the

Engineer indicating that the emergency generator system has been installed in accordance with the manufacturer's installation instructions.

**** End of Section ****

SECTION 26 36 13
AUTOMATIC TRANSFER SWITCHES

PART 1 GENERAL

1.1 DESCRIPTION

- A. Section includes automatic transfer switches for systems rated 600 volts and less.
- B. Provide an automatic transfer switch with the number of poles, withstand, and close-on ratings required based on the existing power distribution system. Each automatic transfer switch shall consist of an inherently double throw power transfer switch mechanism and a microprocessor controller to provide automatic operation. The transfer switch and controller shall be an integrated unit designed and built by the same manufacturer.
- C. The Automatic Transfer Switch shall be supplied with UL No. 1008 approval. The switch shall be double throw design mechanically and electrically interlocked, mechanically held and mounted in a NEMA 3R enclosure. The automatic transfer switch shall be capable of transferring the load to the emergency sources when any phase of the normal power supply fails. The switch shall automatically retransfer the load circuit to the normal source when all phases of normal A.C. power supply have been re-established. The transfer switch and its control panel shall be the product of the same manufacturer.
- D. The transfer switch shall be electrically operated and mechanically held. Transfer switches shall be over center operation, double-throw construction, positively electrically and mechanically interlocked by a simple mechanical beam to prevent simultaneous closing, and mechanically held in both normal and emergency positions. The electrical operator shall be a single-solenoid mechanism, momentarily energized.

1.2 QUALITY ASSURANCE

- A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards, and specifications, except where more stringent requirements have been specified herein:
 - 1. Underwriters Laboratory, Inc. – UL 1008 Standard for Transfer Switch Equipment
 - 2. International Electrotechnical Commission - IEC 947-6-1 Low-voltage Switchgear and Controlgear; Multifunction equipment; Automatic Transfer Switching Equipment
 - 3. National Fire Protection Association – NFPA 70 National Electric Code (with special attention to Articles 700, 701, and 702)
 - 4. National Fire Protection Association - NFPA 99 Essential Electrical Systems for Health Care Facilities
 - 5. National Fire Protection Association – NFPA 110 Emergency and Standby Power Systems

6. Institute of Electrical and Electronics Engineers – IEEE Standard 446 Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
 7. National Electrical Manufacturers Association – ICS10-1993 (formerly ICS2-447) AC Automatic Transfer Switches
 8. Underwriters Laboratory, Inc. – UL 508 Industrial Control Equipment
- B. Manufacturer's Qualifications. The automatic transfer switch shall be manufactured by a single manufacturer who has been regularly engaged in the production of automatic transfer switch equipment for a minimum of ten years. The automatic transfer switch described herein, including their accessory components, shall be factory built, factory tested, and shipped by this single manufacturer, so there is one source of supply and responsibilities for warranty, parts, and service. This manufacturer shall have a local representative (within 300 miles) who can provide factory-trained servicemen, required stock of replacement parts, and technical assistance.
- C. The performance of the emergency generator system including generator, engine, and transfer switch shall be in accordance with procedures certified by an independent testing laboratory. The manufacturer shall have successfully tested a prototype of the proposed unit.

1.3 SUBMITTALS

- A. Submittals shall conform to the requirements of Section 01 33 00 Submittals, and to the requirements given in Section 26 00 00 Electrical General. In addition, submittals shall include the manufacturer's name, trade name, place of manufacturer, catalog model or number, complete part number, nameplate data, size, layout dimensions, capacity, project specification, and technical paragraph reference.
- B. Submittals shall contain a material list with manufacturer's name and data describing the material and showing its compliance with the specifications, EPA required third party certification, associated standards, and testing requirements.
- C. Prior to obtaining any material in connection with this Section, detailed shop drawings of all material shall be submitted. Submittals shall contain a material list with manufacturer data describing the material and showing its compliance with the specifications, associated standards and testing requirements.
- D. Shop drawings shall include manufacturer's catalog data. Submittals for each manufactured item shall be current manufacturer's descriptive literature of cataloged products, equipment drawings, diagrams, performance and characteristic curves, and catalog data sheets. Submittal shall include ratings, circuit diagrams, and dimensional data as a minimum.
- E. Shop drawings shall present complete and accurate information relative to all working dimensions, equipment weights, assembly and section views, and all necessary details pertaining to coordinating the work of the Contract, lists of materials and finishes, parts list and the descriptions thereof, lists of spare parts and tools where such parts or tools

are required, and any other information that is required to demonstrate compliance with the Contract Documents. Shop drawings submitted shall include:

1. Current applicable literature and detailed specifications that completely describe the engine generator set and all accessories. Provide data showing dimensions, weights, ratings, interconnection points, and internal wiring diagrams for engine, generator, control panel, battery, battery rack, battery charger, exhaust silencer, vibration isolators, and elevation and details of the weatherproof enclosure.
 2. Electrical characteristics and connection requirements. Include plan and elevation views that indicate overall interconnection point dimensions.
 3. Provide fuel consumption rate curves at various loads, as well as ventilation and combustion air requirements.
 4. Schematics and wiring diagrams.
 5. Drawings that detail the dimensions of the weatherproof enclosure and sub-base fuel tank.
 6. Overall outline of engine/generator set showing dimensions, base details, and weights.
 7. Front view of generator control panel.
 8. Detailed piping and equipment layouts for the emergency generator system including details of hangers, wall and roof penetrations, fittings, and appurtenances.
 9. Procedure for the startup and testing of the ATS and generator under no-load and full load conditions.
 10. Engine manufacturer, number of engine cylinders, bore and stroke speed of piston at rated rpm, displacement (in cubic inches), Brake Mean Effective Pressure (BMEP) at rated capacity.
 11. Generator capacity in kW, kVA, and power factor.
 12. NEMA MG1-22.40 temperature rise rating of insulation of generator.
 13. Type of generator exciter.
 14. Certified engine horsepower at the ambient temperature and elevation specified.
- F. Operations and Maintenance Manual. Submit six copies of the complete operations and maintenance manual for each generator set. The O&M Manual shall include, as a minimum:

1. Generator Set Installation Manual
2. Generator Set Operator's Manual
3. Generator Set Parts Manual
4. Generator Set Control System Manual
5. Automatic Transfer Switch Installation Manual
6. Automatic Transfer Switch Operations Manual
7. Automatic Transfer Switch Parts Manual
8. Interconnection diagrams for Generator, Automatic Transfer Switch, and Battery Charger

G. Record Drawings. Submit eight copies of record drawings from the actual field installation for the Owner's record.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. The following manufacturers are named to establish a standard of quality necessary for the Project:

1. ASCO Power Systems
2. equal

2.2 MECHANICALLY HELD TRANSFER SWITCH

- A. The Automatic Transfer Switch shall be supplied with UL No. 1008 approval. The switch shall be double throw design mechanically and electrically interlocked, mechanically held and mounted in a NEMA 3R enclosure. The automatic transfer switch shall be capable of transferring the load to the emergency sources when any phase of the normal power supply fails. The switch shall automatically retransfer the load circuit to the normal source when all phases of normal A.C. power supply have been re-established. The transfer switch and its control panel shall be the product of the same manufacturer.
- B. The transfer switch shall be electrically operated and mechanically held. Transfer switches shall be over center operation, double-throw construction, positively electrically and mechanically interlocked by a simple mechanical beam to prevent simultaneous closing, and mechanically held in both normal and emergency positions. The electrical operator shall be a single-solenoid mechanism, momentarily energized.
- C. The switch shall be positively locked and unaffected by momentary outages so that pressure is maintained at a constant value and temperature rise at the contacts is minimized for maximum reliability and operating life.
- D. All main contacts shall be silver composition. Transfer switches shall have three (3) S.P.D.T. (Single Pole Double Throw) auxiliary switches, with solid neutral, on both the normal and emergency-sides, operated by the transfer switch. These auxiliary switches shall be factory wired to an easy access terminal block and may be used to monitor

transfer switch position for controlling remote indicator lamps or other peripheral equipment.

- E. Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. A manual operating handle shall be provided for maintenance purposes. The handle shall permit the operator to manually stop the contacts at any point throughout their entire travel to inspect and service the contacts.
- F. Designs utilizing components of molded-case circuit breakers, contactors, or parts which are not intended for continuous duty, repetitive switching, or transfer between two active power sources are not acceptable.
- G. Where neutral conductors must be switched, the ATS shall be provided with fully-rated neutral transfer contacts.
- H. Where neutral conductors are to be solidly connected, a neutral terminal plate with fully rated AL-CU pressure connectors shall be provided.
- I. The automatic transfer switches shall include all lights, switches, relays, and devices required to provide performance and protection as specified.
- J. The ATS shall be rated to close on and withstand the available RMS symmetrical short circuit current at the ATS terminals with the type of overcurrent protection shown on the plans. The withstand and closing rating shall be 22kAIC.
- K. The automatic transfer switch shall be ASCO Series 300, Zenith ZTG, or Katolight KATG and meet the requirements of the standards listed in paragraph Part 1, Paragraph B.1.

2.3 TRANSFER SWITCH ACCESSORIES

A. Controls

- 1. Control accessories shall be mounted in a separate smaller cabinet mounted on the inside of the main cabinet door. This is to allow for ease of service when the main cabinet lockable door is opened, but to prevent access by unauthorized personnel.
- 2. The control system shall be electronically based and include under voltage and time delay modules. The solid-state under voltage sensors shall simultaneously monitor all phases of the normal and emergency power sources to provide field adjustable range sensors for specific applications. Voltage sensors shall allow for adjustment to sense partial loss of voltage on any phase of the normal or emergency power source, even where motor feedback voltages exist.
- 3. Controls shall signal the emergency power system to start upon signal from normal source voltage sensors. Solid-state time delay start shall be provided to avoid nuisance engine-generator set start-ups on momentary voltage dips or interruptions.

4. The transfer switch shall transfer the load to the emergency power system after the engine-generator set reaches proper voltage and frequency and has stabilized.
5. The transfer switch shall control the engine-generator set to allow the set to start and transfer the load within 10 seconds after a normal source power failure. It shall be the responsibility of the transfer switch supplier to meet this requirement.
6. The transfer switch shall retransfer the load to the normal source after normal source power is restored, allowing normal source to stabilize before retransfer and shall allow staggered retransfer of loads in multiple transfer switch systems.
7. The controls shall signal the engine-generator set(s) to stop after load retransfer to the normal source, but shall maintain the availability of the emergency source in the event that the normal source fails shortly after retransfer. The controls shall allow the engine-generator set(s) to run unloaded for a cool down period prior to shutdown.
8. The controls shall provide an automatic retransfer of the load from the emergency source to the normal source if the emergency source fails when the normal source is available.
9. The transfer switch operating power for transfer and retransfer shall be obtained from the source to which the load is being transferred.
10. Main cabinet front door mounted controls and indicator lamps shall consist of oil-tight, neon position indicator lamps (NORMAL - White and emergency - Amber) and key-operated Test and Selector switches to provide the following

B. Test Switch

1. TEST - Simulated normal source power loss to control unit for testing engine-generator set capability, including transfer of load if so equipped. Control system shall provide for system test without load transfer when specified.
2. NORMAL - Normal operating position and also restores the system to standby operation; and if load was transferred, retransfers load from emergency to normal source after test and time delays.
3. RETRANSFER - Spring-loaded momentary position of switch, that overrides retransfer time delay to cause the immediate return to the normal source after a test or actual power outage.

C. Accessory Items. Transfer switches shall be equipped with the following items:

1. Exerciser clock to set day-of-week (one week dial minimum), time-of-day, and duration-of-time of engine-generator set(s) exercise.

2. Provide Manual-Automatic retransfer selector switch. After normal source is restored, this switch provides either manual or automatic retransfer after the retransfer time delay has expired in the automatic position, or manual retransfer at a time selected by an operator.
3. Transfer switches shall be equipped with a “Programmed Transition” feature with an adjustable time range of 0.5 to 5 seconds. This feature shall provide a field adjustable time delay during switching in either normal or emergency switching directions.
4. During this time delay, the load is isolated from either power source to allow residual voltage components of motors or other inductive loads (such as transformers) to decay prior to completing the switching cycle. Transfer methods that use the phase relationships between the two (2) power sources to control the transfer initiation time are not acceptable.
5. Provide thermostatically controlled space heater of appropriate size in the ATS to reduce condensation when ATS is installed outside.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Refer to all pertinent Sections of these Specifications for installation details of other equipment associated with transfer switches.
- B. Provide all miscellaneous bolts, washers, nuts, clips, belleville washers, lockwashers, small hardware, etc., of corrosion resistant material to make installation complete.
- C. Provide complete installation for all items of equipment included in this Section.
- D. Provide minimum working clearance, as described in NEC Article 110, for all electric equipment.
- E. Verify location at site before installing enclosure or conduits.
- F. Mount wall mounted cabinets level and plumb, flush or surface as scheduled. Mount cabinets such that the operating mechanisms and controls are 42” to 60” above finished floor.
- G. Free-standing cabinets shall be mounted on a concrete equipment pad and secured by anchor bolts. Concrete equipment pads are detailed on the Contract Drawings.
- H. Paint all scratches, marks, etc., resulting from installation. Use matching paint.

3.2 TESTING

A. The services of manufacturer's field technician shall be provided to supervise the installation for proper assembly, start-up and operation the equipment. The manufacturer's field technician shall conduct the field tests.

B. Field Tests

1. After installation, all controls shall be checked and the required adjustments shall be made.
2. Equipment shall be field tested in the presence of the Engineer and shall be demonstrated to operate satisfactorily over the specified ranges.
3. The Contractor shall provide the necessary test equipment and qualified test personnel.
4. In the event of failure of the field test, the Contractor shall retest, at his own cost and expense, the equipment as directed by the Engineer.
5. Field tests shall include initiating (simulating) a power failure to the ATS normal source by opening switches or circuit breakers on the line side of the ATS.

C. Training

The equipment manufacturer shall provide a training session at the project site. The training session shall be a minimum of 8 hours of lecture and practical instruction. The training session shall include safety procedures, operational theory, sub-assembly identification and operation, system controls and adjustment, preventive maintenance and system troubleshooting procedures.

The intent of this specification is to provide equipment of proven reliability and compatibility. Three separate series of tests shall be performed: Factory Prototype Model Tests, Factory Production Model Tests, and Field Tests.

**** End of Section ****

SECTION 26 43 13
TRANSIENT VOLTAGE SURGE SUPPRESSION

PART 1 GENERAL

1.1 DESCRIPTION

This Section describes the materials and installation requirements for transient voltage surge suppressors (TVSS) for the protection of AC electrical circuits from the effects of lightning induced currents, substations switching transients and internally generated transients resulting from inductive and capacitive load switching. This section is applicable for transient voltage surge suppressors for protection of electrical equipment and electronic systems at 600 volts and below, and communication equipment from the effects of line and electromagnetic induced transient voltage surges and coupled lightning discharged transients.

1.2 QUALITY ASSURANCE

- A. Materials and installation shall be in accordance with the latest revision of the following codes, standards, and specifications, except where more stringent requirements have been specified herein:
 - 1. National Electric Manufacturers Association (NEMA) LS-1, Specification Format for Low Voltage AC Surge Protective Devices (1000 volts or less).
 - 2. Underwriters Laboratories, Inc. (UL) 1449 – Standard for Safety for Transient Voltage Surge Suppressors.
 - 3. National Electrical Code (NEC)
 - 4. The Institute of Electrical and Electronic Engineers (IEEE) ANSI/IEEE C62.41, Recommended Practice for Surge Voltages in Low Voltage AC Power Circuits.
 - 5. The Institute of Electrical and Electronic Engineers (IEEE) ANSI/IEEE c62.1, standard for surge Arrestors for AC power circuits.
 - 6. The Institute of Electrical and Electronic Engineers (IEEE) ANSI/IEEE c62.33, standard for Test Specifications for Varistor Surge Protection Devices.
- B. This specification requires that all grounding and grounding circuitry be equal to, or exceed the requirements of NEC Article 250. In the event of a conflict or discrepancy between these Specifications, the Contract Documents, and NEC Article 250, the more stringent requirement shall apply.
- C. Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products, which are of equal material, design, and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in the technical section.

- D. Uniformity. Unless otherwise specified, equipment of same type of classification shall be a product of same manufacturer. All equipment shall be new and of the latest design of manufacturer providing equipment or material.

1.3 SUBMITTALS

- A. Submittals shall conform to the requirements of Section 01 33 00 Submittals, and to the following additional requirements. Submittals shall include the manufacturer's name, trade name, place of manufacture, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification, and technical paragraph reference.
- B. Prior to obtaining any material in connection with this section, catalog data and detailed wiring connection diagrams for each type of equipment shall be submitted. Submittals for each manufactured item shall be current manufacturer's descriptive literature of cataloged products, equipment drawings, diagrams, performance and characteristic curves, and catalog data sheets. Submittal shall include ratings, circuit diagrams, and dimensional data, as a minimum. Handwritten and typed modifications and other notations not part of the manufacturer's preprinted data will result in the rejection of the submittal. Should manufacturer's data require supplemental information for clarification, the supplemental information shall be submitted as specified for certificates of compliance.
- C. Submittals shall contain a material list with manufacturer data describing the material and showing its compliance with the specifications, associated standards, and test requirements.
- D. UL Standard 1449 Listing, Standard for Safety, Transient Voltage Surge Suppressors, documentation.
- E. UL Standard 1283 Listing, Electromagnetic Interference Filters, documentation.
- F. IEEE C62.41-1991 Category C3 (20kV-1.2/50, 10kA-8/20usec waveform) let through voltage test results.
- G. Spectrum analysis of TVSS based on MIL-STD-220A test procedures between 50kHz and 200kHz verifying noise attenuation exceeds 50dB at 100kHz.
- H. Independent third party test results verifying single impulse current rating capabilities.
- I. Conductor size, rating, and type for connection of surge protection.
- J. Submit manufacturer's installation instructions and testing requirements for each type of surge suppressor utilized.
- K. Submit Operations and Maintenance Manual for each type of unit.

1.4 CLOSEOUT SUBMITTALS

Provide project record documents which record actual locations of components and circuits.

PART 2 PRODUCT

2.1 GENERAL

- A. Surge protective devices (SPD) furnished for use on this project are to incorporate protective elements in all applicable modes. Hardwired and direct plug-in type units are to incorporate line to neutral (L-N), line to ground (L-G), and neutral to ground (N-G) protective elements, unless otherwise noted. TVSS shall be UL Listed.
- B. SPD shall be housed in an enclosure that is compatible with the system being protected.
- C. Voltage class and type of unit shall be compatible with system voltage being protected.

2.2 480 VAC SYSTEM SURGE PROTECTIVE DEVICE

- A. Minimum surge current capacity shall be 240 kA per phase at service entrance and panelboard applications.
- B. SPD shall be designed withstand a maximum continuous operating voltage (MCOV) of not less than 115% of nominal RMS voltage.
- C. Pulse life test: Capable of protecting against and surviving 5000 ANSI/IEEE C62.41 Category C3 transients without failure or degradation of UL 1449 suppression voltage ratings by more than 10%.
- D. The UL 1489 suppression voltage ratings (based on IEEE Category C3 Combination Wave):

<u>Voltage</u>	<u>L-G</u>	<u>L-N</u>	<u>N-G</u>
480 V	900V	900V	900V

- E. SPD shall be made of solid-state components and operate bidirectionally.
- F. SPD shall have a response time no greater than one nanosecond for any of the individual protection modes.
- G. Visual indication of proper SPD connection and operation shall be provided. Visual indication shall be by means of solid state status indicator lights on the front of the SPD.
- H. SPD shall have an integral disconnect switch to disconnect all phases simultaneously.
- I. Surge counter to monitor the occurrence of transients entering the facility through the suppressor.

J. Dry contacts to monitor each phase and provide a summary alarm.

K. Approved Manufacturer:

1. Advanced Protection Technologies Inc., TE/XGA Series or Equal

2.3 120/208 VAC System Surge Protective Device and 120/240 Surge Protective Device

A. Minimum surge current capacity shall be 80kA per phase.

B. SPD shall be designed to withstand a maximum continuous operating voltage (MCOV) of not less than 115% of nominal RMS voltage.

C. Pulse life test: Capable of protecting against and surviving 2000 ANSI/IEEE C62.41 Category C3 transients without failure or degradation of UL 1449 suppression voltage ratings by more than 10%.

D. The UL 1449 suppression voltage ratings (based on IEEE Category C3 Combination Wave):

<u>Voltage</u>	<u>L-G</u>	<u>L-N</u>	<u>N-G</u>
480 V	900V	900V	900V

E. SPD shall be made of solid-state and operate bidirectionally.

F. SPD shall have a response time no greater than one nanosecond for any of the individual protection modes.

G. Visible indication of proper SPD connection and operation shall be provided. Visual indication shall be by means of solid state status indicator lights on the front of the SPD.

H. SPD shall have an integral disconnect switch to disconnect all phases simultaneously.

I. Dry contacts to monitor each phase and provide a summary alarm.

J. Approved Manufacturer:

1. Advanced Protection Technologies Inc., TE/HPS Series, or Equal

2.4 PANELBOARD SUPPRESSORS

A. Panelboard surge suppression devices shall be modular design with field-replaceable modules and the following features and accessories:

1. Fuses, rated at 200-kA interrupting capacity.
2. Fabrication using bolted compression lugs for internal wiring.
3. Integral disconnect switch.
4. Redundant suppression circuits.
5. Redundant replaceable modules.

6. Arrangement with copper busbars and for bolted connections to phase bus, and ground bus.
7. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
8. Red and green LED indicator lights for power and protection status.
9. Audible alarm, with silencing switch, to indicate when protection has failed.
10. One set of dry contacts rated at 5-a and 250-V ac, for remote monitoring of protection status.
11. Coordinate with building power monitoring and control system.
12. Surge event operations counter.
13. Peak Single-Impulse Surge Current Ratings: [160] [120] [80] kA per phase.
14. Protection modes and UL 1449 clamping voltage for grounded wye circuits on 3-phase, 4-wire circuits, shall be as follows:
 - a. Line to Neutral:
 - i. 800 V for 480Y/277VAC
 - ii. 400 V for 208Y/120VAC
 - b. Line to Ground:
 - i. 800 V for 480Y/277VAC
 - ii. 400 V for 208Y/120VAC
 - c. Neutral to Ground:
 - i. 800 V for 480Y/277VAC
 - ii. 400 V for 480Y/277VAC
15. Protection modes and UL 1449 clamping voltage for 240/120 VAC, single-phase, single-phase, 3-wire circuits, shall be as follows:
 - a. Line to Neutral: 400V
 - b. Line to Ground: 400V
 - c. Neutral to Ground: 400V
16. Protection modes and UL 1449 clamping voltage for 240/120 VAC, 3-phase, 4-wire circuits, with high leg shall be as follows:
 - a. Line to Neutral: 400V, 800V from high leg
 - b. Line to Ground: 400V
 - c. Neutral to Ground: 400V
17. Protection modes and UL 1449 clamping voltage for voltages of 240, 480, or 600; 3-phase, 3-wire, delta circuits shall be as follows:
 - a. Line to Line:
 - i. 2000 V for 480 VAC
 - ii. 1000 V for 240 VAC
 - b. Line to Ground:
 - i. 1500 V for 480VAC
 - ii. 800 V for 240 VAC

2.5 PLUG-IN SURGE SUPPRESSORS

- A. Non-modular, plug-in suppressors shall have at least four 15-ampere, 120 VAC, NEMA WD 6, with configuration for 15-15R receptacles, suitable to plug into a NEMA WD 6, Configuration 15-15R receptacle. Plug-in suppressors shall have the following features and accessories:
 - 1. LED indicator lights for power and protection status.
 - 2. LED indicator lights for reverse polarity and open outlet ground.
 - 3. Circuit breaker and thermal fusing. When protection is lost, circuit shall open and cannot be reset.
 - 4. Circuit breaker and thermal fusing. Unit shall continue to supply power if protection is lost.
 - 5. Cord connected with nominal 15-foot line cord.
 - 6. Rocker-type on-off switch, illuminated when in on position.
 - 7. One RJ11/12C telephone line protector, suitable for modem connection. Maximum clamping voltage 220-volt peak on pins Nos. 3 and 4.
- B. Peak Single-Impulse Surge Current Rating shall be 33kA per phase.
- C. Protection modes and UL 1449 clamping voltage shall be as follows:
 - 1. Line to Neutral : 475 V.
 - 2. Line to Ground: 475 V.
 - 3. Neutral to Ground: 475 V.

2.6 CONTROL AND DATA TERMINALS

Protection for copper control, data, antenna, and telephone conductors entering the building from the outside shall be as recommended by manufacturer for the type of line being protected and selected by Engineer based on application.

PART 3 EXECUTION

3.1 INSTALLATION OF SURGE PROTECTIVE DEVICES

- A. Install surge protective devices as indicated on the drawings, as specified, and according to manufacturer's recommendations.
- B. Locate suppressor on load side of main disconnect device, as close as possible to the phase conductors and ground/neutral bar.
- C. Hardwired suppressors shall be close-nipped to the device being protected. The mounting position of the suppressor shall permit a straight and short lead length connection between the suppressor and the point of connection.
- D. Securely mount surge suppressor to wall, or panel with stainless steel hardware.

- E. Conductors for connection of surge suppression shall be as recommended by the manufacturer for this application and shall be wrapped together the full length of the conductor.
- F. Neutral and ground shall not be bonded together at panelboard locations.
- G. Minimum conductor size for hardwire connection of SPD to phase, neutral, and grounding connection points shall be as follows:
 - 1. For 480 VAC system applications where surge capacity is 160 kA/phase or greater, #1 AWG shall be used.
 - 2. For 240 VAC (or 208 VAC) system applications where the surge capacity is below 160 kA, #6 AWG shall be used.
- H. Exposed ground conductors shall be installed in conduit.
- I. Install devices at service entrance suppressors on load of the service entrance disconnecting, with ground lead bonded to service entrance grounded conductor bus.
- J. Provide multi-pole circuit breakers as a dedicated disconnect for the suppressor, unless otherwise indicated.

3.2 FIELD QUALITY CONTROL

- A. Testing: Perform the following field quality-control testing:
 - 1. After installing surge protective devices, but before electrical circuitry has been energized, test for compliance with requirements.
 - 2. Complete startup checks according to manufacturer's written instructions.
 - 3. Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.19. Certify compliance with test parameters.
- B. Repair or replace malfunctioning units. Retest after repairs or replacements are made.
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including conduit and electrical connections. Verify that electrical wiring installation complies with manufacturer's installation requirements.

3.3 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain surge protective devices. Training shall consist of one 8-hour day on site for each type of surge suppressor.
 - 1. Train Owner's maintenance personnel on procedures and schedules for maintaining suppressors.
 - 2. Review data in maintenance manuals.
 - 3. Schedule training with Owner, through Engineer, with at least seven days advance notice in writing.

End of Section

This page intentionally left blank

DIVISION 27

SECTION 27 27 10 SPREAD SPECTRUM RADIO SYSTEM

This page intentionally left blank

SECTION 27 27 10
SPREAD SPECTRUM RADIO SYSTEM

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes requirements for a 900 MHz Unlicensed Spread Spectrum Radio and associated Antennas. Radio and antennas shall operate as a complete communications system. The spread spectrum radios and antennas shall comply with FCC rules for unlicensed radio operation in the 902-928 MHz band.
- B. Equipment furnished under this Contract shall be installed in an industrial type environment and powered from an electrical source that may include harmonic distortion, surges, sags, and other electrical noise under normal operating conditions. The Contractor and his suppliers shall verify that all equipment furnished shall function correctly in this noisy electrical environment. If the equipment is found to be unable to operate in this environment, the Contractor and/or his suppliers shall furnish any replacement equipment, surge protection, power line conditioners, UPS, or other equipment required to correct this problem at no additional cost to the owner.
- C. This section also contains Surge Protectors for the antenna and radio, as shown on the drawings.

1.2 QUALITY ASSURANCE

- A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:
 - 1. National Electrical Code (NEC)
 - 2. Underwrites Laboratories, Inc. (UL)
 - 3. Federal Communications Commission (FCC)

1.3 SUBMITTALS

- A. Prior to obtaining any material in connection with this Section, detailed shop drawings on all material shall be submitted. Submittals shall conform to the requirements of Section 01 33 00, Submittals.
- B. Submittals shall include:
 - 1. Bill of materials for all components
 - 2. Catalog cuts for all components
 - 3. Wiring diagrams (including wire numbers and field connection points)
 - 4. Radio installation details
 - 5. Antenna installation details
 - 6. Grounding details for the antenna, antenna cable, and antenna mounting brackets

- C. Samples of any material shall be submitted upon Engineer's request.
- D. Submit test plan for the radio and antenna system.
- E. Perform a radio site survey between all new sites and the master radio site (on the Worcester County SCADA Communications network), or another site designated by the Engineer. Submit radio site survey report.

1.4 CLOSEOUT SUBMITTALS

Provide project record documents which record actual locations of components and circuits.

PART 2 PRODUCT

2.1 RADIO

- A. Spread spectrum radios shall meet FCC rules for unlicensed radio operation in the 902-928 MHz frequency band.
- B. All radios shall be capable of operating as a stand alone Multiple Address System (MAS), as a stand alone point-to-point link, or as a "Tail End" or "Last Mile" link from an existing Multiple Address radio system.
- C. The spread spectrum radio shall use the spread spectrum frequency hopping technique for data communications. In addition, the radio shall utilize narrow band filtering techniques to reject noise and interference. A 10^{-6} Bit Error Rate (minimum) shall be achieved for signal strengths of -110 dBm or stronger.
- D. Radio shall be certified under FCC rules Part 15.247. No license will be required to operate radios under this contract.
- E. Radios must be capable of transmitting users data at standard rates between 1,200 and 115,200 bits per second. The radio must be capable of operation with RTS/CTS flow control and the data interface shall be selectable between RS-232 or RS-485.
- F. Communications between the central master radio site (located at the North Water Tower) and all remote sites must be 100% transparent communications for all standard asynchronous protocols. The radio must transmit data in the same format as used by the data system, seamlessly and without interruptions. Radio overhead or latency must average 6 to 10 milliseconds, and shall not exceed 30 milliseconds for communications from master to remote, or from remote to master.
- G. It shall not be acceptable to require that the user's protocol be modified in any way for compatibility with radio communications nor will it be acceptable to require a special protocol driver in the radio.

- H. It shall not be acceptable to require a front-end controller to convert protocols or reorder data packets.
- I. It shall not be acceptable to transmit data in a non-deterministic manner such that the data would be received longer than 30 milliseconds after transmission.
- J. The master and remote radios shall be interchangeable such that all radios are identical. The user shall be able to select master, remote, or repeater operation using a software command.
- K. Radios shall be designed to minimize interference from noise and other radios operating in this band. Transmission power shall be adjustable from 0.1 watt to the FCC maximum of 1.0 watt. The radio must be capable of hopping over 128 separate frequencies from 902 to 928 MHz. To insure the ability to operate multiple radio systems in one area and to avoid possible interference that may be in this band, the 128 frequencies must be divided into 8 non-overlapping zones. The radio must be able to operate in all 8 zones, or any combination of 4 to 7 zones. Zone selection shall be initiated by a command from the master radio that is broadcast to all radios in the system. In addition, the radio must have a minimum of 65,000 separate system addresses. Assignment of a unique address (which sets the hop pattern) insures that multiple radio systems can operate in the same area with minimal interference.
- L. Radios shall utilize CRC error checking and automatic retransmission in order to minimize the effects of in band interfering signals.
- M. The radio system must utilize Digital Signal Processing (DSP) to automatically optimize communication performance and eliminate the requirements for internal tuning adjustments.
- N. Software and firmware configurable operating parameters must be available to insure maximum radio system performance and that throughput is available for a wide variety of system conditions and configurations. As a minimum, the data rate shall be adjustable from 1200 to 115,200 bps. It must also have two different hop times in order to optimize for best throughput or least delay. It must be possible to operate the system in a mode that buffers data or in a mode that transmits data as it is received by the radio.
- O. All system configuration parameters shall be capable of being set by the user using a terminal or PC directly connected to the radio. Parameters for remote radios must be selectable over the air from the master radio.
- P. Radio shall support automatic store and forward such that data can be transmitted through an unlimited number of repeaters. The repeaters must also be able to act as RTU radios. Using Store and Forward techniques, the radios must be able to perform alternate routing in the event of a repeater failure and to implement both a primary route scheme or a "use any equally" route scheme.
- Q. The radio system shall provide integral diagnostic capability to allow the user to verify communications reliability between the master and remote radios. Diagnostic data must

be continuously acquired by the master radio without interrupting the users data communications. Diagnostic communication must be usable from any radio in the network.

- R. Provide a separate diagnostic port to enable the remote RTU/PLC/Terminal to access all radio diagnostics directly from the radio and enable radio diagnostic data to be incorporated into the SCADA system database.

- S. Other requirements:

General

Frequency range	902-928 MHz, FCC Part 15 Spread Spectrum Band
Frequency Stability	+/- 0.00015% (1.5 PPM), -30°C to 60°C (-22°F to 140°F)
Frequency Hopping Range	128 channels/frequencies
Hop dwell times	7 milliseconds, 28 milliseconds, user selectable
Frequency Zones	8 zones
Unit Addresses	0-65000
System Addresses	0-65000

Data Characteristics

User Interface	RS-232 and RS-485
Data Latency	7 milliseconds (typical)
Byte Length	7 msec (typical)
Data Interface Baud Rate	1200-115,200 bps
Data Rate over the RF channel	115kps
Modulation Type	Binary CPFSK
Output Impedance	50 ohms

Transmitter

Power Output	0.1 to 1.0 Watts (+20 to -30 dBm), user selectable
Duty Cycle	Continuous
Spurious Emissions	60 dBc
Harmonic Emissions	70 dBc
Transmitter Keying	Data activated
VSWR	Unlimited no damage
Modulation Type	Binary CPFSK
Output Impedance	50 ohms

Receiver

Receiver Type	Double conversion superheterodyne
Bit Error Rate	$< 10^{-6}$ (-110dBm)
Intermodulation	59 dB minimum (EIA)
Desensitization	75 dB
Spurious	70 dB minimum
RSSI Range	-40 dBm to -120 dBm

Primary Power

Voltage	13.8 VDC nominal (6-30 VDC Operating Range)
TX Supply Current	500mA @ 13.8 VDC
RX Supply Current	125mA @ 13.8 VDC
Sleep Mode Current	8mA @ 13.8 VDC
Reverse Polarity Protection	Included

Environmental

Humidity	95% at 40°C (104°F) non-condensing
Temperature Range	-40° to +70° C (-22° to 140° F)

T. Radio shall be model MDS TransNET 900 as manufactured by Microwave Data Systems.

2.2 RADIO

A. The radio communications platform shall consist of the following:

1. Router. Router shall have built-in security mechanisms that prevent network access to unauthorized users and devices.
2. Unlicensed Spectrum Radio. 900MHz radio for operation in the 902-928 MHz ISM (Industrial Scientific and Medical) band. Radio shall utilize Media Access Control (MAC) technology at 1.25Mbps with a latency on the order of 5msec. Allowable topologies shall include point to point, point to multipoint, and a self-healing store-and-forward network. Unlicensed radio shall meet the requirements of FCC part 15.

The radio communications platform shall also be capable of the following:

3. Cellular modem. Cellular modem shall be capable of supporting 4G LTE; Cellular modem shall also be capable of 2G/3G/GSM and CDMA.
4. Wi-Fi modem. Wi-f modem shall be cable of supporting 802.11 b/g/n 2.4GHz, or 802.11 a/b/g/n 2.4/5GHz.
5. Licensed Spectrum Radio. Licensed spectrum radio shall provide data rates of up to 240 Kbps in a 50 kHz channel, or up to 120 Kbps in a 25 kHz channel. Licensed radio shall meet the requirements of FCC part 15.

B. The communications device shall include the following features:

1. Two RJ-45 10/100baseT Ethernet ports
2. RS-232 / RS-485 serial port, utilizing RJ-11 connectors. RS-485 mode shall be 2-level and 4-level. The byte lengths shall be 10 or 11 bits, with transmission rates up to 115200bps.

C. Data and Networking Capabilities

1. The device shall provide Layer 2 bridging of Ethernet and WiFi traffic.
2. The device shall be capable of bridging all types of Ethernet frames.
3. The device shall participate in standard IEEE 802.1d spanning tree.
4. The device shall provide Layer 3 IP routing between the available network interfaces.
5. The device must provide Network Address Translation (NAT) and port forwarding
6. The device must provide support for IEEE 802.1Q VLANs including both tagged and untagged operation at the Ethernet ports.
7. The device's WiFi interface must offer a user throughput of at least 20 Mbps.

8. Round-trip latency for an ICMP ping between an Access Point and Remote must average 10 ms or less over the 900 ISM interface when using a 100-byte ping test and a clear wireless channel.
9. Round-trip latency for an ICMP ping must average 10 ms or less over the WiFi interface when using a 100-byte ping test and a clear wireless channel.
10. The device's WiFi interface must support multiple SSIDs when operating as an Access Point. Each SSID must be capable of being mapped into a separate VLAN.
11. The device must have a built in serial gateway (terminal server) to allow connection of serial devices without requiring an external terminal server.
12. The device's serial gateway functionality must allow serial data to be encapsulated in TCP and UDP packets and provide both TCP server and TCP client capability.
13. The device must provide a mechanism to allow Modbus serial traffic to be packetized properly. The mechanism must be compatible with Modbus/RTU, Modbus/ASCII, and Modbus/TCP.
14. The device must provide a mechanism to allow DNP3 serial traffic to be packetized properly.
15. The device must be able to operate as a DHCP server on the Ethernet, 900 ISM, and WiFi ports.
16. The device must support Network Time Protocol (NTP) to obtain time of day.

D. General requirements:

1. Must meet FCC part 15 rules for radio operation.
2. WiFi interface which is IEEE 802.11 b/g/n interoperable.

E. Other requirements:

1. Input power 10-60VDC, with reverse polarity protection
2. Power Consumption 4 watts average, 15 watts maximum, 1 amp @ 13.8 VDC while transmitting.
3. MTBF >25 years (as measured using Telcordia method 1, case 3)
4. Humidity 95% at 104°F (40°C) non-condensing
5. Temperature range -40°F to 158°F (-40°C to 70°C)
6. Reverse polarity protection

- F. Radios shall be designed to minimize interference from noise and other radios operating in this band. Transmission power shall be adjustable from 0.1 watt to the FCC maximum of 1.0 watt. The radio must be capable of hopping over 128 separate frequencies from 902 to 928 MHz. To insure the ability to operate multiple radio systems in one area and to avoid possible interference that may be in this band, the 128 frequencies must be divided into 8 non-overlapping zones. The radio must be able to operate in all 8 zones, or any combination of 4 to 7 zones. Zone selection shall be initiated by a command from the master radio that is broadcast to all radios in the system. In addition, the radio must have a minimum of 65,000 separate system addresses. Assignment of a unique address (which sets the hop pattern) insures that multiple radio systems can operate in the same area with minimal interference.

- G. Radios shall utilize CRC error checking and automatic retransmission in order to minimize the effects of in band interfering signals.

- H. The radio system must utilize Digital Signal Processing (DSP) to automatically optimize communication performance and eliminate the requirements for internal tuning adjustments.
- I. Software and firmware configurable operating parameters must be available to insure maximum radio system performance and that throughput is available for a wide variety of system conditions and configurations. As a minimum, the data rate shall be adjustable from 1200 to 115,200 bps. It must also have two different hop times in order to optimize for best throughput or least delay. It must be possible to operate the system in a mode that buffers data or in a mode that transmits data as it is received by the radio.
- J. All system configuration parameters shall be capable of being set by the user using a terminal or PC directly connected to the radio. Parameters for remote radios must be selectable over the air from the master radio.
- K. Radio shall support automatic store and forward such that data can be transmitted through an unlimited number of repeaters. The repeaters must also be able to act as RTU radios. Using Store and Forward techniques, the radios must be able to perform alternate routing in the event of a repeater failure and to implement both a primary route scheme or a “use any equally” route scheme.
- L. The radio system shall provide integral diagnostic capability to allow the user to verify communications reliability between the master and remote radios. Diagnostic data must be continuously acquired by the master radio without interrupting the users data communications. Diagnostic communication must be usable from any radio in the network.
- M. Provide a separate diagnostic port to enable the remote RTU/PLC/Terminal to access all radio diagnostics directly from the radio and enable radio diagnostic data to be incorporated into the SCADA system data base.
- N. Radio shall be model GE/MDS Orbit platform with NX 900 MHz Spread Spectrum Radio (example part number MXNXU91NNNNNS1F5DUNN), as manufactured by GE/Microwave Data Systems.

2.3 OMNI-DIRECTIONAL ANTENNA

- A. Omni directional antenna shall provide omni-directional coverage in the 902-928 MHz frequency band. Antenna base shall be constructed of 6061-T6 anodized Aluminum.
- B. Omni Directional Antenna Specifications

Bottom Operating Frequency	902 MHz
Top Operating Frequency	928 MHz
Nominal Gain	9 dBd, dBi>1GHz
Horizontal Beamwidth	360 degrees (+/- 3dB)

Vertical Beamwidth	5 degrees (+/- 3dB)
Front to Back Ratio	0 dB
Power Rating	200 Watts
Length	2.5 inches
Width	2.5 inches
Height	120.5 inches
Weight	12.5 pounds
Cross Sectional Area	1.9 ft ²
Lateral Thrust at 100 mph	47.5 pounds
Rated Wind Velocity	120 miles/hour

C. Provide antenna with integral 7/8" Heliax antenna cable.

D. Antenna shall be Model Marathon BMO902J, as manufactured by Bluewave.

2.4 DIRECTIONAL ANTENNA

A. Directional antenna shall provide directional coverage in the 890-960 MHz frequency band. Antenna base shall be constructed of 6061-T6 anodized Aluminum.

B. Directional Antenna Specifications

Bottom Operating Frequency	890 MHz
Top Operating Frequency	960 MHz
Nominal Gain	10.0 dBd
Horizontal Beamwidth	56 degrees (+/- 3dB)
Vertical Beamwidth	46 degrees (+/- 3dB)
Front to Back Ratio	20 dB
Power Rating	200 Watts
Length	24 inches
Width	2.4 inches
Height	6.8 inches
Weight	2 pounds
Cross Sectional Area	.24 ft ²
Lateral Thrust at 100 mph	5.9 pounds
Rated Wind Velocity	125 miles/hour

C. Provide antenna with integral LMR400 antenna cable.

D. Antenna shall be Model Marathon BMY890K, as manufactured by Bluewave.

2.5 SURGE PROTECTION

A. Provide surge protection for input to radio. Surge protection shall conform to the following requirements:

Current	3 ADC
Insertion loss	<= 1dB

Frequency Range	300-2500MHz
Mounting	Flange
Operating Voltage	+/-24 Volts
Polarity	+/-
Protected Side Connector	F Female 75 ohms
RF Power	50 Watts
Surge Side Connector	F Female 75 ohms
Throughput Energy	<= 1000uJ for 3kA @ 8/20usec waveform
Throughput Voltage	<= 2 x operating voltage max Vpk
Turn-On voltage	+/-33 volts
Unit Impedance	75 ohms
Voltage Standing Wave Ratio	1.42:1
Weatherized	Bellcore #TA-NWT-000487 Procedure 4.11, Wind
Driven	(120 h) Rain Intrusion

B. Surge protection device shall be Polyphaser IS-B50LN-C2 or equal.

PART 3 EXECUTION

3.1 GENERAL

- A. Antennas and radio equipment shall be provided with wiring, schematic, layout, connection and control diagrams.
- B. Configure the antenna and radio equipment so that it operates as a slave in the existing Worcester County SCADA communications network.
- C. Provide instructions and data to Worcester County so that this node can be added to the existing SCADA communications network. Data shall include all information necessary to allow this node to operate in a manner consistent with the existing nodes on the SCADA communications network.

3.2 INSTALLATION

- A. Mount antennas as shown on the contract drawings and in accordance with all manufacturer's installation recommendations.
- B. Keep antenna and antenna mast clear of all transmission lines. Antenna shall not be erected in any position such that the feedline, the antenna, or the antenna mast, or any part thereof crosses over or under a power line or pole transformer.
- C. Antenna shall not be mounted in any position such that any part of the antenna or its mounting may fall into a power line in the event of a mechanical failure.
- D. Provide sufficient mounting and supports to withstand a sustained windloading of 90 miles per hour.

- E. Tune antenna to the desired frequency.
- F. Provide separate radio frequency signal ground for the transmitted signal. Ensure that the antenna is solidly grounded; do not rely on feed cable for ground return. Secure feed-line and transmission line to tower or building.
- G. Weatherproof all cable connections.
- H. Orient the antenna so that the received signal strength is maximized.

3.3 FIELD TESTS

- A. The panel shall be checked and necessary adjustments shall be made in the field after installation.
- B. Ensure that the antenna has been securely fixed, and that the antenna is oriented correctly.
- C. Test radio system operation using simulated inputs and messages. Tests shall be performed in the presence of the Engineer.

** End of Section **

DIVISION 31

SECTION 31 25 00 EROSION AND SEDIMENT CONTROL

This page intentionally left blank

SECTION 31 25 00
EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.1 DESCRIPTION

- A. The Work covered by this Section consists of furnishing all materials, equipment tools and labor to construct erosion and sediment control systems.
- B. The Work to be performed includes, but is not limited to silt fence, stabilized construction entrances, and site surface drainage conveyances as specified herein and as shown on the Contract Drawings.
- C. All erosion and sediment control devices shall be inspected daily by the CONTRACTOR and maintained continuously throughout the duration of the project by the CONTRACTOR. The CONTRACTOR is required to provide the ENGINEER with a Daily Inspection Form for Erosion and Sediment Controls that documents the condition of the erosion and sediment control devices and documents repairs and maintenance that is completed that day. The CONTRACTOR is required to indicate on the Daily Inspection Form for Erosion and Sediment Controls any observations of erosion and sediment controls that require maintenance, repair, or replacement, as well as indicate his/her recommendations for erosion and sediment controls that require maintenance, repair, or replacement. The County may conduct independent periodic inspections. This process will enable the CONTRACTOR to obtain approval from the ENGINEER prior to conducting any required maintenance, repairs, or replacements of erosion and sediment controls. The CONTRACTOR will not be compensated for maintenance, repairs, or replacement of erosion and sediment controls unless Daily Inspection Forms for Erosion and Sediment Controls are provided to the ENGINEER and the ENGINEER provides prior authorization of such maintenance, repairs, or replacement of erosion and sediment controls.
- D. The CONTRACTOR shall water seeded areas immediately upon placement of both temporary and permanent seeding. The CONTRACTOR shall provide sufficient watering of grass throughout the duration of the project.

1.2 REFERENCES

- A. Maryland Standards and Specifications for Soil Erosion and Sediment Control, 2011 Ed.

1.3 QUALITY ASSURANCE

- A. The CONTRACTOR shall provide the necessary straw bales, silt fence, and/or other temporary erosion control measures to contain all his/her work activities, and as shown on the Contract Drawings or as directed by the ENGINEER.
- B. Erosion control measures as shown on the Contract Drawings shall be established at the beginning of construction and maintained during the entire period of construction. Onsite areas that are subject to severe erosion, and offsite areas that are especially vulnerable to damage from erosion and/or sedimentation are to be identified and receive special attention in a manner approved by the ENGINEER.
- C. All land-disturbing activities are to be planned and conducted to minimize the size of the area to be exposed at any one time and the length of exposure. In any case, the area to be exposed at any one time shall not be greater than the construction phase in which work is being conducted, as delineated on the Contract Drawings.
- D. Surface water runoff originating upgrade of exposed areas shall be controlled to reduce erosion and sediment loss during the period of exposure.
- E. When the increase in peak velocity of storm water runoff resulting from a land-disturbing activity is sufficient to cause accelerated erosion of the receiving stream, the CONTRACTOR shall provide measures to control both the velocity and the rate of release so as to minimize accelerated erosion and increased sedimentation of the stream. Such measures shall be approved by the ENGINEER. All land-disturbing activities are to be planned and conducted to prevent offsite sedimentation damage.
- F. Vegetative Stabilization: Seeding both Temporary and Permanent shall be in accordance with the specifications on the Erosion and Sediment Control Drawings and Maryland Department of Environment specifications.
- G. Erosion and sediment control systems shall be maintained in functional and satisfactory condition by the CONTRACTOR until all the disturbed areas are stabilized and approval is given by the ENGINEER.
- H. Erosion and sediment control systems shall only be removed by the CONTRACTOR when the site has been fully stabilized and approved by the ENGINEER.

1.4 SUBMITTALS

- A. The CONTRACTOR shall submit to the ENGINEER the following items in accordance with Section 01 33 00, Submittals, or other related sections herein these special provisions:

1. Product data and source for all materials to be used ten (10) calendar days prior to placement.
2. Submit daily/rain event checklists, Erosion and Sediment Control inspection forms, and Daily Construction Reports.

PART 2 PRODUCTS

2.1 EROSION AND SEDIMENT CONTROL MATERIALS

- A. Silt Fence: CONTRACTOR shall supply silt fence to control surface-water runoff and sediment. Silt fence material shall meet or exceed the criteria specified on the Contract Drawings. CONTRACTOR shall submit manufacturer's product data to the ENGINEER for approval.
- B. Stabilized Construction Entrances: Stone for stabilized construction entrances shall meet requirements of AASHTO M 43, No. 2.

PART 3 EXECUTION

3.1 TRANSPORTATION, HANDLING AND STORAGE

- A. Materials shall be handled and stored in such a manner as to prevent damage to the material. Materials shall not be dropped or dragged over the ground. Any materials damage shall be replaced at no expense to the County.

3.2 EROSION AND SEDIMENT CONTROL STRUCTURES

- A. Silt Fence:
 1. Installation: CONTRACTOR shall install silt fence in accordance with specifications and installation instructions provided by the manufacturer or on the Contract Drawings, or as directed by the ENGINEER. The proposed silt fence shall be staked out and approved by the ENGINEER prior to installation. Authority of precedence shall be as follows: ENGINEER'S direction, Contract Drawings, Specifications, and manufacturer's installation instructions.
 2. Maintenance: Silt fencing shall be inspected daily and maintained continuously throughout the duration of the project. The CONTRACTOR is required to provide immediate replacement of tears in the fabric, strengthening of posts where movement is observed, and cleaning of excessive silt accumulation. Fabric torn shall be replaced without any delay. Silt shall be removed when it has accumulated to a level that is 20% of the height of the silt fence, or approximately 3 in. high from the ground surface. Silt shall be removed, hauled, and disposed of offsite.

3. The CONTRACTOR shall use portable sediment tank(s) or dirt bag(s) while dewatering. The CONTRACTOR may use other methods for dewatering as approved by the ENGINEER.
 4. Removal: Upon full stabilization of the areas the ENGINEER may require the CONTRACTOR to remove certain lengths of the silt fence. In such cases the CONTRACTOR shall remove all materials and dispose of them in an appropriate manner. All the disturbed areas by this operation shall be stabilized satisfactorily.
 5. All work shall meet with the ENGINEER'S approval.
- B. Temporary erosion control measures will be used to correct conditions that develop during construction that were not foreseen during design stage, that are needed prior to installation of permanent control features or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project. The ENGINEER will limit the area of the area of clearing and grubbing, and capping operations in progress, commensurate with the CONTRACTOR'S capability and progress in keeping with the finish grading, mulching, seeding, and other such permanent control measures current in accordance with the accepted schedule.
1. In the event that temporary erosion control measures are required due to the negligence, carelessness, or failure of the CONTRACTOR to install permanent controls as a part of the work as scheduled, and ordered by the ENGINEER for these reasons, such work shall be performed by the CONTRACTOR at his / her own expense.
 2. The erosion control features installed by the CONTRACTOR shall be acceptably maintained by the CONTRACTOR during the construction period.
- C. Permanent seeding shall be done in accordance with the requirements of the Specifications provided in the Contract Drawings and Maryland Department of Environment requirements. The CONTRACTOR shall water seeded areas immediately upon placement of permanent seeding. The CONTRACTOR shall provide sufficient watering of grass throughout the duration of the project.
1. The CONTRACTOR shall protect seeded areas against traffic or other use by warning signs or barricades, as approved by the ENGINEER. Surfaces gullied or otherwise damaged following seeding shall be repaired by regrading and reseeding as directed. The CONTRACTOR shall mow and water as directed, and otherwise maintain seeded areas in satisfactory condition until final inspection and acceptance of the work. It will be required that the CONTRACTOR establishes a good stand of grass of

uniform color and density to the satisfaction of the ENGINEER. If at the time when the Contract has been otherwise completed it is not possible to make an adequate determination of the color, density and uniformity of such stand of grass, payment for the unaccepted portions of the areas will be withheld until such time as the above requirements have been met.

- D. Removal and Disposal of Sediment and/or Debris: CONTRACTOR shall remove, upon direction by the ENGINEER, all accumulated sediment and/or debris that has accumulated behind or within any of the erosion and sediment control devices. CONTRACTOR shall dispose of offsite.
- E. CONTRACTOR shall inspect all erosion and sediment control devices daily and immediately following all precipitation events and submit to the ENGINEER the following workday written documentation that identifies any erosion and sediment control device that is in need of repair or in which sediment or debris has accumulated.

**** End of Section ****

This page intentionally left blank

DIVISION 32

SECTION 32 92 00 LAWNS AND GRASSES

This page intentionally left blank

SECTION 32 92 00
LAWNS AND GRASSES

PART 1 GENERAL

1.1 DESCRIPTION

- A. This section includes requirements for seeding and mulching and as required for restoration and restabilization of any and all disturbed areas, stockpiles, and as directed by the ENGINEER, in accordance with the Contract Documents.

1.2 SUBMITTALS

- A. Submit certificates of compliance before delivery of materials as specified in Section 01 33 00 for the following items:
 - 1. Seed
 - 2. Sod
 - 3. Fertilizer
 - 4. Lime
 - 5. Mulch.

PART 2 PRODUCTS

2.1 TOPSOIL

- A. Existing topsoil which is stripped may be stockpiled for reuse.

2.2 SEED

- A. Unless otherwise specified herein, seed shall be certified by the Maryland Department of Agriculture and shall conform to requirements of Maryland Seed Law and Regulations.
- B. Provide the following for all areas:
 - 1. Mix
 - a. SHA Mix No. 1 applied at a rate of two (2) pounds per 1,000 ft²
 - b. Sow mixture between 3 March and 1 May and between 1 August and 31 October.

2.3 FERTILIZER

- A. The CONTRACTOR will submit soil samples to an approved soils testing laboratory for fertilizer recommendations. Recommendations shall be submitted to and approved by the ENGINEER before implementation.
- B. Fertilizer shall be uniform in composition, free flowing and delivered to the site fully labeled according to applicable state fertilizer laws and shall bear the name, tradename or trademark, and warranty of the producer.

2.4 LIME

- A. Lime shall be ground limestone containing at least 50% total oxides, calcium oxide plus magnesium oxide. Limestone shall be ground to fineness such that at least 50% will pass through a 100 mesh sieve and 98% will pass through a 20-mesh sieve.

2.5 MULCH

- A. Mulch for protection of all seeding shall conform to the following requirements:
 - 1. Straw shall be clean, weed free, unrotted, applied at a rate of not less than 70 to 90 pounds per 1,000 ft², 1.5 to 2.0 tons per acre, and shall be anchored with one of the following methods. Mulching anchoring tool for flat slopes, mulch nettings, cut back and emulsified asphalt applied five gallons per 1,000 ft², Curasol AH applied five gallons per 1,000 ft², Petroset applied per Manufacturer's recommendations, RMH Plus Tackifier applied per manufacturer's recommendations, or other equivalent binding solutions. Increase application rate on slopes 8 feet or more high as recommended by the manufacturer.
 - 2. Straw erosion control blanket shall be placed in all channel beds that are grass lined, as shown on Plans. Erosion control blankets shall be Type SC150 as manufactured by North American Green, Evansville, Indiana, or equal. Also, all slopes greater than or equal to 3H:1V shall have type SC150 erosion blanket or equal.
 - 3. Wood chips, coverage to be 1.5 inches deep.
 - 4. Mulch utilized as temporary protection and stabilization shall conform to the above materials requirements. Rate of application shall be directed by the ENGINEER. Stone mulch will be permitted at the option of the CONTRACTOR.

PART 3 EXECUTION

3.1 PERMANENT SEEDING

- A. Place 4 inches of topsoil on all areas not receiving asphalt pavement, crushed stone, or designated as access roads. Harrow, disc, or otherwise loosen subsoil to a depth of 4 inches.
- B. Remove objectionable material such as stones, 2 inches or larger, clods, brush, roots and trash from the top 4 inches of soil.
- C. Apply fertilizer and lime at the rates specified herein. Thoroughly mix into the top 4 inches. Scarify the area and rake until the surface is leveled to provide a maximum of 2 inches in variation, and the soil is friable and a uniform fine texture.
- D. Immediately prior to seeding apply additional fertilizer at the rates specified herein, and work into the top 2 inches of the soil.
- E. Apply seed mixture uniformly with mechanical power driven seeders, mechanical cyclone hand seeders or hydroseeding equipment. Slurry for hydroseeder may contain seed and fertilizer only. Disc seed 1 inch into soil in drainage ditch areas. Apply jute matting to areas shown on Drawings. Do not rake, roll, or drag the seedbed in all other areas if hydroseeder is used.

3.2 TIME RESTRICTIONS

- A. Apply mulch at the rates specified herein, to all areas.

3.3 TIME RESTRICTIONS

- A. When permanent seeding is specified or directed and seeding is not allowed because of time restrictions specified, utilize one or more of the following methods to prevent erosion and sedimentation until such time as permanent seeding or sodding is allowed:
 - 1. Place and anchor straw mulch or wood chips.
 - 2. Apply temporary seeding.
 - 3. Prepare soil as for permanent seeding and then mulch as specified; overseed during next seasonal seeding period.
 - 4. Provide other erosion control measures acceptable to the ENGINEER.

- B. Remove straw or wood chips used as temporary mulch or work into subsoil at a minimum depth of 6 inches prior to initiation of permanent seeding application.

3.4 MAINTENANCE OF SEEDED OR SODDED AREAS

- A. Maintain seeded areas until accepted in writing by the ENGINEER.
- B. Water seeded, sodded and tree planting areas as necessary to maintain adequate moisture in the upper 4 inches of soil and keep grass mowed to a height of 2 to 3 inches. Do not remove more than one third of the grass leaf during initial mowing.
- C. Inspect areas for failures and necessary repairs due to poor vegetative growth, traffic, or equipment damage, weather damage, or erosion.
- D. Provide replacements during the specified planting seasons for areas where repairs are deemed to be necessary by the Inspector at no cost to the OWNER. This shall include repairs and replacements due to erosional or weather-related damage.
- E. If stand of turf is inadequate as determined by the ENGINEER, overseed and fertilize using half of the rates originally applied, or resod. If stand is over 60% damaged, as determined by the ENGINEER, reestablish following original lime, fertilizer, seed bed preparation, and seeding recommendations.

** End of Section **

DIVISION 33

SECTION 33 05 13 MECHANICAL GENERAL REQUIREMENTS
SECTION 33 11 00 VALVES, PIPING, AND APPURTENANCES

This page intentionally left blank

SECTION 33 05 13
MECHANICAL GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 DESCRIPTION

- A. This Section includes the requirements for providing all labor, materials, equipment, and incidentals necessary for mechanical construction requirements of the Contract, as specified herein and as shown on the Drawings.

1.2 QUALITY ASSURANCE

- A. Standards: Where standards, codes or specifications are referred to, the reference is to particular standards, codes or specifications together with all the latest amendments and errata applicable at the time the bids are taken. These are listed below:

AMCA - Air Moving and Conditioning Association, Inc.
ANSI - American National Standards Institute
ASME - American Society of Mechanical Engineers
ASTM - American Society for Testing Materials
AWS - American Welding Society
AWWA - American Water Works Association
Federal - Federal Government Specifications
IEEE - Institute of Electrical & Electronics Engineers
NEMA - National Electrical Manufacturer's Association
NFPA - National Fire Protection Association
NSF - National Sanitation Foundation
OSHA - Occupational Safety and Health Act
UL - Underwriters Laboratories, Inc.

- B. Material and Equipment Qualifications: Provide materials and equipment that are standard products of manufacturers regularly engaged in the manufacture of such products, which are of a similar material, design, and workmanship. Standard products shall have been in satisfactory commercial or industrial use for two (2) years prior to bid opening, unless otherwise specified. The two (2) year use shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the two (2) year period.
- C. Alternative Qualifications: Products having less than a two (2) year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6,000 hours, exclusive of the manufacturer's factory or laboratory tests, can be shown.
- D. Manufacturer's Lists: Within thirty days after the date of award of contract, the CONTRACTOR shall submit to the ENGINEER a complete list of proposed manufacturers for all equipment and materials to be used except for those required to be listed in the Bid Form. Complete separate manufacturer's lists shall be submitted for each Mechanical and Equipment section of the specifications. No consideration will be given

to partial or incomplete lists. After approval of each manufacturer's list, detailed shop drawing and/or material lists shall be submitted as specified hereinafter

- E. Service Support: The equipment items shall be supported by service organizations. Submit a certified list of qualified permanent service organizations for support of the equipment which includes their addresses and qualifications. These service organizations shall be reasonably convenient to the equipment installation and able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the Contract.
- F. Manufacturer's Nameplate: Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.
- G. Modification of References: In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the ENGINEER.

1.3 EQUIPMENT SELECTION

- A. Equipment of greater or larger power, dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing by the ENGINEER and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. No additional costs shall be approved for these increases, if larger equipment is approved. If minimum energy ratings or efficiencies of the equipment are specified, the equipment must meet the design requirements and commissioning requirements.
- B. If the CONTRACTOR proposes to use equipment other than that specified or detailed on the drawings, but equal to, such proposals must be approved in writing by the ENGINEER. If approved alternate equipment requires redesign of any associated part of the mechanical, electrical, or structural work, all work associated with the redesign shall be the responsibility of the CONTRACTOR. Design drawings detailing the redesign shall be prepared at the CONTRACTOR'S expense and is subject to approval by the ENGINEER. If approved alternate system requires additional materials or equipment, the CONTRACTOR shall furnish additional materials at no additional cost to the COUNTY.
- C. The equipment supplied shall be supported by service organizations. The CONTRACTOR shall submit a certified list of qualified service organizations for support of the equipment which includes their addresses and qualifications. These service organizations shall be reasonably convenient to the equipment installation and able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the Contract.
- D. Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent shall not be acceptable.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Handle, store, and protect equipment and materials to prevent damage before and during installation in accordance with the manufacturer's recommendations, and as approved by the ENGINEER. Replace damaged or defective items.
- B. Protect stored pipes and valves from moisture and dirt. Elevate above grade. When stored inside, do not exceed structural capacity of the floor.
- C. Protect flanges, fittings, and piping specialties from moisture and dirt.

1.5 SAFETY REQUIREMENTS

- A. Equipment Safety: Provide positive means of locking out equipment so that equipment cannot be accidentally started during maintenance procedures. High-temperature equipment and piping so located as to endanger personnel or create a fire hazard shall be properly guarded or covered with insulation of the type specified. Provide walkways, maintenance platforms, and guardrails where required for safe operation and maintenance of equipment. Provide ladders or stairways to reach walkways and maintenance platforms. Ensure that access openings leading to equipment are large enough to carry through routine maintenance items.
- B. Warning Sign: Provide a permanent placard or sign at the entrance to confined spaces contained in the equipment. The sign shall warn personnel not to enter the space until the atmosphere inside has been tested and systems have been de-energized.
- C. Lockout of Energy Sources: Provide appropriate lockout devices for energy isolating valves and for machines or other equipment to prevent unexpected startup or release of mechanical, hydraulic, pneumatic, thermal, chemical, or other energy in accordance with 29 CFR 1910.147. Lockout devices for valves shall provide a means of attachment to which, or through which, a lock can be affixed or shall have a locking mechanism built into it so that valves cannot be moved from the lockout position until the lock is removed. Electrical isolation of machines or other equipment shall be in accordance with requirements of Division 26, Electrical.

1.6 ELECTRICAL REQUIREMENTS

- A. Furnish motors only with the respective pieces of equipment except on packaged equipment with stand-alone control panels. Controllers shall be furnished and installed under Division 26, Electrical. Furnish internal wiring for components of packaged equipment as an integral part of the equipment.

1.7 SEQUENCING AND SCHEDULING

- A. Sequence, coordinate, and integrate installations of mechanical materials and equipment with civil/structural aspects of the project for efficient flow of the Work.
- B. Coordinate connection of electrical services. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

1.8 INSTRUCTION TO OWNER'S PERSONNEL

- A. When specified in other sections, furnish the services of competent instructors to give full instruction to the designated COUNTY personnel in the adjustment, operation, and maintenance, including pertinent safety requirements, of the specified equipment or system. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work. Instruction shall begin during the first regular work week after the equipment or system has been accepted and turned over to the OWNER for regular operation. The number of man-days [eight (8) hours per day] of instruction furnished shall be as specified in the individual section. When more than four (4) man-days of instruction are specified, use approximately half of the time for classroom instruction. Use other time for instruction with the equipment or system. When the number of man-days or hours of instruction are not specified, then the CONTRACTOR shall provide training as necessary to meet the requirements of the equipment operation per the manufacturer's recommendations. When significant changes or modifications in the equipment or system are made under the terms of the Contract, provide additional instruction to acquaint the operating personnel with the changes or modifications.

1.9 ACCESSIBILITY

- A. Install all work so that parts requiring periodic inspection, operation, maintenance, and repair are readily accessible. Install concealed valves, expansion joints, controls, dampers, and equipment requiring access, in locations freely accessible through access doors.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Unless otherwise specified, materials shall be in accordance with the following latest Standard Specifications of the ASTM:
- | | | |
|----|------------------------|---------------|
| 1. | Structural Steel | A-36 |
| 2. | Iron Castings | A-48 or A-126 |
| 3. | Welding Steel Pipe | A-53 |
| 4. | Zinc (Hot-Galvanizing) | A-123 |
| 5. | Steel Bolts | A-307 |
| 6. | Babbitt | B-23 |
| 7. | Bronze Castings | B-30 |
| 8. | Bronze (Silicone) | B-98 |
| 9. | Bronze (Manganese) | B-138. |
- B. All materials shall, if required, be tested and shall fulfill all requirements specified. Physical tests may be made by the OWNER. The CONTRACTOR at his own expense shall furnish test pieces and samples in the number, shape, size and finish required by the ENGINEER. All broken material shall become the property of the OWNER. The failure of test specimens to fully conform to the requirements of the specifications shall be sufficient cause for rejection of the whole melt or stock from which samples were obtained.

- C. Iron castings shall be smooth, clean and free from scale, lumps, blisters and other defects. No plugging, welding or filling will be allowed.
- D. The alloy grade number of all babbitt shall be that bearing alloy of a composition recommended by the manufacturer of the equipment or machinery for the service required, subject to the approval of the ENGINEER.
- E. All bronze shall be made of new material and shall be free from objectionable imperfections. If the materials show signs of improper mixing when being machined, the castings will be rejected.

2.2 FLANGES AND BOLTS

- A. Flanges, where threaded on pipe shall be of the same material as the pipe and bolt holes shall be drilled and spot-faced on the back. Stud holes shall not be drilled through. Flanges shall be uniform in thickness and shall come fair and, if required, shall be turned or chipped in a neat and workmanlike manner.
- B. Jacking screws shall be provided for covers, etc. where required, and also suitable eye bolts for lifting. Bolts and nuts shall be of the best quality of open hearth, free machining steel. Bolts shall have good, sound well-fitting threads; nuts shall be cold pressed. Where noted as galvanized, all heads, nuts and threads shall be of the American Standard regular sizes.

2.3 SCAFFOLDING - RIGGING - HOISTING

- A. Unless otherwise specified, the CONTRACTOR shall design and furnish all scaffolding, rigging, hoisting and services necessary for erection and delivery onto the premises of any materials and equipment furnished. The CONTRACTOR shall remove same from the premises when no longer required.

PART 3 EXECUTION

3.1 PIPING INSTALLATION

- A. General: Install piping as described below, except where system Sections specify otherwise.
- B. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, except where deviations to layout are approved on coordination drawings. CONTRACTOR shall submit the design approach, proposed materials, layout and fitment for the wet well components including all materials within the wet well (rails, lifting equipment, hatch and hatch openings, pump location, ladder and steps, fastenings, etc.). Submittal shall verify equipment and pump access through proposed safety hatch and submitted in accordance with Section 01 33 00 Submittals.
- C. Install components having pressure rating equal to or greater than system operating pressure.

- D. Install piping free of sags and bends.
- E. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, except where indicated.
- F. Install piping tight to slabs, beams, joists, columns, walls, and other building elements.
- G. Verify final equipment locations for roughing in. Refer to equipment specifications in other Sections for roughing-in requirements.
- H. Where mains are reduced, provide eccentric reducing fittings installed with flat side on the bottom.
- I. Piping systems shall be free of noise and vibration under normal operating conditions.

3.2 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings as follows and as specifically required in individual piping system Sections.
 - 1. Flanged Joints: Align flange surfaces parallel. Select gasket materials as required in individual piping system Sections. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.

3.3 PIPING CONNECTIONS

- A. Piping Connections: Except as otherwise noted, piping connections as specified below.
 - 1. Install unions in piping 2 inches and smaller adjacent to each valve and at final connection to each piece of equipment having a 2-inch or smaller threaded pipe connection.
 - 2. Install flanges in piping 2-1/2 inches and larger adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.
 - 3. Install dielectric connections to connect piping materials of dissimilar metals.

3.4 CERTIFICATION OF WELDERS

- A. All shop and field welding under this contract for steel piping and other piping systems shall be done by experienced operators who are skilled and have had experience in the method and materials used. All welders shall be qualified as specified in the ASME Code for Unfired Pressure Vessels, Paragraph U-70.
- B. For field welding, the CONTRACTOR shall submit to the ENGINEER for his review and approval a certified statement, from an approved testing agency for each welder he proposes to use for welded piping. Each certified statement shall indicate that the welder

has, within six months from proposed employment on this project, been successfully qualified under the requirements of Section IX of the ASME Boiler Construction Code. All certificates and qualifications shall be at the CONTRACTOR'S expense. The ENGINEER will return the certified statements to the CONTRACTOR for retention on job in the CONTRACTOR'S field office. Any work installed by an individual who has not been qualified by the testing agency and approved by the ENGINEER shall be removed by the CONTRACTOR and shall be replaced with work installed by qualified and approved welders at the CONTRACTOR'S expense.

- C. Care shall be exercised during all welding operations to prevent injury or damage to personnel and property.

3.5 EQUIPMENT INSTALLATION – COMMON REQUIREMENTS

- A. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, except where otherwise indicated.
- B. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.
- C. Install equipment giving right-of-way to piping systems installed at a required slope.

3.6 PAINTING OF NEW EQUIPMENT

- A. Equipment painting, factory applied or shop applied, shall be as specified herein, and provided under each individual section.
- B. Factory Painting Systems: Manufacturer's standard factory painting systems shall be provided, unless otherwise indicated.
- C. Shop Painting Systems for Metal Surfaces: Clean, pretreat, prime, and paint metal surfaces, except aluminum and stainless steel surfaces need not be painted. Apply coatings to clean dry surfaces. Clean the surfaces to remove dust, dirt, rust, oil, and grease by wire brushing and solvent degreasing prior to application of paint, except metal surfaces subject to temperatures in excess of 120 degrees Fahrenheit shall be cleaned to bare metal. Where more than one (1) coat of paint is specified, apply the second coat after the preceding coat is thoroughly dry. Lightly sand damaged painting and retouch before applying the succeeding coat. Color of finish coat shall be aluminum or light gray. Immediately after cleaning, the metal surfaces subject to temperatures less than 120 degrees Fahrenheit shall receive one (1) coat of pretreatment primer applied to a minimum dry film thickness of 0.3 mil, one (1) coat of primer applied to a minimum dry film thickness of one (1) mil; and two (2) coats of enamel applied to a minimum dry film thickness of one (1) mil per coat.

3.7 OPERATION OF NEW EQUIPMENT

- A. Crane Systems: Operators shall follow all safety guidelines outlined in the Manufacturer's Operation and Maintenance Manual, and all OSHA safety standards.

This page intentionally left blank

SECTION 33 31 00
VALVES, PIPING AND APPURTENANCES

PART I – GENERAL

1.1 DESCRIPTION

This Section covers all piping that will be used for the Lewis Road Gravity Sewer and Pump Station project.

1.2 RELATED REQUIREMENTS

- Section 01 33 00 Submittals
- Section 02 25 00 Excavation, Backfill, and Compaction.
- Section 02 74 10 Asphalt Paving
- Section 02 80 00 Restoration

1.3 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referenced too in the text by basic designation only.

- ANSI B16.1: Cast Iron Pipe Flanges and Flanged Fittings.
- ANSI/AWWA C151/A21.51: Ductile-Iron Pipe, centrifugally cast in metal molds or sand-lined molds, for water or other liquids.
- ANSI/AWWA C110/A21.10: Ductile-Iron and Gray-Iron Fittings, 3-in through 48-in., for water and other liquids.
- ANSI/AWWA C104/A21.4: Cement-Mortar Lining for ductile-iron pipe and fittings for water.
- ANSI/AWWA C207: Steel Piping Flanges for Waterworks Service - sizes 4-in., through 144-in.
- ANSI/AWWA C509: Resilient - Seated gate valves for water and sewerage systems.
- AWWA C550: Protective interior coatings for valves and hydrants.
- ANSI/AWWA C600: Installation of ductile-iron water mains and their appurtenances.
- ASTM D 3350: Polyethylene Plastic Pipe and Fittings Materials.
- ASTM F-714: Polyethylene (PE) Plastic Pipe (SDR-PR) Based on outside diameter.
- ASTM A126: Gray Iron Castings for Valves, Flanges, and Piping Fittings.
- ASTM C443: Joints for Circular Concrete Sewer and Culvert Pipe, using Rubber Gaskets.
- ASTM C425: Compression joints for vitrified clay pipe and fittings.
- ASTM C564: Rubber gaskets for cast iron soil pipe and fittings.
- ASTM F-714: Polyethylene (PE) Plastic Pipe (SDR-PR) Based on outside diameter.
- ASTM C-76: Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
- 2017 Maryland Department of Transportation Standard Specifications for Construction Materials

1.4 DESCRIPTION OF WORK

This Section specifies the following items:

- Gravity Sewer piping materials.
- Wastewater force main piping materials.
- Pump station mechanical materials.
- Reinforced concrete pipe for drainage at pumpstation entrance.
- The COUNTY will not furnish any materials for construction.

1.5 QUALITY ASSURANCE

- A. Pipe shall be tested prior to shipment to ensure that the physical properties are in accordance with this Specification. Copies of the manufacturer's quality assurance testing shall be submitted to the ENGINEER.
1. To minimize the number of joints, only standard manufacturer's length of pipe shall be furnished and installed for all mains unless otherwise indicated on the Plans, or as approved by the OWNER.
 2. Polyvinyl Chloride (PVC) Pipe—PVC pipe will be tested prior to shipment to ensure that the physical properties are in accordance with this specification. Copies of the manufacturer's quality assurance (QA) testing will be submitted to the ENGINEER.
 3. Reinforced Concrete Pipe—RCP pipe will be tested prior to shipment to ensure that the physical properties are in accordance with this specification. Copies of the manufacturer's QA testing will be submitted to the ENGINEER.
 4. Ductile Iron Pipe (DI)—DI pipe shall be tested prior to shipment to ensure that the physical properties are in accordance with this specification. Copies of the manufacturer's quality assurance testing shall be submitted to the ENGINEER.
 5. High Density Polyethylene Pipe (HDPE) – HDPE pipe shall be tested prior to shipment to ensure that the physical properties are in accordance with this specification. Copies of the manufacturer's quality assurance testing shall be submitted to the ENGINEER.

1.6 SUBMITTALS

1.6.1 Installation Drawings

- A. The CONTRACTOR shall submit installation drawings for, but not limited to, the gravity sewer piping, force main piping, gravity main sewer, and sewer laterals. Submit

drawings in accordance with Section 01 33 00. Furnish laying schedules that specify all fittings (including sizes) and pipe lengths.

1.6.2 Certificate of Compliance

- A. The CONTRACTOR shall submit to the ENGINEER for approval Certificates of Compliance before delivery of materials furnished by the CONTRACTOR under this section. Certificates shall include a copy of the manufacturer's certified test reports; job location; the CONTRACTOR'S name; types, classes, and strengths of pipe, and the pipe manufacturer's name. The CONTRACTOR shall further submit within the manufacturer's Certificate of Compliance that the piping and fittings are new and not defective.

1.6.3 Certified Test Reports

- A. Certified test reports within the requirements of standards and testing methods specified herein shall be submitted to the ENGINEER for approval prior to all pipe delivery. The pipe manufacturer and CONTRACTOR must satisfy the ENGINEER that the material he offers to furnish and install will meet in every aspect the requirements set forth in these Specifications. The CONTRACTOR shall transmit to the ENGINEER all information given him by the manufacturer or supplier prior to approval for furnishing and installing any such material.

1.6.4 Packing List

- A. A packing list or invoice shall accompany every shipment and shall contain the following information: CONTRACTOR'S name, kind and class of pipe, length, and other pertinent information.

1.6.5 Shop Drawings

- A. Provide shop drawings or vendor "cut sheets" for all equipment specified in this section, as per Section 01 33 00.

1.6.6 Installation and Repair Recommendations

The CONTRACTOR shall submit to the ENGINEER the manufacturer's recommended installation and repair procedures for all types of pipes used on the project.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivery of pipe and related materials shall be coordinated with installation of the materials. Materials shall be unloaded with proper equipment and shall be properly wedged secure. They shall be stored outside of traffic and work areas in a reasonably level, well-drained area away from brush and poison oak or ivy. Individual pieces or bundles shall be stored with safe walking space and clearance between them to allow a

full view for inspection. Other materials shall not be placed over or against the stored pipe. Piping shall be stored on a flat surface so that the barrel of the pipe is evenly supported and not piled more than 4 feet high. Bundles and containers shall not be stacked on one another.

- B. Pipe, fittings, and appurtenances shall be unloaded and handled with crane, backhoe, or other equipment of adequate capacity with an appropriate sling to protect the materials from damage. Materials shall be handled in a manner that ensures delivery to installation location in sound, undamaged conditions. Pipe shall be carried to placement location, not dragged.
- C. If damage occurs and is deemed repairable, it shall be repaired as directed by the ENGINEER in accordance with approved manufacturer's recommendations. If damage is not repairable in the opinion of the ENGINEER, such items will be rejected and shall be removed and replaced at the CONTRACTOR'S expense.
- D. PVC pipe will be totally covered with a tarpaulin that is sufficient to prevent ultra-violet light exposure to the PVC pipe with the exception of installation periods. Tarpaulins shall cover/protect the PVC pipe anytime the pipe has exposure to ultraviolet light.

PART II – PRODUCTS

2.1 FITTINGS

- A. All fittings shall have mechanical joints for ductile iron, bell and spigot joints for PVC, and butt-welded for HDPE.
- B. All fittings three (3) inches through twenty-four (24) inches shall be manufactured in accordance with the ANSI/AWWA C153/A21.53 Standard. All fittings 30-inches through forty-eight (48) inches shall be manufactured in accordance with the ANSI/AWWA C110/A21.10 standard for a working pressure of two hundred fifty (250) pounds per square inch (psi) unless specified or directed otherwise by the County.

2.1.2 Joints

- A. Ductile Iron Joints
 - 1. All joints at equipment shall conform to the equipment requirements. No direct welded connections shall be made to valves or other equipment. Right and left couplings, long screws, or caulking of pipe threads or gasket joints will not be permitted. Mitered joints for elbows and notching straight runs of pipe for tees or elbows will not be permitted.
 - 2. Soldered or brazed joints shall be made with solder and a noncorrosive paste flux. The solder mixture will be of 95-5 (tin-antimony) content.

The use of acid core solder shall not be permitted. The application of excess heat shall be avoided to prevent undue softening or burning of the fittings or tubing when making connections. All soldering operations shall be performed in strict accordance with best accepted practices. Tubing shall be square cut and reamed to remove all burrs. The inside of the fittings and the outside of the tubing at each end shall be well cleaned immediately prior to soldering to remove all traces of oxidation, regardless of how clean the surfaces of the pipe and fittings may appear.

3. Threads shall be standard, clean-cut and tapered. All pipe shall be reamed free from burrs and kept free from scale and dirt. Unless otherwise specified, threaded joints shall be made up with "Permatex" type 2, black, nonhardening pipe joint compound applied to the male thread only. The use of red lead or white lead will not be permitted. The complete threaded joint shall not have more than two threads exposed when made tight. Threads shall comply with ANSI B2.1.
4. Except where special couplings are indicated, piping requiring screwed connections shall be connected with screwed, malleable iron, ground joint, brass seat, 150 psi unions; for piping requiring flanged connections, flanged malleable iron unions shall be used. The finish of all unions shall match piping in which they are installed. Unions shall be provided at equipment and where required otherwise to facilitate removal of piping or equipment.
5. All gaskets between flanged connections and fittings shall be rubber ring gaskets 1/8 inch thick as specified herein.
6. Flanges shall be of the same material as the piping on which installed, and bolts, nuts and washers shall be of mild steel, with good sound well-fitting threads; the nuts shall be cold punched, hexagonal, trimmed and chamfered. Heads, nuts and threads shall be U.S. Standard sizes. Bolts shall be of such length as to project 1/4 inch beyond the nut when the flanged joint with gasket is assembled. All hardware shall be galvanized. For exterior, exposed flanged joints, bolts and nuts shall be of 18-8 stainless steel. Hardware for connecting stainless steel flanges shall be stainless steel, compatible with the pipe material. All gaskets between flanges shall be full face rubber or ring gasket, 1/8 inch thick. The flange joint system (bolts, nuts, gaskets and installation) are to be suitable for the intended service and have a minimum pressure rating of 250 psi.
7. Welded joints, if required in the project, shall be made by the electric arc or oxyacetylene gas process. Only thoroughly experienced certified pipe welders shall be employed for the work. The welding wire used shall be coated heavily and shall be of material suitable for making the best possible pipe welds. After being welded, the piping, when tested as

specified hereinafter, shall show no indication of leakage, weakness, and other defects. Welding and welders shall be in accordance with the paragraph entitled "Certification of Welders" specified hereinbefore.

8. Mechanical joints shall be made up with rubber gaskets conforming to ANSI A 21.11. Glands shall be bituminous coated and bolts and nuts shall be of high strength cast iron or high strength low alloy steel.

B. PVC Pipe Joints

1. PVC pipe joints shall utilize a gasket with bell and spigot. The gasket shall be reinforced with a steel band and meet the requirements of ASTM F477. Vinyltech pipe or approved equal shall have an integral bell end with a locked-in factory installed gasket and shall meet the joint requirements of ASTM D 3139.
2. For the PVC pipe, clean joint surfaces immediately before jointing. Apply lubricant or solvent, align the spigot to the bell inserting until it contacts evenly all around then force the pipe units together with proper equipment. Spigot ends shall be inserted into bells to the depth marked on the pipe. If spigot depth reference mark is missing, improperly placed or on field cut pipe, marked depth reference around the entire circumference of the pipe before making the joint. To field cut, make a square cut and bevel outer edge the same as factory made spigot ends.

C. HDPE Pipe

1. HDPE pipe joints shall be butt welded in accordance with Section 2.2.2 HDPE Pipe below.

D. Special Couplings

1. Unless specified or shown otherwise on the drawings, flexible couplings shall be the Style 38 or flanged adapter Style 128 of the Dresser Manufacturing Division, Models 411, 431, 912, or 913 of Rockwell International, or equal. Each shall be so designed and constructed to withstand an internal line pressure equal to that of the pipeline in which it is to be installed. The various flexible couplings shall be suitable for the class and size of ductile iron pipe or steel pipe as required at the various locations, and shall be without pipe stops. The CONTRACTOR shall provide and install flexible couplings in addition to those shown, as required, for flexibility in installing the various piping systems. Locations of additional couplings shall be as directed by the ENGINEER.
1. Harnesses shall be provided across all flexible/mechanical couplings unless otherwise specifically noted on the drawings to be omitted and shall be as detailed on the Contract Drawings.

2.2 PIPING

2.2.1 C900 PVC Pipe

1. C900 pipe shall conform to the following standards:
 - a. AWWA C900-97 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 inches Through 12 inches (100mm Through 300mm), for Water Distribution AWWA C605 - Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
 - b. ASTM D 1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds ASTM D 3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
 - c. ASTM F 477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
 - d. ASTM D 2412 - Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading UNI-PUB-8 - Tapping Guide for AWWA C900 Pressure Pipe UNI-B-8 - Recommended Practice for the Direct Tapping of PVC Pressure Water Pipe (Nominal Diameters 6-12 inch).
2. Pipe Compound: The pipe shall be extruded from compounds meeting (PVC1120) the requirements of Cell Classification 12454-B, as defined in ASTM D 1784, Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds. The PVC shall also be listed by the National Sanitation Foundation (NSF) for use in potable water.
3. Pipe: Pipe shall be manufactured in accordance with AWWA C900-97 by Vinyltech or approved equal.
4. Marking: The pipe shall be marked in accordance with AWWA C900 as in the following example.
 - a. Manufacturer's name and production codes
 - b. Nominal size, dimension ratio number, and O.D. base (for example, 8-inch DR 18 CI)
 - c. Materials cell classification (PVC1120)

- d. AWWA pressure class (150 PSI, or 200) and hydrostatic test pressure (T600, or T800)
- e. AWWA designation number (AWWA C900)
- f. Production date code (VOO 101A)
- g. Pipe color shall be green
- h. Underwriters Laboratories approval is indicated by the green UL sticker applied to the pipe.

2.2.2 HDPE Pipe

- A. HDPE pipe and fittings used for the force main shall be the diameter and size(s) shown on the Contract Drawings, wall thickness classification SDR 11. HDPE pipe material shall, as a minimum, conform to the requirements of ASTM D-3350, Cell Classification, 34543C, with pressure rated to meet project requirements. Molded fittings shall be manufactured in accordance with ASTM F-714. Pipe and fittings shall be EHMW PE 3408 High Density Polyethylene as manufactured by Plexco or approved equal.
- B. Joints for HDPE pipe shall be butt-welded to provide a watertight joint. All welding will be performed by a trained individual according to the pipe manufacturer's recommendations.
- C. Provide lap joint flanges-AWWA C-207 Class "D" as manufactured by Plexco or approve equal and ductile iron flange back-up ring when connecting to HDPE pipe to flanged plug valves.

2.2.3 SCHEDULE 35 PVC PIPE

- A. Schedule 35 PVC pipe shall meet Type I, Grade I Polyvinyl Chloride (PVC) compound with a Cell Classification of 12454 per ASTM D1784. The pipe shall be manufactured in strict compliance to ASTM D1785 and D2665 (where applicable), consistently meeting and/or exceeding the Quality Assurance test requirements of these standards with regard to material, workmanship, burst pressure, flattening, and extrusion quality.

2.2.4 CONCRETE PIPE

- A. Concrete pipe and fittings shall be furnished in accordance with ASTM Designation C-76, reinforced concrete culvert storm drain and sewer pipe.
- B. Pipe shall be manufactured without lifting holed and shall be handled at all times by means of slings or other methods approved prior to the start on construction.

- C. Pipe manufactured shall meet the applicable strength requirements contained in ASTM designation C-76, reinforced concrete culvert, stormdrain, and sewer pipe., minimum circumferential reinforcement shall be as prescribed in Class III. Where depth of cover is less than 2 feet, Class IV, wall A pipe shall be used. Where depth of cover is less than 15 inches Class IV, wall B pipe shall be used. In roadways, only Class IV pipe will be allowed.

2.2.5 DUCTILE IRON PIPE

- A. Ductile iron pressure pipe shall be made of ductile iron of good quality and of such character as shall make the metal castings strong, tough and of even grain and soft enough to satisfactorily permit drilling, tapping and cutting. All piping shall be smooth, free from cold shuts, scale, lumps, blisters, and sand holes and defects of every nature which make it unfit for the use intended. All piping shall be straight and shall be true circles in section with its inner and outer surfaces concentric. No plugging, filling, burning-in or welding shall be allowed. All piping shall be subject to inspection and approval by the ENGINEER upon delivery, and no broken, cracked, misshaped or otherwise damaged or unsatisfactory piping will be accepted.
- B. Each piece of ductile iron pipe shall have the weight and class designation conspicuously painted on it as near as possible to flange or bell end of the pipe and these designations shall be clearly legible.
- C. Wherever ductile iron pipe is specified or shown as having a spigot end, plain end will be acceptable.
- D. Where required or shown, the CONTRACTOR shall provide ductile iron specials. Specials shall in general consist of spool pieces, less than standard lengths of flanged, spigot end, or bell end pipe, or combination of ends, and nonstandard fittings. The specials shall conform in material, thickness and finish to the pipe in which they are installed. Tapped reinforced bosses shall be provided as an integral part of fittings, when shown or specified.
- E. It is to be noted that in the relatively small piping systems, the drawings do not necessarily show all fittings, offsets, unions, hangers, supports, etc. All such items shall be furnished and installed, however, as required for complete and satisfactory installation of the equipment shown.
- F. All gaskets for flanged pipe, valve and fitting joints shall be full faced or rubber ring gaskets in accordance with ANSI/AWWA C115/A21.15 Appendix A. Gaskets shall be rated for service pressures listed in pipe schedule.
- G. Flange nuts and bolts shall be in accordance with ANSI/AWWA C115/A21.15 Appendix A. Nuts and bolts shall be rated for service pressures listed in pipe schedule. Flange kits shall be stainless steel inside the valve pit meeting ASME A182 and B16.5

- H. Flanges may be cast integrally with the ductile iron pipe, or screwed on type flanges may be used. Threaded flanges shall be the same material as the pipe. Field installation of threaded flanges or the use of "uniflanges" shall not be permitted. Flanges shall be faced after the flange is installed on the pipe. Grooved type joints shall be used where shown on the drawings or where necessary to install piping through a sleeve.
- I. All exposed interior, ductile iron or black steel pipe, fittings and exposed ductile iron specials, shall be painted. The CONTRACTOR may furnish pipe and fittings with the ductile iron pipe industry's standard exterior bituminous coating, or uncoated pipe and fittings, or pipe and fittings with a shop prime coat of paint. In any case, it shall be the CONTRACTOR'S responsibility to provide a satisfactory final field finish painting job. Sealer coats (on bituminous coated surfaces), thorough field cleaning (of uncoated surfaces), or shop primer which is compatible with field coats, shall be provided as required.
- J. Ductile Iron pipe shall be manufactured by American Ductile Iron Pipe, or equal, and shall conform ANSI/AWWA C115/A21.15 and ANSI/AWWA C110/A21.10.
- K. pipe shall be double cement lined.

2.3 VALVES – GENERAL

- A. Valves specified herein shall have the type of ends specified or as indicated on the drawings or as required by equipment connections.
- B. No valves shall be installed with stems in the vertical down position.
- C. Each piece of equipment or appliance shall be separately valved so that supply and return services can be shut off and the piece of equipment or appliance removed if desired, without disturbing the piping systems. Valves shall be located so as to be easily accessible to operator of equipment. Valves shall be installed whether shown on the drawings or not.
- D. Check valves shall be protected by plug valves unless otherwise shown on the drawings so that they may be repaired without removal from the line.
- E. The valve and operator shall be the responsibility of the valve manufacturer.
- F. All valves shall open left, counterclockwise, and shall be Fully Ported Plug valves unless otherwise indicated.
- G. Valve Boxes – Screw type valve boxes and covers shall be made of cast iron conforming to the requirements of ASTM A 48, Class 30 B and shall meet the dimensional and marking requirements indicated in the Standard Details. Boxes shall be marked "sewer" and show valve size. The use of brick for valve support and miscellaneous valve appurtenances shall be concrete brick. All Valve Boxes shall be centered and plumb over

the valve operating nut. Valve boxes shall have concrete collar slightly above ground surface.

2.4 VALVES

- A. Geared Plug Valves: Valves shall be fully ported of the non-lubricated eccentric type with an elastomer covering all seating surfaces. The elastomer shall be suitable for the service intended. Flanged valves shall be manufactured in accordance with ANSI B16.1 Class 125 including facing, drilling and flange thickness. Mechanical joint ends shall be in compliance with AWWA/ ANSI C-111-92. Ports shall be round on sizes two (2) to twelve (12) inches and rectangular port design on valves fourteen (14) inches and larger. All valves shall be capable of being “pigged” with a soft pig when required. Valve bodies shall be of ASTM A-126 Class B cast iron in accordance with AWWA C-517-09 Section 4.3.3.1. Valves three (3) inches and larger shall be furnished with a welded-in overlay seat of one-eighth (1/8) inch thick of not less than ninety-nine (99) percent nickel in accordance with AWWA C-517-09 Section 4.3.3.4. Sprayed, plated or screwed-in seats are not acceptable. Plugs shall be of ASTM A-536-Grade 65-45-12 ductile iron for sizes twenty (20) inches and smaller, and ASTM A126 Class B cast Iron for sizes twenty-four (24) inches and larger in compliance with AWWA C-517-09 Sections 4.3.3.1 and 4.3.3.2. The plugs shall be of one piece solid construction with PTFE thrust bearings on the upper and lower bearing journals to reduce torque and prevent dirt and grit from entering the bearing and seal area. Valves shall be furnished with replaceable sleeve type bearings conforming to AWWA C-517-09 Section 4.3.3.6. Bearings shall be of sintered, oil impregnated stainless steel. Valve shaft seals shall be of the “U” cup type in accordance with AWWA C-517-09 Section 4.4.7. Seals shall be self-adjusting and repackable without removing the bonnet from the valve. Wrench operated valves two (2) to eight (8) inches shall be capable of being converted to worm gear or automated operation without removing the bonnet or plug from the valve. All wrench operated valves shall be equipped with a two (2) inch square nut for use with removable levers or extended “T” handles. Plug valves inside the pump station shall be gear and hand wheel operated. Worm gear operators, where required, shall be of the heavy duty construction with the ductile iron quadrant supported on the top and bottom by oil impregnated bronze bearings. The worm gear and shaft shall be manufactured of hardened steel and run on high efficiency roller bearings. All worm gear operators shall be sized for bi-directional shutoff at the valves design pressure rating. Valves shall be designed and manufactured to shut off bubble tight at 175 psi for valves two (2) to twelve (12) inches and 150 psi for valves fourteen (14) inches and larger. Each valve shall be given a hydrostatic and seat test with the test results being certified when required by the customer. Certified copies of Proof-of-Design test reports shall be furnished as outlined in AWWA C-517-09 Section 5.2.2 when requested. Plug valves shall be Millcentric Series 601FP/600FP as manufactured by Milliken Valve Company of Bethlehem, Pennsylvania or approved equal.
- B. Swing Check Valves: Valves shall be swing-type suitable for use in water or waste water conditions, with a flanged cast iron body, bronze or stainless steel seat rings, Buna-N or EPDM disc inserts, and hinge pins of corrosion resistant stainless steel. Internal and

external epoxy coating conforming to AWWA C550 is a standard. non-slam type with working pressures of not less than 150 pounds per square inch. Swing Check Valves shall comply with AWWA C508. Flanges shall be the Class 125 type complying with ASME B16.1. The seats and seals shall be Teflon or Viton. Valves shall have a clear waterway equal to the full nominal diameter of the valve. Check valves shall be designed for horizontal or vertical installations and for uninterrupted continuous service providing a positive check against backflow. The manufacturer's name, initials, or trademark and also the size of the valve, working pressure, and direction of flow shall be directly cast on the body. Swing Check Valves shall be Milliken Model 8001 as manufactured by Milliken Valve Company of Bethlehem, Pennsylvania or approved equal.

- C. Flexible Disc Check Valves: Valve shall be of the flanged, full body type with no internal moving parts except for the resilient disc. The flanged ends shall be manufactured in accordance with ANSI B16.1 Class 125. Valves shall be rated to 250 psi for all sizes. The valve body shall be constructed of ductile iron ASTM A-536 Grade 65-45-12 with flow area equal to the nominal pipe inside diameter throughout the valve. Seat shall be constructed on a 45 degree angle to reduce disc travel. The seat and internal body shall be fully coated with a two part thermosetting epoxy suitable for use in both potable water and wastewater applications. The domed bonnet shall be manufactured of ductile iron ASTM A-536 Grade 65-45-12. The bonnet-to-body seal shall be provided by a gasket to allow easy removal and replacement of the access bonnet. Bonnet bolting shall be SAE Grade 5 zinc plated. The resilient disc shall feature a fully encapsulated steel pressure plate with integral molded O-ring on the face of the elastomer. Nylon reinforcements shall be provided in the flexible hinge area of the disc assembly. If requested the manufacturer shall furnish certified results of a proof of design test performed at an independent testing laboratory. Testing shall include a million-cycle continuous test to demonstrate the durability of the flexible connection. Flexible Check Valves shall be Milliken Series 851 as manufactured by Milliken Valve Company of Bethlehem, Pennsylvania or approved equal.
- D. Electromagnetic Flow Meter: Flow Meter shall be: Siemens meter as a stand-alone submittal to include all appurtenances for installation and operation per Section 26 09 16, Instrumentation, 2.5 Electromagnetic Flow Meter.

2.5 CONNECTION APPURTENANCES

- A. The CONTRACTOR is responsible for field verifying the location of existing piping or structures to which connections are to be made, and location of other facilities which could be destroyed during earthmoving activities.
1. Link seals, where required on the Contract Drawings, shall be manufactured by Thunderline Corporation or approved equal.
 2. Portland cement concrete for pipe fitting buttresses and anchorages shall be 2,500 psi mix.

3. Rod for tie rod assemblies shall meet the material requirements of ASTM A 193, Grade B7, and shall be threaded for at least 4 inches on both ends. Rod shall be three-quarter ($\frac{3}{4}$)-inch diameter unless otherwise noted. Nuts shall meet the requirements of ASTM A 194. Manufactured tie rod and accessories shall result in the completed restrained joint assembly having a minimum working pressure rating of 200 psi.
4. Pipeline detectable tape shall be installed continuously along all water and sewer mains. The tape shall be installed directly above the mains and 12 inches from the ground surface. The tape shall be Lineguard Type II Detectable Tape as manufactured by Lineguard, Inc. of Wheaton, Illinois, or equal. The tape shall be a minimum of 2 inches wide, blue(green) in color for water(sewer), imprinted with the words, "CAUTION: WATER(SEWER) LINE BELOW," and be capable of being detected with inductive methods.
5. Tracer Wire for Non-Metallic Pipelines—Tracer wire shall be THHN/THWN12 gauge solid copper conductor insulated with a high molecular weight polyethylene (HMWPE) coating. Tracer wire shall be installed with sufficient length inside valve boxes and meter pits to allow for connection at ground surface. The wire shall be color coded green per the APWA uniform color code, have "UL" markings and suitable for direct bury applications. All underground splicing shall be split bolt connections with a waterproof shrink tubing and underground electrical tape.

PART III – EXECUTION

3.1 INSTALLATION OF PIPE

3.1.1 Inspection of Delivered Materials

- A. Pipe and fittings delivered to the work site will be inspected by the CONTRACTOR and the ENGINEER prior to installation. When accepted by the ENGINEER for installation, such materials will be marked. Nonaccepted and damaged pipe and fittings shall not be installed but shall be removed or repaired, if repairable, as directed by the ENGINEER.

3.1.2 Handling of Pipe and Fittings After Delivery

- A. All pipe and fittings shall be unloaded and handled with proper equipment avoiding severe impact blows, especially during cold weather.
- B. Pipe and appurtenances shall be unloaded and handled with a crane or backhoe of proper capacity equipped with appropriate slings to protect the exterior of the pipe. Gaskets shall be stored in a cool place out of direct sunlight. Pipe will be inspected before installation. If damage occurs during handling and placement and is deemed repairable, it shall be repaired as directed by the ENGINEER in accordance with approved manufacturer's recommendation. If damage is not repairable in the opinion of the

ENGINEER, such pipe shall be rejected, removed, and replaced at the CONTRACTOR'S expense.

3.1.3 Excavation

- A. Trench excavation and backfill shall be as specified on the drawings and in Section 02 25 00. Pipe between structures or between structure and terminus shall be of the same size and materials and shall be furnished by the same manufacturer. Before pipe installation, excavate sufficient trench in advance so that reasonable changes in line and grade can be made where the location of existing structures vary from that shown and to assure that no unforeseeable obstruction exists. Work required by failure to take such precautions shall be performed at no cost to the OWNER.

3.1.4 Bedding

- A. Provide bedding materials in accordance with the Contract Drawings and Section 02 25 00.

3.1.5 Placement

- A. Prior to pipe installation bring bedding material to grade along the entire length of pipe to be installed. Foreign matter shall be cleaned and removed from each pipe, fitting, and appurtenances before placing in the trench. Should foreign matter be observed in previously installed pipe, fitting, and appurtenance, cease work until foreign matter is removed. Open ends of pipes and fittings shall be closed with a watertight cap or plug when work is not proceeding.
- B. Place sufficient backfill on each section of pipe, as it is installed to hold it firmly in place.
- C. Laying Pipe in Freezing Weather: No pipe shall be laid upon a foundation into which frost has penetrated, or at any time when there is danger of ice formation or frost penetration at the bottom of the excavation. In freezing weather, open trench length shall be kept to a minimum and the excavation promptly backfilled after the pipe has been installed.

3.2 FIELD TESTING

3.2.1 Field Testing Wastewater Force Main Piping

The CONTRACTOR shall provide all necessary equipment such as pumps, gauges, and water measuring tanks and shall perform all work required for pipe pressure and leakage test. Hydrostatic and leakage tests shall be made between valves and/or connectors for each section tested using the procedure outline in ANSI/AWWA C600.

3.2.2 Hydrostatic Testing

- A. CONTRACTOR shall furnish all equipment, labor, and materials, including water, pumps compressors, stopwatch, gauges, and meters as approved by the ENGINEER for testing. The ENGINEER shall determine the amount of main to be testing at any one time and reserves the right to separate the installation into several test sections. All test must be witnessed by the ENGINEER or OWNER.

3.2.3 Water Pressure Testing

- A. Pipe shall be subjected to a hydrostatic pressure of 125 pounds per square inch (psi) for two hours and shall not deviate by greater than 5 psi.

3.2.4 Pressurization

- A. Each valved section of the pipe shall be filled with water slowly and the specified test pressure, based on the elevation of the lower point of the line or section under the test and correct to the elevation of the test gage, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the OWNER.

3.2.5 Air Removal

- A. Before applying the specified test pressure, air shall be expelled completely from the pipe.

3.2.6 Examination

- A. All exposed pipe, fittings, and joints shall be examined carefully during the test. Any damage for defective pipe, fitting, or joint that are discovered following the pressure test shall be repaired or replaced with the same material and the test shall be repeated unit it is satisfactory to the OWNER.

3.2.7 Sewer Testing

- A. CONTRACTOR shall furnish all labor, tools, materials, and equipment, including water, pumps, compressors, stopwatch, gauges, and meters, subject to the approval of the ENGINEER for testing in accordance with the OWNER of Berlin Standard Specifications.

1. The ENGINEER shall be notified in advance of all test, and all tests shall be conduction to his entire satisfaction.
2. Gravity sewer mains shall be mirror tested.

MIRROR TEST:

Upon completion of pipe laying and backfilling to a point at least two (2) feet above the crown of the pipe, the ENGINEER will conduct a mirror test to check for defects, excess deflection, leakage, and for horizontal or vertical

misalignment. Mirror testing shall consist of reflection sunlight or artificial light via mirrors through the completed section of pipeline, which, in order to be accepted, shall be true and straight in horizontal and vertical alignment to allow for the full passage of the reflected light.

3. Manhole Inspections: If inspection reveals any visible leakage or seepage in any manhole, the CONTRACTOR will be required to accomplish remedial measures as may be directed by the ENGINEER. Caulking or patching of interior manhole surfaces will not be acceptable.

3.2.8 Repair/Retest

- A. If test results indicate that the pipe laid has leakage and/or a noticeable pressure loss, the CONTRACTOR shall locate and repair the defective joints, fittings, pipe or valves and retest. The CONTRACTOR shall retest until specified conditions are met to the satisfaction of the ENGINEER, at no cost to the OWNER.

+ + END OF SECTION + +

SECTION F

PERMITS



Maryland
Department of
the Environment

Wes Moore, Governor
Aruna Miller, Lt. Governor

Serena McIlwain, Secretary
Suzanne E. Dorsey, Deputy Secretary

WATER AND/OR SEWERAGE CONSTRUCTION PERMIT

Permit No.: 23-22:23-1030
Permit Fee: N/A

Date Issued: 4/9/2024
Expiration Date: 4/9/2027

This permit authorizes Worcester County Department of Public Works to construct force mains and a wastewater pumping station together with all appurtenances, in and around Lewis Road, Worcester County, in accordance with an application dated 3/6/2023 and received by the Maryland Department of the Environment on 3/13/2023 titled in part:

**LEWIS ROAD GRAVITY SEWER SYSTEM AND PUMP STATION
DRAWING SHEET NOS. 1 THRU 22 OF 22
AND SPECIFICATIONS**

THIS PERMIT IS ISSUED SUBJECT TO THE ATTACHED FOLLOWING CONDITIONS:

Note: This permit may be suspended or revoked upon a final, unreviewable determination that the permittee lacks, or is in violation of federal, state or local approval necessary to conduct the activity authorized by this permit.

**Walid Saffouri, P.E., Program Administrator
Engineering & Capital Projects Program**

GENERAL CONDITIONS FOR WATER OR SEWERAGE CONSTRUCTION PERMIT

- The structural adequacy and expected performance characteristics of the various components are not certified by this permit.
- This permit is not transferable.
- A copy of this permit must be posted at the work site during construction.
- This permit will expire, if not specifically extended, unless the construction authorized under this permit has been initiated. The permit will then remain valid for the remainder of construction for a period of up to five years from the start of construction.
- If any provision of this permit shall be held invalid for any reason, the remaining provisions shall remain in full force and effect, and such invalid provision shall be considered severed and deleted from this permit.
- Persons violating the requirements of this permit are subject to penalties of up to \$1000 per day as set forth in Environment Article 9-268 and 9-334 through 9-342, Annotated Code of Maryland.
- A copy of the plans and specifications, authorized for use under this permit, shall be made available at the work site during construction of this project. A revised construction permit in accordance with COMAR 26.03.12 is required prior to making substantive changes or material alteration to the construction authorized under this permit.
- The owner shall secure all Federal, State or local permits, including approval of Sedimentation and Erosion Control Plans that may be required before starting the construction of the project.
- The owner shall insure that this project is inspected during the progress of construction to assure substantial compliance with the approved plans and specifications. A log and construction records shall be maintained by the inspector and may be requested for review at any time by this office.
- The project engineer of the Maryland Department of the Environment (the 'Department') shall be notified prior to the start of construction.
- Inspectors of the Department shall be afforded access to the project site, at reasonable times and upon presentation of credentials:
 - a. to inspect construction authorized under this permit and to determine compliance with applicable regulations;
 - b. to have access to and copy any records required to be kept by this permit and by applicable regulations; and
 - c. to obtain any photographic documentation or evidence.
- Within 60 days after completion of construction, a copy of as-built drawings and the attached construction completion certificate (page 3 of this permit) shall be submitted to the Department. Where construction was completed in accordance with the original plans approved under this permit, the submittal of as-built drawings will not be required.
- The owner shall maintain a permanent record of the as-built drawings, or the original plans if as-built drawings are not required.

GENERAL CONDITIONS (CONTINUED)

- Pursuant to Labor & Employment Article 9-201, the owner shall ensure that the contractor and subcontractors involved in the construction of this project must carry workers' compensation insurance for their employees. If the owner determines to perform the project construction by his/her labor force, the owner shall provide the same. If the entity, undertaking the project construction, is not covered by a workers' compensation policy, a Certificate of Compliance shall be submitted and approved by the Workers' Compensation Commission before initiation of the construction.
- Approval must be obtained from the Department before this project may be placed into service. Any exception allowing partial use of this project shall have the prior written approval of the Department. Approval may be obtained pursuant to the following procedure:
 - a. Where large political subdivisions, commissions, authorities etc. have their own inspection capabilities (satisfactory to the Department), the attached construction completion certificate shall be completed by the director of Public Works or similar responsible person and submitted to the Department.
 - b. Where an acceptable local construction inspection program does not exist, the attached construction completion certification shall be completed by a Professional Engineer licensed to practice in the State of Maryland (preferably the same engineer whose seal and signature appear on the plans approved under this permit) and submitted to the Department.
 - c. Upon receipt of the signed certificate, the Department shall, within (30) working days of the receipt, 1) issue an approval, 2) require further review and on-site inspection or 3) reject the construction certification. Approval shall be automatic for projects that have not received some form of written notification from the Department within (30) working days of receipt of the signed certificate.

23-22:23-1030

Permit Number


Brandon Choi

Project Engineer

Engineering & Capital Projects Program

WATER AND SEWER CONSTRUCTION COMPLETION CERTIFICATION

The undersigned certifies that the construction authorized by this permit has been completed and inspected and that it substantially meets the terms of Environment Article 9-204, Annotated Code of Maryland.

Signature

Title

Date

The above project has been accepted by the Department within the terms of Environment Article 9-204, Annotated Code of Maryland.

Authorized Official

Date

Complete this certificate and return to:
Maryland Department of the Environment
Engineering & Capital Projects Program (ECP)
Office of Budget and Infrastructure Financing
1800 Washington Boulevard
Baltimore, MD 21230

06/2022



Maryland
Department of
the Environment

Wes Moore, Governor
Aruna Miller, Lt. Governor

Serena McIlwain, Secretary
Suzanne E. Dorsey, Deputy Secretary

NOTICE

Prior to starting construction, please notify Brandon Choi, Project Engineer, by email at brandon.choi@maryland.gov. Upon completion of the project, the construction must be certified with the signed permit returned to this office along with a set of as-built drawings.

Should you have any questions concerning the permit or its conditions, please contact me at (410) 537-3757 or at walid.saffouri@maryland.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "Walid Saffouri", with a long horizontal stroke extending to the right.

**Walid Saffouri, Program Administrator
Engineering and Capital Projects Program
Office of Budget and Infrastructure Financing**



Maryland

Department of the Environment

Wes Moore, Governor
Aruna Miller, Lt. Governor
Serena Mcllwain, Secretary
Suzanne E Dorsey, Deputy Secretary

10/2/2023

Worcester County Department of Public Works

6113 Timmons Road
Snow Hill, Maryland 21863

RE: Authorization of Application Number: **20CPX07KE/MDRCX07KE**

Dear **Mr. Chris Clasing**,

This letter confirms, that as of **10/2/2023**, your authorization for coverage under the General Permit for Stormwater Associated with Construction Activity (MDRC/20-CP) was granted for discharges into:

Use II: Newport Bay (02130105)

In signing the Notice of Intent (NOI) you have certified that the Operator named here:

Worcester County Department of Public Works

intends to abide by the terms of the MDRC/20-CP permit for:

Lewis Road Sanitary System

for a total disturbed area of: **1.95 acres**

at a property located at:

**Lewis Road
Berlin, Maryland 21842**

in:

Worcester County

This coverage will continue under the terms of the General Permit until the permit is renewed by MDE (see 20CP Part I.F). You must print the full permit text to be kept on file and onsite with this letter. The permit text can be printed from:

https://mde.maryland.gov/programs/Water/wwp/Pages/gp_construction.aspx. Staff on-site must be thoroughly familiar with the content of the permit and where a copy is available on-site. A summary of the permit requirements and provision are provided below.

The stormwater discharges associated with construction and associated support activity are authorized under this authorization provided that appropriate stormwater controls are designed, installed, and maintained (see 20CP Parts III.A and III.B). In addition to stormwater associated with construction activity (see 20CP Part I.C.2) of the permit specifies the allowable non-stormwater discharges under this authorization. Any discharges not authorized by the General Permit may require additional permit coverage (see 20CP Part I.E).

If the current E&SC plan approval covers only part of the entire site, be advised that this registration does not authorize discharges from the other portions for the site until the appropriate E&SC approval authority approves the E&SC plan for those portions.

Discharges must be controlled as necessary to meet applicable water quality standards (see 20CP Part III.B). The narrative surface water quality criteria in Maryland's water quality standards include floating debris, oil, grease, scum, sludge, and other floating materials in amounts sufficient to cause the receiving water(s) to be unsightly; change the existing color to produce objectionable color for aesthetic purposes, or interfere directly or indirectly with designated uses; or elevate temperature which interfere directly or indirectly with designated uses.

In addition to the Technology-Based and Water Quality-Based Limits, the permit requirements include:

- "Site Inspection, Monitoring and Records", categorized as Person(s) Responsible for Inspecting Site (see 20CP Part III.C.1), Frequency of Inspections (see 20CP Part III.C.2), Increase in Inspection Frequency for Sites Discharging to Sensitive Waters (see 20CP Part III.C.3), Reductions in Inspection Frequency (see 20CP Part III.C.4), Areas That Must Be Inspected (see 20CP Part III.C.5), Requirements for Inspections (see 20CP Part III.C.6), Inspection Report (see 20CP Part III.C.7) and Records On-site (see 20CP Part III.C.8).
- "Corrective Actions", categorized as Conditions Triggering Corrective Action (see 20CP Part III.D.1), Corrective Action Deadlines (see 20CP Part III.D.2), and Corrective Action Report (see 20CP Part III.D.3).
- "Staff Training Requirements", categorized as Prior to the commencement of construction activities (see 20CP Part III.E.1), Regarding subcontractors or outside service providers (see 20CP Part III.E.2), Specific training related to scope of jobs (see 20CP Part III.E.3), and Easy access to documents (see 20CP Part III.E.4).
- "Stormwater Pollution Prevention Plan (SWPPP)", categorized as when a SWPPP is required (see 20CP Part III.F.1), the onsite availability of your SWPPP (see 20CP Part III.F.3) and when your SWPPP must be updated (see 20CP Part III.F.4).

You are required to submit any Modifications to this coverage, Transfers of Authorization, or Notices of Termination via the ePermits portal found at <https://egov.maryland.gov/mde/npdes/Account/Login>. If your contact information changes, update it through the ePermits portal. If you have any questions, please call the administrative team for the General Permit at (410) 537-3019.

Lastly, please remember to contact the compliance program to schedule a preconstruction meeting two (2) weeks prior to starting construction. If the compliance program contact name isn't on your approved E&SC plan, refer to the regional office Compliance Program Contacts listed on the following web page: <https://mde.maryland.gov/programs/water/Compliance/Pages/index.aspx>.

Sincerely,



Jennifer Nitsch
Industrial Stormwater Permits Division
Wastewater Pollution Prevention & Reclamation Program

General Permit for Stormwater Associated with Construction Activity Addendum

Cause(s) of the impairment: Bacteria, Biological, Nutrients.

This page left intentionally blank

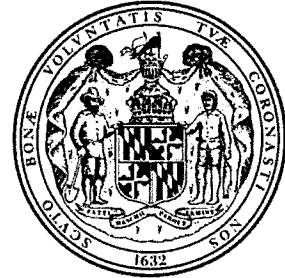
STATE OF MARYLAND
DEPARTMENT OF THE ENVIRONMENT
WATER AND SCIENCE ADMINISTRATION
WETLANDS AND WATERWAYS PROTECTION PROGRAM
LETTER OF AUTHORIZATION

AUTHORIZATION NUMBER: 23-NT-2052/202361229

EFFECTIVE DATE: March 28, 2024

EXPIRATION DATE: March 28, 2029

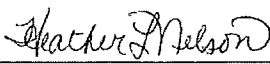
AUTHORIZED PERSON: Worcester County DPW
6113 Timmons Road
Snow Hill, Maryland 21863
Attn: Dallas Baker, P.E



IN ACCORDANCE WITH ENVIRONMENT ARTICLE §5-503(a) AND §5-906(b), ANNOTATED CODE OF MARYLAND, COMAR 26.17.04 AND 26.23.01, AND 26.08.02 AND THE ATTACHED CONDITIONS OF AUTHORIZATIONS, Worcester County DPW (AUTHORIZED PERSON"), IS HEREBY AUTHORIZED BY THE WATER AND SCIENCE ADMINISTRATION ("ADMINISTRATION") TO CONDUCT A REGULATED ACTIVITY IN A NONTIDAL WETLAND, BUFFER, OR EXPANDED BUFFER, AND/OR TO CHANGE THE COURSE, CURRENT OR CROSS-SECTION OF WATERS OF THE STATE, IN ACCORDANCE WITH THE ATTACHED PLANS APPROVED BY THE ADMINISTRATION ON February 23, 2024 ("APPROVED PLAN") AND PREPARED BY EA Engineering, Science and Technology AND INCORPORATED HEREIN, AS DESCRIBED BELOW:

To construct a public sanitary sewer system and pumping station which will permanently impact 262 square feet of forested nontidal wetlands and 1,401 square feet of 25-foot nontidal wetlands buffer. The authorized activity will connect existing private properties operating on private septic systems to public service. This authorized activity is located on the east side of Lewis Road near 8809 Lewis Road, Berlin, Worcester County, Maryland, 21811.

MD Grid Coordinates N 38.303135, E 75153071



Heather L. Nelson
Program Manager
Wetlands and Waterways Protection Program

Attachments: Conditions of Authorization

cc: MDE Compliance Program

1. **Validity:** Authorization is valid only for use by Authorized Person. Authorization may be transferred only with prior written approval of the Administration. In the event of transfer, transferee agrees to comply with all terms and conditions of Authorization.
2. **Initiation of Work, Modifications and Extension of Term:** Authorized Person shall initiate authorized activities in waterways, including streams and the 100-year floodplain, within two (2) years of the Effective Date of this Authorization or the Authorization shall expire. [Annotated Code of Maryland, Environment Article 5-510(a)-(b) and Code of Maryland Regulations 26.17.04.12]. Authorized Person may submit written requests to the Administration for (a) extension of the period for initiation of work, (b) modification of Authorization, including the Approved Plan, or, (c) not later than 45 days prior to Expiration Date, an extension of term. Requests for modification shall be in accordance with applicable regulations and shall state reasons for changes, and shall indicate the impacts on nontidal wetlands, streams, and the floodplain, as applicable. The Administration may grant a request at its sole discretion. (Annotated Code of Maryland, Environment Article 5-510(c), and Code of Maryland Regulations 26.17.04.12, and Annotated Code of Maryland, Environment Article 5-907 and Code of Maryland Regulations 26.23.02.07).
3. **Responsibility and Compliance:** Authorized Person is fully responsible for all work performed and activities authorized by this Authorization shall be performed in compliance with this Authorization and Approved Plan. Authorized Person agrees that a copy of the Authorization and Approved Plan shall be kept at the construction site and provided to its employees, agents and contractors. A person (including Authorized Person, its employees, agents or contractors) who violates or fails to comply with the terms and conditions of this Authorization, Approved Plan or an administrative order may be subject to penalties in accordance with §5-514 and §5-911, Department of the Environment Article, Annotated Code of Maryland (2007 Replacement Volume).
4. **Failure to Comply:** If Authorized Person, its employees, agents or contractors fail to comply with this Authorization or Approved Plan, the Administration may, in its discretion, issue an administrative order requiring Authorized Person, its employees, agents and contractors to cease and desist any activities which violate this Authorization, or the Administration may take any other enforcement action available to it by law, including filing civil or criminal charges.
5. **Suspension or Revocation:** Authorization may be suspended or revoked by the Administration, after notice of opportunity for a hearing, if Authorized Person: (a) submits false or inaccurate information in Permit application or subsequently required submittals; (b) deviates from the Approved Plan, specifications, terms and conditions; (c) violates, or is about to violate terms and conditions of this Authorization; (d) violates, or is about to violate, any regulation promulgated pursuant to Title 5, Department of the Environment Article, Annotated Code of Maryland as amended; (e) fails to allow authorized representatives of the Administration to enter the site of authorized activities at any reasonable time to conduct inspections and evaluations; (f) fails to comply with the requirements of an administrative action or order issued by the Administration; or (g) does not have vested rights under this Authorization and new information, changes in site conditions, or amended regulatory requirements necessitate revocation or suspension.
6. **Other Approvals:** Authorization does not authorize any injury to private property, any invasion of rights, or any infringement of federal, State or local laws or regulations, nor does it obviate the need to obtain required authorizations or approvals from other State, federal or local agencies as required by law.
7. **Site Access:** Authorized Person shall allow authorized representatives of the Administration access to the site of authorized activities during normal business hours to conduct inspections and evaluations necessary to assure compliance with this Authorization. Authorized Person shall provide necessary assistance to effectively and safely conduct such inspections and evaluations.
8. **Inspection Notification:** Authorized Person shall notify the Administration's Compliance Program at least five (5) days before starting authorized activities and five (5) days after completion. For Allegany, Garrett, and Washington Counties, Authorized Person shall call 301-689-1480. For Carroll, Frederick, Howard, Montgomery and Prince George's Counties, Authorized Person shall call 301-665-2850. For Baltimore City, Anne Arundel, Baltimore, Calvert, Charles, Harford and St. Mary's Counties, Authorized Person shall call 410-537-3510. For Caroline, Cecil, Dorchester, Kent, Queen Anne's, Somerset, Talbot, Wicomico and Worcester Counties, Authorized Person shall call 410-901-4020. If Authorization is for a project that is part of a mining site, please contact the Land and Materials Administration's Mining Program at 410-537-3557 at least five (5) days before starting authorized activities and five (5) days after completion.
9. **Sediment Control:** Authorized Person shall obtain approval from the Worcester County Soil Conservation District for a grading and sediment control plan specifying soil erosion control measures. The approved grading and sediment control plan shall be included in the Approved Plan, and shall be available at the construction site.
10. **Best Management Practices During Construction:** Authorized Person, its employees, agents and contractors shall conduct authorized activities in a manner consistent with the Best Management Practices specified by the Administration.

11. **Disposal of Excess:** Unless otherwise shown on the Approved Plan, all excess fill, spoil material, debris, and construction material shall be disposed of outside of nontidal wetlands, nontidal wetlands buffers, and the 100-year floodplain, and in a location and manner which does not adversely impact surface or subsurface water flow into or out of nontidal wetlands.
12. **Temporary Staging Areas:** Temporary construction trailers or structures, staging areas and stockpiles shall not be located within nontidal wetlands, nontidal wetlands buffers, or the 100-year floodplain unless specifically included on the Approved Plan.
13. **Temporary Stream Access Crossings:** Temporary stream access crossings shall not be constructed or utilized unless shown on the Approved Plan. If temporary stream access crossings are determined necessary prior to initiation of work or at any time during construction, Authorized Person, its employees, agents or contractors shall submit a written request to the Administration and secure the necessary permits or approvals for such crossings before installation of the crossings. Temporary stream access crossings shall be removed and the disturbance stabilized prior to completion of authorized activity or within one (1) year of installation.
14. **Discharge:** Runoff or accumulated water containing sediment or other suspended materials shall not be discharged into waters of the State unless treated by an approved sediment control device or structure.
15. **Instream Construction Prohibition:** To protect important aquatic species, motor driven construction equipment shall not be allowed within stream channels unless on authorized ford crossings. Activities within stream channels are prohibited as determined by the classification of the stream (COMAR 26.08.02.08): NA is a Use NA waterway; in-stream work may not be conducted from NA through NA, inclusive, of any year.
16. **Instream Blasting:** Authorized Person shall obtain prior written approval from the Administration before blasting or using explosives in the stream channel.
17. **Minimum Disturbance:** Any disturbance of stream banks, channel bottom, wetlands, and wetlands buffer authorized by this Authorization or Approved Plan shall be the minimum necessary to conduct permitted activities. All disturbed areas shall be stabilized vegetatively no later than seven (7) days after construction is completed or in accordance with the approved grading or sediment and erosion control plan.
18. **Restoration of Construction Site:** Authorized Person shall restore the construction site upon completion of authorized activities. Undercutting, meandering or degradation of the stream banks or channel bottom, any deposition of sediment or other materials, and any alteration of wetland vegetation, soils, or hydrology, resulting directly or indirectly from construction or authorized activities, shall be corrected by Authorized Person as directed by the Administration.
19. **Mitigation:** Mitigation for these authorized permanent impacts has been satisfied by investment into the Maryland Department of the Environment Nontidal Wetlands Compensation Fund.

FEDERALLY MANDATED STATE AUTHORIZATIONS

The State of Maryland issued a Water Quality Certification to the U.S. Army Corps of Engineers for projects receiving federal authorization under the Maryland State Programmatic General Permit, Regional General Permit for Chesapeake Bay Total Maximum Daily Load (TMDL) Activities and non-suspended Nationwide Permits. In addition, as applicable, this Authorization constitutes the State's concurrence with the Applicant's certification that the activities authorized herein are consistent with the Maryland Coastal Zone Management Program, as required by Section 307 of the Coastal Zone Management Act of 1972, as amended. Activities in the following counties are not subject to the Maryland Coastal Zone Management requirement: Allegany, Carroll, Frederick, Garrett, Howard, Montgomery, and Washington.

U.S. ARMY CORPS OF ENGINEERS AUTHORIZATION

The U.S. Army Corps of Engineers has reviewed this activity and:

☒ Granted authorization under the Maryland State Programmatic General Permit (MDSPGP-6), as a Category A E1 activity. The terms and conditions of the MDSPGP-6 as outlined in the documents found on the Maryland Department of the Environment's website, https://mde.maryland.gov/programs/Water/WetlandsandWaterways/Pages/MDSPGP6_conditions.aspx, should be followed when performing the authorized work, or

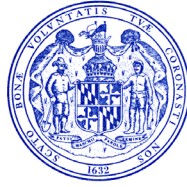
☐ Will issue a Category B authorization or Individual Permit directly to the Authorized Person

**BEST MANAGEMENT PRACTICES FOR WORKING IN
NONTIDAL WETLANDS, WETLAND BUFFERS,
WATERWAYS AND 100-YEAR FLOODPLAINS**

- 1) No excess fill, construction material, or debris shall be stockpiled or stored in nontidal wetlands, nontidal wetland buffers, waterways, or the 100-year floodplain.
- 2) Place materials in a location and manner which does not adversely impact surface or subsurface water flow into or out of nontidal wetlands, nontidal wetland buffers, waterways, or the 100-year floodplain.
- 3) Do not use the excavated material as backfill if it contains waste metal products, unsightly debris, toxic material, or any other deleterious substance. If additional backfill is required, use clean material free of waste metal products, unsightly debris, toxic material, or any other deleterious substance.
- 4) Place heavy equipment on mats or suitably operate the equipment to prevent damage to nontidal wetlands, nontidal wetland buffers, waterways, or the 100-year floodplain.
- 5) Repair and maintain any serviceable structure or fill so there is no permanent loss of nontidal wetlands, nontidal wetland buffers, or waterways, or permanent modification of the 100-year floodplain in excess of that lost under the originally authorized structure or fill.
- 6) Rectify any nontidal wetlands, wetland buffers, waterways, or 100-year floodplain temporarily impacted by any construction.
- 7) All stabilization in the nontidal wetland and nontidal wetland buffer shall consist of the following species: Annual Ryegrass (*Lolium multiflorum*), Millet (*Setaria italica*), Barley (*Hordeum* sp.), Oats (*Uniola* sp.), and/or Rye (*Secale cereale*). These species will allow for the stabilization of the site while also allowing for the voluntary revegetation of natural wetland species. Other non-persistent vegetation may be acceptable, but must be approved by the Nontidal Wetlands and Waterways Division. **Kentucky 31 fescue shall not be utilized in wetland or buffer areas.** The area should be seeded and mulched to reduce erosion after construction activities have been completed.
- 8) After installation has been completed, make post-construction grades and elevations the same as the original grades and elevations in temporarily impacted areas.
- 9) To protect aquatic species, in-stream work is prohibited as determined by the classification of the stream:
 - Use I waters: In-stream work shall not be conducted during the period March 1 through June 15, inclusive, during any year.
 - Use III waters: In-stream work shall not be conducted during the period October 1 through April 30, inclusive, during any year.
 - Use IV waters: In-stream work shall not be conducted during the period March 1 through May 31, inclusive, during any year.
- 10) Stormwater runoff from impervious surfaces shall be controlled to prevent the washing of debris into the waterway.
- 11) Culverts shall be constructed and any riprap placed so as not to obstruct the movement of aquatic species, unless the purpose of the activity is to impound water.

Wes Moore
Governor

Aruna Miller
Lt. Governor



Charles C. Deegan
Chairman

Katherine Charbonneau
Executive Director

**STATE OF MARYLAND
CRITICAL AREA COMMISSION
CHESAPEAKE AND ATLANTIC COASTAL BAYS**

March 31, 2023

Mr. David Bradford
Dept. of Environmental Programs
Worcester County Government
Room 1306
1 West Market St.
Snow Hill, MD 21863

Re: Lewis Rd, Utility Lot Creation, Consistency Report
TM 33, P 318

Dear Mr. Bradford:

Thank you for submitting a revised plat regarding the above-referenced project. Worcester County Department of Public Works is proposing to create a new lot for the purposes of locating a future pump station. The parent parcel (Tax Map 33, Parcel 318) includes 0.95 acres within the Resource Conservation Area (RCA). The proposed utility lot is 0.1289 acres.

The revised plat addresses our previous comments regarding application of the 15% lot coverage limit. Specifically, the 15% limit is 0.1425 acres. The utility lot will use 0.05 acres of that lot coverage, leaving 0.0925 acres remaining for parent parcel 318.

Additionally, the proposed forest clearing which will occur in edge FIDS habitat will be mitigated at a 1:1 ratio by planting adjacent to existing FIDS habitat on a county-owned property.

Therefore, this office concurs that the project is consistent with the County's Critical Area Program as required under COMAR 27.02.02. Please let me know if you have any questions or if any of the above conditions change.

Sincerely,

A handwritten signature in cursive script that reads "Kate Charbonneau".

Kate Charbonneau
Executive Director

